2008-01-01

Poverty, Diet and Health Behaviours: a Quantitative and Qualitative Study Among Young Urbanised Women.

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Table of Contents

Chapter 2 Methodology

Chapter 3 Dietary Assessment Methods

Chapter 4 Socio-economic Differences in Food Group and Nutrient Intakes

Chapter 5 Health Behaviours and Anthropometry

Volume II

Chapter 6 Attitudes and Beliefs

Chapter 7 Conclusions, Recommendations & Further Work

Appendices

Table of Illustrations, Figures and Tables

Chapter 1 Introduction

Chapter 2 Methodology

Chapter 3 Dietary Assessment Methods

Chapter 4 Socio-economic Differences in Food Group and Nutrient Intakes

Chapter 5 Health Behaviours and Anthropometry

Volume II

Chapter 6 Attitudes and Beliefs

Poverty, Diet & Health Behaviours
A Quantitative and Qualitative Study
Among Young Urbanised Women

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Dip./B.Sc. (Hum. Nut.), M.Sc.

Submitted for the Award of Doctor of Philosophy (Ph.D.)

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April 2008

Volume I (of II)

Abstract

Demographic, socio-economic, attitudinal, dietary, health behavioural and anthropometric data were collected from 221 "disadvantaged" and 74 "advantaged" women aged 18-35 years across Dublin, according to the provisions of a novel socio-economic sampling frame. Internal and external validation techniques established the dietary assessment method of choice and identified "valid" dietary reporters (n=216, 153 disadvantaged, 63 advantaged) among this sample. Five qualitative focus groups (n=5-8 per group) were also conducted among disadvantaged women to examine their diet and health behaviour choices.

Lower intakes of fruit & vegetables (172g/d vs. 405g/d, $p<0.001$), breakfast cereals (4g/d vs. 29g/d, $p<0.001$), fish (0g/d vs. 26g/d, $p<0.001$) and dairy products (166g/d vs. 228g/d, $p=0.001$), and higher intakes of meat and meat products (184g/d vs. 143g/d, $p<0.001$) and potatoes and potato products (165g/d vs. 77g/d, $p<0.001$), were observed among the disadvantaged versus the advantaged women. Non-compliance with carbohydrate (49% vs. 30%, $p=0.017$), fat (74% vs. 35%, $p<0.001$), saturated fat (89% vs. 65%, $p<0.001$), and sugar (60% vs. 30%, $p<0.001$) intake guidelines was also significantly higher among the disadvantaged women. Additionally, non-achievement of intake guidelines (EAR) for folate (35% vs. 21%, $p=0.050$), vitamin C (31% vs. 6%, $p<0.001$), vitamin D (80% vs. 67%, $p=0.047$) and calcium (25% vs. 10%, $p=0.019$) was higher among the disadvantaged women, while both groups showed poor compliance with iron and sodium intake guidelines.

Higher smoking rates ($p<0.001$), higher alcohol consumption ($p=0.029$), lower participation in vigorous physical activity ($p=0.001$) and lower supplementation rates ($p=0.004$) were observed among the disadvantaged cohort, as were higher mean BMI (25.3 kg/m^2 vs. 22.9 kg/m^2, $p=0.001$) and waist circumference measurements (87.9 cm vs. 79.7 cm, $p<0.001$).

Quantitative analyses suggest that differences in attitudinal factors (dietary stage of change, locus of health control) predict some of these adverse behaviours, while deficits in diet and health knowledge and health information seeking may also contribute. The qualitative study additionally highlights the importance of psycho-social stress, depression, poor knowledge and cost as further impediments to healthy diet and lifestyle among disadvantaged women.

These findings demonstrate the clustering of significantly less favourable diet, nutrient intakes and health behaviours among socially disadvantaged women in Dublin, trends which augur poorly for these women's long-term health.

Declaration

I certify that this thesis which I now submit for examination for the award of Doctor of Philosophy, is entirely my own work and has not been taken from the work of others save, and to the extent, that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for an award in any other Institute or University.

The work reported on in this thesis conforms to the principles and requirements of the Institute's guidelines for ethics in research.

The Institute has permission to keep, to lend or to copy this thesis in whole or in part, on condition that any such use of the material of the thesis be duly acknowledged.

Signed ______________________________

Date ______________________________

Acknowledgements

I wish to express my sincere gratitude to the following individuals and agencies and who have each contributed enormously to this project, and without whom its successful completion would not have been possible.

Special thanks are owed to Dr. John Kearney and Dr. Kate Younger for their tireless supervision and support throughout the course of the project. Their expert technical and editorial advice was always matched by a kindness and generosity of spirit which supported and encouraged me throughout the project, even when difficulties arose.

Special thanks are due also to Ms. Brid Ann Ryan, Head of Biological Sciences at DIT, whose generous support for this work from its inception to its conclusion has been instrumental in its success, and whose personal kindness and encouragement from the outset are also greatly appreciated.

Sincere thanks are also due to our sponsors the Food Safety Promotion Board (FSPB *Safe*Food), particularly Dr. Marion Faughnan and Dr. Cliodhna Foley-Nolan, for their generous funding of this work and for their technical advice and support over the past three and a half years.

Many thanks too, to the Irish Universities Nutrition Alliance (IUNA), for granting access to the North/South Ireland Food Consumption Survey (NSIFCS) and pan-EU Attitudinal databases for the preliminary socio-economic analyses. Specific thanks is owed to my collaborators Dr. Sinead McCarthy and Dr. Sarah Burke of Trinity College Dublin and University College Dublin, and Dr. Barbara Stewart and Dr. Maria Barton of the University of Ulster Coleraine, all of whom contributed to the formulation of the quantitative and qualitative studies described in this thesis.

Warm thanks as well to Ms. Marie O'Neill and Ms. Joanne Walsh for their tenacious assistance with the quantitative fieldwork, and for their stoicism and good humour during our time together.

Sincere thanks also to Ms. Barbara Whelan for her generous help with the qualitative field work and for her assistance with the preparation of Chapter 5 of this thesis.

Many thanks to all my friends in the School of Biological Sciences, DIT, especially to my nutrition and dietetics colleagues Dr. Clare Corish, Ms. Sheila Sugrue and Ms. Mary Moloney who facilitated the completion of this work over its latter stages. Thanks also to Dr. Mairead Stack, Dr. Nuala O'Byrne-Ring, Dr. Sara Lynch, Dr. Ray Ryan, Dr. Ursula McEvilly, Dr. Helen Lambkin, Dr. Jacinta Kelly, Mr. Frank Clarke, Dr. Gwilym Williams, Dr. John McEvoy, Mr. Mike Mulvaney, Ms. Ide Cussen and Ms. Marie Kortenhorst whose good humour and encouragement was always warmly appreciated, and to my office and laboratory colleagues Dr. Celine Herra, Ms. Roslyn Tarrant, Ms. Joanna Faye and Ms. Quanling Zhou for their ready laughter and friendship.

Thanks are also due to my DIT colleagues from outside the School of Biological Sciences including Dr. Brendan O'Shea and Dr. Bryan Duggan for their assistance with the computer-aided data capture system, Prof. Matt Hussey, and Dr. Tommy Cooke, Mr. Peter Byrne, Dr. Eddie Rohan and Ms. Joy Redmond for their assistance with respondent recruitment for the quantitative study. Sincere thanks also to Mr. Patrick Walsh for his timely IT support which proved crucial at several junctures along the way. Thanks too to Mr. Tony Johns, Tinuviel Software Ltd., for his assistance and guidance with use of the nutrient analysis software.

Kind thanks are also due to my nutrition and dietetics colleagues outside DIT whose advice and encouragement were gratefully received. These were Dr. Nick Kennedy of Trinity College Dublin, Dr. Edel McNamara, Ms. Sarah McEvoy and Ms. Kathleen Jordan of HSE Northern Area, Ms. Gillian Farren of HSE South West Area, Dr. Anne Nugent of University College Dublin, Dr. Marie Cantwell of Queens University Belfast, Dr. Mairead Kiely of University College Cork, Dr. Gail Goldberg of the Dunn MRC Research Centre, Cambridge, Dr. Fiona Lithander of Trinity College Dublin and Prof. Johanna Dwyer of Tufts University, Boston. Thanks too to Dr. Kevin Balanda of the Institute of Public Health in Ireland, Prof. Richard Layte and Dr. Dorothy Watson of the Economic and Social Research Institute (ESRI), Mr. Jim Walsh of the Combat Poverty Agency, Mr. Kevin McCormack of the Central Statistics Office (CSO) and Dr. James McBride of the Irish Social Sciences Data Archive (ISSDA) for their assistance with the socio-economic aspects of the project design.

A considerable debt of gratitude is also owed to the local organisers who facilitated the recruitment and interview of respondents for both the quantitative and qualitative fieldwork. These were Ms. Carmel Brien, Ms. Mary Corridon, Ms. Anne-Marie Kennedy, Mr. Jack Dunphy, Ms. Sinead Keenan, Ms. Jessie Hall, Ms. Phyllis Hall, Mr. Brian Kenna, Ms. Chris McCarthy, Ms. Niamh O'Callaghan, Ms. Mary Donnelly, Ms. Fionnuala Anderson, Mr. Pat Kivelihan, Mr. Gerry Larkin, Ms. Caroline O'Dowd, Ms. Anne Gilton, Mr. Gerry O'Shea, Ms. Linda Curran, Ms. Pauline Mangan, Ms. Barbara Martin, Ms. Martine Murphy, Ms. Anne Smith, Ms. Susan Fox, Ms. Nuala Kane, Ms. Ann Osborne, Ms. Grace Wills, Ms. Teresa Keegan, Mr. John Paul Collins, Ms. Angela McDonagh, Ms. Anne Saul, Ms. Margaret Sweeney and Mr. Mick Melia.

Many thanks also to all of the respondents in both the quantitative and qualitative studies, who have given so freely of their time to participate in this project, and without whose contribution this important research would not be possible.

On a personal level, I owe a massive debt of gratitude to Emer, whose enormous contribution to the transcription of the qualitative focus groups, but also to the recruitment of quantitative respondents, was critical to the completion of this work. Hugely consequential as these were, they are dwarfed in significance by the love, patience and support which she has shown me over the past three years, and which sustained me during my hardest times. Thanks also to all the Mulherns for all their encouragement and kindness over these three years.

I am indebted to my great friends Colin Bebbington, Sarah Beesley, Gavan Ward, Brendan and Victoria Lawlor, Martin and Leonie O'Reilly, Declan and Juliette Byrne, Eoghan and Hazel Brennan, Michael and Elaine McGillicuddy, Gillian Farren, Edel McNamara, Enda Noone, Susan Floyd and Hilary Colgan whose perennial friendship heartened me for the challenges I encountered along the way.

My most heartfelt thanks are finally offered to my family - to my brothers Austin, John and David, and my sisters-in-law Susan, Annie and Sharon, for their advice, love and friendship. Most especially, I would like to thank my mother and father whose constant love and support has fortified me in all my endeavours, and whose patience, friendship and guidance have, as ever, made all the difference. Semper totus tuus.

List of Abbreviations

AOAC	Association of Official Analytical Chemists
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BW	Barbara Whelan
carbs	Carbohydrates
CARDIA	Coronary Artery Risk Development in Young Adults
CCTV	Closed-circuit Television
CDC	Centres for Disease Control
Chipper	Fast Food Outlet
cm	Centimetres
©	Copyright
CPA	Combat Poverty Agency
CPI	Cigarette Promotional Item
CRP	C-reactive Protein
CSO	Central Statistics Office (Ireland)
CV_{tP}	Mean coefficient of variation for PAL
CV_{WB}	Mean coefficient of variation for BMR estimated from Schofield (1985)
CV_{WEI}	Mean within-individual coefficient of variation energy intake
d	The number of days of dietary assessment
DALY	Disability-adjusted Life Years
DASH	Dietary Approaches to Stop Hypertension
DIT	Dublin Institute of Technology
DLW	Doubly-labelled Water
DMC	Daniel McCartney
DoHC	Department of Health and Children (Ireland)
DVD	Digital Versatile Disc
e.g.	For example
EAR	Estimated Average Requirement
ECHP	European Community Household Panel
ED	Electoral District
EI	Energy Intake
ESRI	Economic and Social Research Institute

etc.	Etcetera
EU	European Union
€	Euros
EU-SILC	EU Survey of Income and Living Conditions
FAO	United Nations Food and Agriculture Organisation
FFQ	Food Frequency Questionnaire
FSA	Food Standards Agency
FSAI	Food Safety Authority of Ireland
FSPB	Food Safety Promotion Board
g	Gram
GMS	General Medical Scheme
GP	General Practitioner
HBSC	Health Behaviour in School Age Children Survey
HCA	Heterocyclic Amine
HDL	High Density Lipoprotein
HMSO	Her Majesty's Stationery Office
hr	Hour
Hx	History
i.e.	That is
IgA	Immunoglobulin A
IGF	Insulin-like Growth Factor
IQR	Inter-quartile Range
ISSDA	Irish Social Sciences Data Archive
IUNA	Irish Universities Nutrition Alliance
kcal	Kilocalorie
KFC	Kentucky Fried Chicken
kg	Kilogram
LDL	Low Density Lipoprotein
LIDNS	Low Income Diet and Nutrition Survey (UK)
LIIS	Living in Ireland Survey
LTI	Lower Threshold Intake
m	Metre
MAFF	UK Ministry of Agriculture, Fisheries and Food
µg	Microgram

mg	Milligram
MJ	Megajoules
MUFA	Monounsaturated Fatty Acids
n	Number of Respondents
n-3	Omega-3
NAPS	National Anti-Poverty Strategy
NAPS IDPC	National Anti-Poverty Strategy Inter-Departmental Policy Committee
NDNS	National Diet and Nutrition Survey (UK)
NMES	Non-milk Extrinsic Sugars
NSIFCS	North South Ireland Food Consumption Survey
NSP	Non-Starch Polysaccharide
OECD	Organisation for Economic Cooperation & Development
PAL	Physical Activity Level
PDA	Personal Digital Assistant
PMSD	Pre-menstrual Stress Disorder
PUFA	Polyunsaturated Fatty Acids
RAPID	Revitalising Areas by Planning, Investment and Development
RDA	Recommended Dietary Allowance
®	Registered Trademark
RSC	Royal Society of Chemistry
RTEBC	Ready-to-eat Breakfast Cereal
SAPS	Small Area Population Statistics
SD	Standard Deviation
SE	Socio-economic
SEG	Socio-economic Group
SES	Socio-economic Status
SFA	Saturated Fatty Acids
SLAN	Survey of Lifestyles, Attitudes and Nutrition
SPSS	Statistical Package for Social Sciences
SQL	Structured Query Language
STFA	Strategic Task Force on Alcohol
TCD	Trinity College Dublin
TEE	Total Energy Expenditure
TM	Trademark

TPB	Theory of Planned Behaviour
TV	Television
UCC	University College Cork
UK	United Kingdom
UKDH	UK Department of Health
UNU	United Nations Universities
US	United States of America
UU	University of Ulster
vs.	Versus
WHO	World Health Organisation
WISP	Weighed Intake Software Package
YLL	Years of Life Lost

"Believe in yourself, know yourself, deny yourself,

and be humble."

John Treacy, Olympic Marathon Silver Medallist,

Los Angeles 1984

Chapter 1

Introduction

1.1. Introduction

Poverty has been consistently associated with poorer health indices across a broad spectrum of geographic constituencies. The factors associated with poor health status among disadvantaged groups are thought to include physiological, ecological, psycho-social and structural determinants. Among the proximate effectors which actually mediate the deleterious influence of these factors are poor diet, physical inactivity and other negative health behaviours (Barrington, 2004). While national surveys like the North South Ireland Food Consumption Survey (NSIFCS) (Harrington *et al.*, 2001) and the Survey of Lifestyles, Attitudes and Nutrition (SLAN) (Kelleher *et al.*, 2002) suggest that socio-economic differences in food group, nutrient intakes and health behaviours do exist in Ireland, many such studies have failed to capture the very poorest groups where these problems may be most profound. There is thus a paucity of robust data describing the diet, nutrient intakes and health behaviours of the lowest socio-economic status (SES) groups in Ireland, and the specific barriers to healthy diet and lifestyle which prevail in these groups.

In order for these themes to be comprehensively investigated, it is necessary to first understand the nature of poverty and disadvantage itself, including its measurement, trends and multiple effects on health behaviours and health outcomes. Data will also be presented from our own socio-economic analyses of the NSIFCS database among women aged 18-35 years. Although this dataset does not capture the *very lowest* social groupings in Ireland, it will provide context for the subsequent discussion of health subversive dietary and lifestyle behaviours commonly observed among those of lower SES.

1.2. Poverty and Social Disadvantage

One of the obstacles impeding research into socio-economic health inequalities is the difficulty encountered when attempting to adequately define and measure poverty or low SES. This problem arises due to the multi-dimensional nature of poverty which embraces such elements as low income, poor education, unemployment, area of residence, household structure, accommodation tenure and many others. Even when these parameters are defined, it is difficult to identify which (if any) preferentially co-segregate with unhealthy behaviours and poor health status, and why. While it is crucially important to describe the aspects of poverty which are specifically associated with poor health, it is also important to ensure that the measures of poverty selected in health research programmes are relevant in the policy context, if the findings of such research are to inform substantive change.

Notwithstanding these issues, the following definition of poverty has been offered by Townsend (1979) and latterly adopted by many agencies working in this area, including the Combat Poverty Agency (CPA) in Ireland.

"People are living in poverty if their income and resources (material, cultural and social) are so inadequate as to preclude them from having a standard of living that is regarded as acceptable by Irish society generally. As a result of inadequate income and resources, people may be excluded and marginalised from participating in activities that are considered the norm for other people".

The CPA (2003) also provides the following definition for social exclusion, again emphasising the issue of marginalisation as central to any discussion of poverty.

"When poverty prevents people from participating as equals in everyday life, from feeling part of their community and from developing their skills and talents, this process is often referred to as "social exclusion".

While the above definitions provide a thematic or conceptual interpretation of poverty, they do not elucidate how these factors should be "operationalised" to develop indices by which poverty can be identified, measured and compared both within and between groups.

Many issues need to be addressed in this context including:

- How are "resources" to be measured?
- How do we define inadequacy of income and resources?
- What are the societal norms (living patterns, customs and activities), from which disadvantaged people are excluded due to lack of resources?

The formulation of useful poverty indices therefore relies not just on conceptual choices (e.g. which dimensions of poverty are thought to affect health), but also on pragmatic considerations such as the availability of data to measure these dimensions.

1.3. Types of Poverty

The types of poverty typically referred to for legislative or policy purposes in the Republic of Ireland include relative income poverty, relative deprivation and consistent poverty (Government of Ireland, 2007), although others such as absolute poverty (a lack of food, shelter, clothing and medical care so severe that it threatens an individual's survival) do still exist among a small number of people in the Irish population.

1.3.1. Relative Poverty

In this type of poverty, the individual's income and resources are deemed substantially less than those required to provide a generally acceptable standard of living for the society in which they live (Government of Ireland, 2007). This type of poverty is characteristic of poverty in developed countries, including Ireland. Relative poverty comprises several key elements:

1.3.1.1. Relative Income Poverty

This refers to an individual's monetary income relative to a pre-determined "cut-off" point (the "relative poverty line"). In the past, this relative poverty line has been derived from both mean and median income levels among the general population, although the European Union (EU) now advocates use of the 60% *median* income threshold (Central Statistics Office, 2006).

Using this methodology, the total household income is divided by the number of adult equivalents in that household to provide the individual income figure. For example, using the equivalisation scale previously employed by the Economic and Social Research Institute (ESRI) in Ireland; if a person lives in a one-income household comprising one adult (1.0) and three children (0.33 each) (i.e. 2 adult equivalents) and their total household income (divided by 2) is less than 60% of the median income for the population in which they live, then that individual may be said to be living in relative income poverty. While the scale described in the example above has been superseded since 2003 by a 1.0/0.5/0.3 scale used by the Central Statistics Office (CSO) for the EU Survey of Income and Living Conditions (EU-SILC) (CSO, 2006), it serves to illustrate the manner in which all such equivalisation scales are applied to population household income data.

While many researchers have posited that low income is a fundamental component of disadvantage, there are certain provisos which must be considered in this context. Low income does not always indicate a low standard of living i.e. a lack of resources precipitating social exclusion. For example, if a household has accumulated assets which allow it to maintain a high standard of living despite low income e.g. elderly people living in high cost nursing homes; or if the high standard of living is being financed by the accumulation of unsustainable debt (as is frequently the case, at least anecdotally, in disadvantaged households), measures of relative income will fail to accurately classify such individuals. Similarly, high income does not always coincide with a high standard of living where, for example, large debt repayments or other non-discretionary expenses can exhaust disposable income (Gordon *et al.,* 2001).

Hence any index of poverty which relies exclusively on the measurement of income, may not reliably capture the true nature of poverty, or the population experiencing it. Low relative income may thus be most usefully considered as a major *risk factor for poverty*.

1.3.1.2. Relative Deprivation

This concept takes account of resources rather than income. It uses a consensual list of items or activities which are deemed necessities by the population at large, to establish a deprivation index. Deprivation is then defined as the enforced absence of a specified number of these commodities due to lack of income.

In Ireland, the Living in Ireland Surveys (Callan *et al.,* 1996; Callan *et al.,* 1999; Layte *et al.,* 2000; Nolan *et al.,* 2002; Whelan *et al.,* 2003) conducted by the ESRI from 1987 to 2001, employed a deprivation index comprising 23 indicators, of which it cited eight as "basic necessities". The list of 23 was originally derived by Mack & Lansley (1985) using factor analysis, and was employed to delineate three distinct dimensions of deprivation, namely basic deprivation (primarily food and clothing items), secondary deprivation (mainly household durables) and housing deprivation (accommodation variables) among the United Kingdom (UK) population. The eight "basic necessities" selected by the ESRI to describe relative deprivation in Ireland are:

- Not having:
  - new, but second-hand clothes.
  - a meal with meat, chicken or fish every second day.
  - a warm, water-proof coat.
  - two pairs of strong shoes.
  - a roast or its equivalent once per week.

- Having:
    - debt problems arising from normal living expenses (or availing of charity).
    - a day in the last two weeks without a substantial meal.
    - to go without heating during the last year through lack of money.

The selection of these eight parameters by the ESRI implies that the Mack and Lansley (1985) full index may have captured social phenomena other than poverty by using indicators like housing deprivation. For example, in Ireland, housing problems are higher among rural dwellers, but there is no increased poverty level observed among this group. The ESRI's use of these eight basic necessities to define relative deprivation hence improved the sensitivity and specificity of this index to capture those experiencing deprivation due to *poverty* alone.

However, from 2007 onwards, this list was to be revised, with deprivation defined as an enforced lack of two or more basic indicators from a list of eleven. While the first six items on this amended list are to remain unchanged from those above, there will now be a greater bias towards social aspects of deprivation, with a coincident move away from indicators of absolute material deprivation. For instance, debt arising from normal living expenses and enforced lack of a substantial meal in the last two weeks, will be replaced by the ability to buy presents for friends and family once per year, the ability to replace old furniture, the ability to have friends over for a meal or a drink once a month or to go out for entertainment once per fortnight (Government of Ireland, 2007). This shift in focus towards social indicators of deprivation permits a greater emphasis on the factors which now most effectively predict social exclusion and marginalisation, following significant rises in absolute (material) living standards in Ireland over recent years.

1.3.2. Consistent Poverty

Consistent poverty combines relative income poverty and relative deprivation in a composite conceptual index to describe disadvantage. If a household or individual falls below a median income threshold (usually 60 or 70% of the median) and simultaneously lacks one or more of the eight indicators of basic deprivation listed on page 29-30, they are said to be experiencing consistent poverty. This ESRI approach yields a much lower prevalence of poverty than those methodologies measuring enforced deprivation or relative income poverty alone, but the ESRI have stated that this method most accurately reflects social exclusion due to lack of resources, as well as the evolution of poverty in Ireland from the late 1980s onwards (Layte *et al.,* 2001).

1.3.3. Depth of Poverty

The "poverty gap" is the term used to describe how far below the relative income poverty lines an individual or household falls. The average income of those below the income poverty threshold is also compared with the income poverty threshold to describe the *population* poverty gap. As this gap widens, it becomes more difficult for individuals living in poverty to escape the "poverty trap".

1.4. Measuring Poverty in Ireland

1.4.1. Quantitative Assessment

Between 1987 and 2001, the ESRI in the Republic of Ireland conducted several waves of a longitudinal study examining poverty trends in Ireland (Living in Ireland Survey (LIIS), 1987 (Whelan *et al.,* 1989), 1994 (Callan *et al.,* 1996), 1997 (Callan *et al.,* 1999), 1998 (Layte *et al.,* 2000), 2000 (Nolan *et al.,* 2002) and 2001 (Whelan *et al.,* 2003)), latterly under the aegis of the National Anti-Poverty Strategy (NAPS) (Government of Ireland, 1997). In this study a large, randomised cohort of households were followed over time to assess temporal shifts and trends in the prevalence and degree of poverty in Ireland, as part of the European Community Household Panel (ECHP) Survey (Nolan & Maître, 1999). In their analysis of these data, the ESRI suggested that consistent poverty be defined as less than 70% of the median income (or 60% of the mean income) along with the absence of one or more of the indicators of deprivation from the list of eight mentioned previously.

While the criteria suggested above provided adequate discrimination between disadvantaged and non-disadvantaged individuals in most cases, the ESRI cited a range of different relative income lines ranging from 40% to 70% of the mean or median, and several putative equivalence measures to adjust for variation in household size and composition. The median income thresholds were generally preferred as these automatically correct for the confounding influence that a small number of very high earners might have on the mean income figure.

In following the methodology described above, the ESRI ensured that data were analysed in a scientifically rigorous manner, and that robust findings could be identified which did not depend on the precise location and structure of the poverty line. This approach permitted comparison of serial data between waves of the survey, while explicitly acknowledging the intrinsically arbitrary nature of the assessment method. The presentation of data in this way reflected the diversity of opinion concerning the exact location of the poverty line.

The ESRI also critically appraised the ability of their list of socially perceived necessities to capture the dynamic nature of deprivation as standards of living changed over time. In doing so, they ascertained the characteristics of a “potentially poor” grouping, whom they compared with the “definitely poor” and the “non-poor” groups. To the point of previous data collection in 2000, the characteristics of the “potentially poor” group more closely resembled the features of the “non-poor” group, and consequently the list of deprivation indicators remained unchanged from 1994 (Nolan *et al.,* 2002), and was adopted by the subsequent EU Survey of Income and Living Conditions (EU-SILC) (CSO, 2005 & 2006).

From June 2003 onwards, the longitudinal LIIS conducted by the ESRI was replaced by the EU-SILC, which is administered and analysed annually by the CSO (CSO, 2005 & 2006). The latter survey employs a methodology standardised across the EU, and as such, deviates slightly from the LIIS methodology used previously, most notably in the measurement of deprivation and, by inference, consistent poverty.

The new methodology also favours the use of the 60% median income threshold rather than the previously-employed 70% median threshold, in the derivation of consistent poverty, bringing the Irish definition into line with that of other member states.

Other "operational differences" between the two methodologies include the use of "computer assisted personal interviewing" to administer the EU-SILC, and the fact that the LIIS was a panel survey where the same households were interviewed periodically over a number of years, as opposed to the cross-sectional approach of the initial EU-SILC. The CSO has explicitly stated that the relative deprivation and consistent poverty data from the two studies are not comparable, due to the uncertain provenance of differences in deprivation prevalence between the two (CSO, 2005). Nonetheless, both the LIIS and the EU-SILC have, in their own time, provided a respective barometer of past and future poverty trends in Ireland.

1.5. Poverty in Ireland

1.5.1. Policy Perspective and Prevailing Trends

The NAPS "Sharing in Progress" (Government of Ireland, 1997) was a policy initiative launched in 1997 in response to the United Nations World Summit for Social Development held in Copenhagen in 1995. It was the Irish government's strategic plan to reduce poverty, social exclusion and inequality in the context of an international commitment towards these objectives agreed at the Copenhagen summit.

The NAPS unit, based in the Department of Social, Community and Family Affairs is charged with the responsibility of coordinating anti-poverty initiatives across all government departments and with advising the high level NAPS Inter-Departmental Policy Committee (IDPC) and the Cabinet Committee on Social Inclusion.

The NAPS unit is supported by the Combat Poverty Agency which provides an advisory, educational and monitoring role and by the ESRI which conducts research in social areas of key relevance to the strategy.

At the time of its initial inception in 1997, the most recent LIIS data collected in 1994 estimated the prevalence of consistent poverty in Ireland at 14.5% of all households. Originally, the NAPS aimed to reduce this prevalence of consistent poverty to below 5-10% by the year 2007. By 2001 however, the prevalence of consistent poverty among the Irish population had declined to 4.9% (at the 70% median income threshold) (Whelan *et al.,* 2003). Due to this greater than anticipated reduction in consistent poverty which coincided with the unprecedented rise in economic prosperity experienced by Ireland from the mid-1990s onwards, the target for consistent poverty was revised in the NAPS review of 2002 (Government of Ireland, 2002) to a figure of less than 2% by 2007. This target was further revised in early 2007 by the National Action Plan for Social Inclusion 2007-2016 (Government of Ireland, 2007), to "reduce the number of those experiencing consistent poverty to between 2% and 4% by 2012, with the aim of eliminating consistent poverty by 2016 under the *revised definition*".

The NAPS review of 2002 (Government of Ireland, 2002) identified several vulnerable groups within the population which were at specifically high risk of consistent poverty, and which warranted specific attention in pursuit of the overall poverty reduction target. These vulnerable groups included children and young people, women, older people, travellers, people with disabilities and migrants and members of ethnic minority groups.

For each of these groups, explicit targets for the attenuation or elimination of poverty and its consequences were defined. However, the 2007 National Action Plan for Social Inclusion (Government of Ireland, 2007) indicates a persisting high prevalence of poverty among these groups. Despite appreciable declines in poverty levels in some instances over recent years (e.g. among women), these levels have remained static or actually increased for several of these groups (e.g. the unemployed, students, children).

With regard to health, the NAPS review of 2002 recognised that a multi-sectoral approach was required to reduce the health inequalities which exist in Irish society. In so doing, the government pledged to prioritise the reduction of health inequalities in the formulation of all public policy and to address the social impediments to the pursuit of health among disadvantaged groups. It also committed to the improvement of access to health and personal services by disadvantaged groups, and to the development of a research base examining health status and its influencing factors among these groups. The 2007 National Action Plan for Social Inclusion (Government of Ireland, 2007), while again recognising the relevance of health to quality of life and social participation, like its predecessor, gives only limited explicit detail of how social inequalities in health are to be addressed among low SES groups. Where clear objectives are defined, there again appears to be a disproportionate emphasis on remedial rather than preventative healthcare. For adults, the only mention of nutritional intervention is the following: "working in partnership, the Department of Health & Children will develop specific community and sectoral initiatives to encourage healthy eating and access to healthy food and physical activity among adults, with a particular focus on adults living in disadvantage", thereby failing to explicitly cite specific initiatives which might yield benefit in this regard (e.g. subsidy of healthy foods, targeted education programmes, improvements to the built environment).

1.5.2. Current Status

During the period of rapid economic expansion which occurred in Ireland from the mid-1990s onwards, the prevalence of consistent poverty in the population declined from 14.5% in 1994 to 4.9% by 2001. The prevalence of relative income poverty increased from 15.6% to 21.9% during the same period however (Whelan *et al.,* 2003)

The EU-SILC conducted from 2003 onwards (CSO, 2005 & 2006) revealed that the prevalence of relative income poverty had begun to fall again, reaching a level of 18.5% in 2005, the latest year for which data are available. Notwithstanding the fact that the EU-SILC data for deprivation and consistent poverty are not comparable with those from the LIIS, they do provide an insight into the evolution of these poverty trends from 2003 onwards. Here, it may be clearly seen that despite significant declines in the prevalence of both deprivation and consistent poverty from 2003 to 2004, these rates increased from 2004 to 2005. As illustrated in Table 1.1, this reveals the first reliably indicative increase in either of these parameters since 1994.

Poverty Index	1987	1994	1997	1998	2000	2001	2003	2004	2005
% in Relative Income Poverty *		15.6	18.2	20.0	22.1	21.9	19.7	19.4	18.5
% in Deprivation §		25.4	15.9	12.7	9.7		23.4	18.3	19.2
% in Consistent Poverty ∞	16	14.5	10.7	7.7	5.4	4.9	8.8	6.8	7.0

* % of population below the 60% of median income line (1.0/0.66/0.33 equivalence scale).
§ % of population experiencing enforced absence of one or more of the 8 basic deprivation indicators.
∞ % of population below the 70% of median income line (1.0/0.66/0.33 equivalence scale) *and* experiencing enforced absence of one or more basic deprivation indicators.
2003, 2004 and 2005 data from EU-SILC survey (rather than LIIS).

Table 1.1 Poverty Trends in Ireland from 1987 to 2005

Other indices of poverty described by the recent EU-SILC also present cause for concern. Despite a reduction in the poverty gap from 21.5% to 19.8% from 2003 to 2004, this trend was reversed in 2005, with the poverty gap widening again to 20.8% in that year. The Gini coefficient (Gini, 1921; Dorfman, 1979) is another measure of inequality which assesses the cumulative proportion of the total equivalised net income received by a defined proportion of the population.

In Ireland, the Gini coefficient has increased consistently from 30.3 (LIIS data) in 2001, to 31.1 in 2003 to 31.8 in 2004, to 32.4 in 2005 (CSO, 2006). Overall, those in the highest income quintile now have almost five times the income of those in the lowest income quintile, a statistic which has remained largely unchanged since 2003. Further data also suggest a situation of increasing inequality in Ireland. In 2003, Ireland had the highest level of income inequality in Europe, and the second highest level of income inequality among the Organisation for Economic Cooperation & Development (OECD) countries after the U.S. (Nolan & Smeeding, 2005). Therefore, despite improvements in absolute living conditions, those living in poverty have become poorer relative to their peers during this period of national prosperity.

The discussion of growing income inequality is fundamental to any discussion of socio-economic health inequalities, as research has previously indicated that in developed countries, it is *relative* disadvantage rather than *absolute* disadvantage which is most closely associated with poorer health status among those in the lower social echelons (Marmot & Wilkinson, 2001).

1.5.3. Susceptible Groups

Like the ESRI's previous analysis of the LIIS data, the CSO have also analysed data from the EU-SILC in 2004 and 2005 to identify those groups which are at particular risk of poverty (CSO, 2005 & 2006). In both of the EU-SILC surveys to date, young women living in deprived, urban environments feature prominently by virtue of their preponderance of traits independently associated with poverty.

For example, in 2004, women had an overall greater risk of relative income poverty (21%) than men (18%), although this gap narrowed significantly in 2005. In 2004, 49.1% of women living in lone parent households were at risk of relative income poverty, compared with 21.9% living in two adult households without children, and 13.1% of women living in two adult households with 1-3 children. Although this figure improved considerably to 37.7% in 2005, women living in these one adult households with children remained at significantly greater risk of relative income poverty than their peers. In 2004, women who were unemployed (25.9%) or engaged in home duties (31.8%) were at significantly greater risk of relative income poverty than their working peers (6.4%), and the figure for unemployed women increased to 27.4% in 2005. In 2004, women living in rented or free accommodation (36.3%) were at roughly twice the risk of relative income poverty of those who were owner-occupiers (17.1%), and this figure remained largely unchanged in 2005.

Regarding deprivation, 57.9% of those living in lone parent households with children reported having at least one of the eight basic indicators of deprivation in 2004, and by 2005 this figure had risen to 58.7%. Debt problems were particularly common among those living in single adult households with children.

With regard to consistent poverty, those living in single adult households with children had the highest consistent poverty rates of any group in both 2004 (31.1%) and 2005 (27%). Women in free or rented accommodation also had very high levels of consistent poverty in 2004 (22.5%) and 2005 (22.5%), while a significant proportion of women resident in urban areas were also consistently poor (8.3% and 7.7% in 2004 and 2005 respectively).

Young women living in socio-economically disadvantaged areas of Dublin are thought to experience a disproportionately high preponderance of the characteristics discussed above, and as such, may be readily identified as a group at particularly high overall risk of poverty.

1.6. Poverty and Health

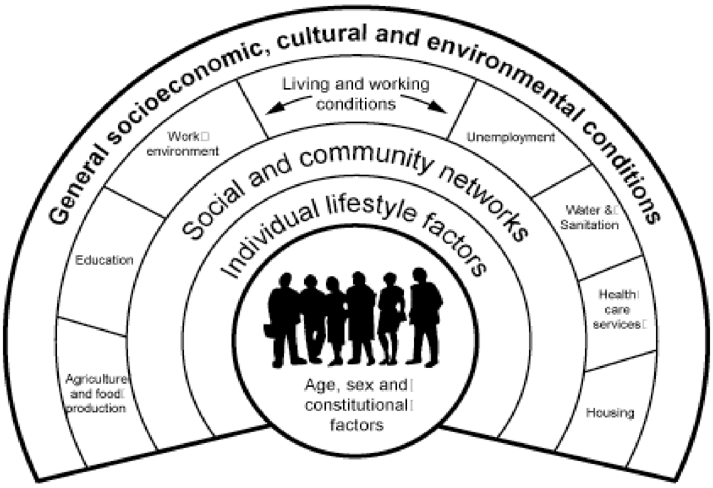
"There's a point of poverty at which the spirit isn't with the body all the time. It finds the body really too unbearable. So it's almost as if you were talking to the soul itself. And a soul's not properly responsible".

Louis-Ferdinand Céline (1932)

1.6.1. Factors Mediating Health Inequalities

In order to elucidate the health inequalities which relate to socio-economic status, it is essential that we examine the causative factors which might mediate this effect. Van Lenthe *et al.*, (2004), in their investigation of socio-economic determinants of health inequality among the Dutch population identified four distinct deleterious influences on health among disadvantaged groups, namely adverse material circumstances, negative health behaviours, adverse psycho-social characteristics and adverse childhood circumstances.

The following anthropological model to elucidate the relationship between poverty and health has been proposed (Whitehead & Dahlgren, 1991). The utility of this model lies in its ability to succinctly capture the myriad factors which impact upon people's health status, ranging from individual non-modifiable factors (e.g. genetic susceptibility to disease), to individual factors which are under the persons autonomous control (e.g. health behaviours), to the broader and more elusive ecological, structural and psycho-social factors which impinge on these volitional health behaviours. It is recognition and redress of these latter sociological factors which may yield the most effective means of improving public health.



Source: Whitehead & Dahlgren (1991).

Figure 1.1 Factors Mediating Health Inequalities

In the model, the authors describe the over-arching influence of prevailing societal, environmental and cultural norms on health and health behaviours. A good example of this would be the tradition of high alcohol consumption in Ireland, which seems to transcend many socio-economic, cultural and geographical divides.

Structural factors such as education, public services and other elements controlled by legislative and government policy are also shown to exert an effect. These can impose limitations on health behaviours, by failing to provide an environment where "the healthier choice is the easier choice".

The social and community networks cited describe the way in which individuals meet and interact with one another in society. These networks are the mediators of "social cohesion", and may be viewed simply as the interstitial "cement" which binds the structural "bricks" of society into a stable, functional unit. It is via these networks that sub-cultural identity, and the value that it places on health and health conducive behaviours, is propagated.

While the health behaviours of an individual within a society are undoubtedly influenced by the factors discussed above, this model also proposes that individuals retain autonomy to make the ultimate decisions regarding their own health behaviours. It is at this level that psychometric phenomena such as anxiety, self-efficacy and future salience come into play. These intrinsic personal characteristics are often pivotal in determining health behaviours at the individual level. In other words, while the chances of a person pursuing a healthy lifestyle may be severely compromised by their living circumstances, it still remains possible to overcome these barriers at the individual level.

The innermost stratum of influence in this model refers to the non-modifiable or "constitutional" characteristics of an individual such as age, gender, genotypic and phenotypic profile, all of which have a bearing on health.

From this discussion, it is clear that many of the forces which shape and influence health lie outside the direct control of the individual, particularly those living in disadvantaged circumstances. Examples would include the structural elements (e.g. government policy, local environment, public services), material factors (income, housing, individual and communal amenities), socio-demographic and cultural factors (family and social environment, pervasive attitudes and behavioural norms), constitutional factors (age, gender, genotype), developmental influences (foetal development, childhood development) and psycho-biological phenomena (stress mediated perturbations in the neuro-endocrine milieu). Indeed even the seemingly autonomous attitudinal and behavioural traits of individuals which impact upon health are themselves heavily influenced by environmental factors such as those cited above (World Health Organisation, 1987).

All of these elements can conspire to exert a multi-dimensional deleterious effect on the health behaviours and health status of those living in socio-economically deprived circumstances (Mackenbach & Howden-Chapman, 2003). They will now be explored in detail to describe the ways in which they mediate their adverse effects on health and health behaviours.

1.6.1.1. Structural Factors

These relate to national and local policies which affect health. Examples would include educational policy, welfare policy, health policy, economic and food policy, access to health services, public service provision and environmental issues. These can all create imposed limitations on the pursuit of a healthy lifestyle or living circumstances by disadvantaged communities and individuals.

Poor education in particular can have a devastating influence on the health of communities as it influences the knowledge, attitudes, behaviour and psychological wellbeing of not just individuals, but also those of subsequent generations growing up in that environment (Gordon-Larsen *et al.,* 2000; Kahn *et al.,* 2005). Food and economic policy too, by influencing the availability and price of food and other commodities which influence health (e.g. alcohol and tobacco), has a central role to play in the facilitation of healthy lifestyles (Steptoe & Marmot, 2003).

1.6.1.2. Material Factors

There is considerable debate as to what proportion of socio-economic health inequality is attributable to low income. Although low income is one of the most obvious (and most readily measured) indicators of material disadvantage, several researchers have identified *relative* income poverty as a more salient health determinant than absolute income (Marmot & Wilkinson, 2001). It is important to note that in this instance, income inequality most likely represents an imperfect proxy for disparity in social status - it is the presence of rigid social hierarchies where relations of dominance and subordination are the norm, that may be more relevant to health (Bosma *et al.*, 1997; Brunner *et al.*, 1997).

Such unequal societies have lower levels of community involvement, trust, inclusiveness and social capital, and the consequent compromise in psychosocial well-being may be the most important actual effector of poor health status among these groups, rather than any material deficit (Wilkinson & Bezruchka, 2002).

The importance of *relative disadvantage* as a determinant of poor health status should have particular resonance in Ireland, where despite recent declines in absolute poverty and deprivation, the problem of socio-economic inequality continues to worsen as described previously.

1.6.1.3. Developmental Impediments to Health

1.6.1.3.1. Adverse Foetal Programming

There is now substantial evidence to suggest that risk of chronic disease (particularly cardiovascular disease, stroke and diabetes mellitus) and its risk factors (e.g. hypertension) are subject to influence by the intra-uterine gestational environment (Godfrey & Barker, 2001). The proximate effectors of this sub-optimal gestational environment on long term cardiovascular health status are not yet fully defined, but several hypotheses have been put forward including aberrations in metabolic and/or endocrine axes (e.g. the hypothalamic-pituitary-adrenal axis (Kajantie *et al.*, 2002) and the insulin-like growth factor (IGF) axis) which precipitate such effects as impaired glucose tolerance, coagulopathy (increased fibrinogen levels), elevated body mass index (BMI) and atherogenic lipid profiles (Roseboom *et al.*, 2001).

The effects of maternal undernutrition on long term foetal outcome are dependant on the stage of gestation at which this compromise occurs, and are not dependant on low birth weight alone but may also relate to low foetal:placental ratio (Barker *et al.*, 1990), growth retardation in relation to gestational age (Jaquet & Czernichow, 2003) and increased rate of catch up growth *post-partum* in low birth weight infants (Singhal *et al.*, 2004), as well as endocrine sequelae which do not affect foetal growth adversely (Roseboom *et al.*, 2000). Furthermore, it appears that the ill-effects of gestational undernutrition are not confined to their physical impact on the foetus, but may also relate to long-term deficits in psychological profile and cognition (Thompson *et al.*, 2001; Bellingham-Young & Adamson-Macedo, 2003) mediated by aberrant neurological development.

Whether or not sub-optimal gestational conditions are more prevalent in socio-economically disadvantaged groups is pertinent to the premise that a proportion of health inequality in later life may be related to adverse intra-uterine programming. Certainly, evidence from the 1958 birth cohort in the UK suggests an increased prevalence of low birth weight due to gestational compromise among lower socio-economic groups, which ultimately appears to predict higher adult BMI. Consequently, intra-uterine compromise and low birth weight have been designated "risk factors" for chronic disease in later life (Power *et al.*, 2003). In Ireland, the prevalence of low birth weight (<2,500 grams) is twice as high among the unskilled manual social classes as it is among professional groups (Barry *et al.*, 2001). This is mirrored by higher incidence of cardiovascular disease, diabetes and hypertension among disadvantaged groups (Davey-Smith *et al.*, 2001).

1.6.1.3.2. Adverse Childhood Development

The influence of physiological, psychological and psycho-social development in early life can have profound effects on long term health. All of these parameters can be influenced negatively by low socio-economic status.

1.6.1.3.2.1. Physiological development

As discussed previously, the associations between sub-optimal intra-uterine environment, impaired foetal growth and metabolic compromise in later life are becoming increasingly well established (Levy-Marchal & Jaquet, 2004).

Several recent studies have also posited a deleterious effect of not just low birth weight or low birth weight relative to gestational age, but also of rapid catch up growth, on long term health status (Fagerberg *et al.*, 2004). The damaging effects of this accelerated catch up growth may be mediated by several factors including increased insulin secretion and decreased insulin sensitivity post-natally (Soto *et al.*, 2003), enhanced central adipose deposition in early childhood (Ong *et al.*, 2000), increased blood pressure (Guerra *et al.*, 2004) and elevated C-reactive protein (CRP) levels (Sattar *et al.*, 2004). Many of these metabolic phenomena persist into adult life where they exert their cumulative deleterious effect over a prolonged period.

Evidence is also emerging that catch up growth or altered growth trajectories occurring after the early neonatal period may also have detrimental effects on long term cardiovascular health (Eriksson & Forsen, 2002) and its determinants such as high blood pressure (Law *et al.*, 2002). It seems that low birth weight or reduced weight for gestational age, when coupled with accelerated catch-up growth rates in early childhood may be a potent predictor of cardiovascular disease in later life, possibly as a result of increased fat:muscle ratio and the risk imposed by this increased adipose mass.

It is known that low birth weight is more prevalent among socio-economically disadvantaged groups, although it is not documented whether these groups have a greater prevalence of rapid catch up growth in the neonatal period. In the Irish context however, it is well established that lower socio-economic groups have consistently lower rates of breast feeding than those from higher socio-economic groups (~20% in these groups versus ~41% average and ~64% in the highest class) (Bonham, 2007), and that Irish children of low SES have a higher mean BMI than their more advantaged peers (Whelton *et al.*, 2007).

Breast feeding has been previously associated with a lower rate of weight gain in the immediate post-natal phase (Ong *et al.*, 2002). This slower growth rate is thought to relate to attenuated insulin secretion, which in turn is believed to have a protective effect against the development of obesity and insulin resistance in later life.

1.6.1.3.2.2. Psychological and Cognitive Development

The notion that poor intra-uterine environment can predispose to impaired psychological well being (e.g. depression, reduced self-efficacy) has been alluded to earlier. There is also evidence to suggest slower learning and skill development in low birth weight infants <2500 grams (Tandon *et al.*, 2000; Richards *et al.*, 2001), and that the positive association of birth weight with cognitive ability may be present even within the normal birth weight range >2,500 grams (Sorensen *et al.*, 2004). This compromise in cognitive function with low birth weight has been shown to have functional implications in terms of poor academic achievement (Weindrich *et al.*, 2003; Breslau *et al.*, 2004), particularly in cases of very low birth weight (Anderson & Doyle, 2003). Further studies have demonstrated that this effect can be ameliorated by breast feeding these low birth weight infants, particularly if breast feeding is maintained for the first six months of life (Rao *et al.*, 2002).

What emerges therefore, is a combination of biological risk factors including increased prevalence of low birth weight and decreased prevalence of breast feeding among low socio-economic groups, which together may impact negatively upon long-term metabolic status, psychological function, cognition, behaviour and academic achievement. These phenomena contribute to perpetuation of the health compromising correlates of poverty such as unemployment and damaging health behaviours among these groups.

1.6.1.3.2.3. Social Environment

There are marked socio-economic gradients in some childhood health behaviours, including smoking and diet (Graham & Power, 2004). Although these behaviours are subject to change by social mobility during the life course, the majority of disadvantaged people who remain in that socio-economic stratum are more likely to continue such behaviours into adult life (Karvonen *et al.*, 1999). This indicates the importance of the social and cultural environment during early childhood in determining health behaviours throughout life.

Central to this concept of conditioned health behaviours from childhood is the role of the family. Lowry *et al.*, (1996) found that the likelihood of several negative health behaviours among adolescents, including smoking, sedentary lifestyle and inadequate fruit and vegetable consumption, increased as education level of the responsible adult declined. Qualitative research has revealed that although children from disadvantaged backgrounds in the UK describe the importance of familial and social resources in reducing the impact of poverty on their lives, these resources are often undermined and diminished by the strain of material and social hardship (Attree, 2004).

For example, disadvantage is associated with increased prevalence of marital conflict, parental mental health problems and stress (Taylor *et al.*, 2000). Pressure to meet the material needs of children when resources are limited can also lead to tension, conflict and deterioration of parent-child relationships.

When these factors are combined with the imposed material restrictions of poverty (low income, overcrowding, lack of leisure space, restricted shared family activities, sleep deprivation, etc.), family support is severely compromised. This increases the vulnerability of these children to stress and alienation from parents and family, key contributors to the adoption of negative health behaviours in early life (Prinstein *et al.*, 2001).

While parental influence remains important in determining health behaviours in early childhood (He *et al.*, 2004), peer influence and group acceptance assume an increasingly important role in this regard as adolescence approaches (Beal *et al.*, 2001). In situations where adolescents' material resources (accommodation, clothes, transport, hospitality facilities) are limited by poverty, this can compromise the ability to form and maintain supportive friendships (Backett-Milburn *et al.*, 2003). In lower SES groups where there is a higher prevalence of negative health behaviours (e.g. smoking, binge alcohol consumption, poor diet) among adolescents (Lowry *et al.*, 1996), these behaviours may be adopted more readily by children who are vulnerable to social exclusion, in order to fit in (group affiliation) and avoid bullying.

It is thought that negative peer and social influences on health behaviour can be exacerbated by the emotional impact of family dysfunction (Prinstein *et al.*, 2001), a common phenomenon in lower socio-economic strata as seen previously. Conversely, it has been demonstrated that in adolescence, the positive family life attributes (absence of abuse, absence of violence, absence of stressful life events) and parental support characteristic of higher SES are associated with lower prevalence of risky health behaviours including smoking and alcohol consumption (Simantov *et al.*, 2000).

The adoption of such negative health behaviours (along with poor social interaction) in adolescence has been shown to predict poor progress in academic and professional life (Koivusilta *et al.*, 1999), thereby perpetuating the intergenerational transmission of poverty.

Apart from the factors which push low SES children towards damaging health behaviours, pervasive low prioritisation of health (e.g. expenditure of limited resources on fashionable clothes rather than healthy food etc.) may be a coincident feature of childhood poverty which fails to divert these children from such damaging behaviours. In broader social terms, deprived neighbourhoods can expose children to drug abuse, alcoholism, crime and violence (Backett-Milburn *et al.*, 2003), which apart from their immediate hazard, also "re-programme" their perception of social norms and push health-promoting behaviours further down the sub-conscious priority agenda.

Therefore, the encouragement of positive health behaviours among disadvantaged children in childhood, particularly by positive parental instruction and support, which reduce risk-taking tendency and increase refusal assertiveness (Epstein & Botvin, 2002), is essential in pre-empting the pervasive adverse health attitudes and behaviours which they encounter in adolescence. In the broader context, a holistic, multi-factorial intervention which addresses all of the early determinants of health (biological, psychological, psycho-social, behavioural, material, economic and political) is required to assuage these portentous threats to long-term health among disadvantaged children.

1.6.1.4. Adult Impediments to Health

1.6.1.4.1. Psycho-biological Phenomena

Many studies indicate poorer health status among those from lower socio-economic groups, and these differences are not thought to relate necessarily to absolute levels of deprivation, but rather to *relative* deprivation and social disadvantage (Marmot & Wilkinson, 2001). The manner in which low social status mediates its deleterious effect is not fully understood. Several studies have demonstrated an association between low control in the workplace, low social support, depression, anxiety and hostility, and risk of coronary heart disease (Bosma *et al.*, 1997; Marmot *et al.*, 1997). Low self-perceived control in general, which has been linked with an increased prevalence of cardiovascular risk, is thought to characterise life in disadvantaged communities.

Beyond the epidemiological data associating low social status with increased prevalence of cardiovascular disease and its behavioural determinants, some researchers have investigated additional patho-physiological mechanisms by which stress may exert its damaging effects on health (McEwen, 1998). Human studies as well as animal studies in primates have shown that the psychological stress associated with low social status, as measured by hourly subjective measures of self-perceived stress and salivary cortisol levels, precipitates a multitude of damaging sequelae including increased low density lipoprotein to high density lipoprotein (LDL:HDL) ratio, insulin resistance, central adiposity and chronically elevated cortisol levels (Rosmond & Bjorntorp, 2000; Goodman *et al.*, 2005).

In the case of stress-induced elevation in cortisol levels, this is thought to be exacerbated by inadequate social support (Abbott *et al.*, 2003), and sleep disturbance (Van Cauter & Spiegel, 1999), both common features of living in disadvantage. Other established cardiovascular risk factors such as elevated C-reactive protein (Owen *et al.*, 2003), increased plasma fibrinogen (Steptoe *et al.*, 2003) and hypertension (Levenstein *et al.*, 2001) have also been associated with the psychological stress which prevails among those of low socio-economic status.

1.6.1.4.2. Attitudes, Beliefs and Behaviours

Superimposed on the deleterious neuro-endocrine responses to chronic stress which are thought to prevail in disadvantage, there is also a higher prevalence of negative health attitudes and behaviours in these groups. Wardle & Steptoe (2003) examined socio-economic differences in attitudes and beliefs about healthy lifestyles among a cross-sectional representative UK population. They revealed that lower socio-economic groups were less health conscious (thought less about health-promoting behaviours), had stronger belief in the influence of chance on health (chance locus of health control), thought less about the future in general (lower future salience) and had generally lower self-perceived life expectancy than those in higher socio-economic groups. Crucially, these attitudinal factors were reflected in a greater prevalence of negative health behaviours (smoking, poor exercise, low fruit and vegetable intakes) among the lower SES groups, perhaps reflecting a greater degree of fatalism among these individuals. Similarly, Irish data have revealed a preponderance of poorer self-perceived health among disadvantaged groups, a feature thought to be strongly predictive of poorer *actual* health status (Balanda & Wilde, 2003).

These findings are corroborated by studies which demonstrate lower self-efficacy and greater belief in the influence of chance on health outcome (Leganger & Kraft, 2003), and increased risk behaviour and reduced health behaviour (especially among men) (Stronegger *et al.*, 1997), among those from the lower socio-economic strata. Ominously, these attitudinal and behavioural traits may also be more resistant to change among lower SES groups (Boniface *et al.*, 2001).

Although the alteration of damaging health behaviours, including poor diet and sedentary lifestyle, is a primary objective in improving the health status of disadvantaged people, it should now be clear that a wider ecological approach is required to address the issue of socio-economic health inequalities effectively (Lantz *et al.*, 1998; Mackenbach & Howden-Chapman, 2003). Such an approach will require detailed examination of the interrelated negative factors influencing health: foetal programming, infant and childhood development, the impact of psychosocial stress and poor emotional, social, cultural and physical environments, the consequences of material deprivation and the role of damaging health behaviours and their precipitants.

1.7. Poverty and Health in Ireland

The Black report (1980) in the UK reported a death rate which was 2 to 3 times higher among people on low incomes than that of the better off classes, and also suggested that this gap was widening. Similar disparities in death rates according to socio-economic status have been observed among the Irish population (Balanda & Wilde, 2001).

These health disparities may be mediated by a myriad of factors which intervene at multiple stages of the life course as described previously. While many efforts to redress these health inequalities in Ireland have focussed on reform of the health sector, the actual contribution of remedial healthcare inequalities to differences in health outcome is relatively small (Wilkinson, 1996).

Barrington (2004) states that “the contribution of medical care, while of vital importance to those who are ill, is too often to ameliorate the impact of diseases whose roots lie deep in the social and economic fabric of our society”. In recognising this, the author advocates a broad-based, multi-sectoral collaborative approach which addresses the major determinants of socio-economic health inequalities (i.e. the inequitable organisation of society as a whole, including public policy). It has been estimated that 5,400 fewer people in Ireland would die prematurely each year by tackling social deprivation and inequalities (Balanda & Wilde, 2002).

The current social partnership agreement, *Sustaining Progress*, enshrines the aspiration of a fair and inclusive society laid out in the previous NAPS (Government of Ireland, 1997 & 2002), where "people have the resources and opportunities to live life with dignity and have access to quality public services that underpin life chances and experiences". In this agreement, while there is explicit reference to addressing health inequalities, there is a somewhat naive assumption that these inequalities can be eradicated by reform of the health services and the extension of (particularly acute) healthcare facilities. No explicit mention is made of the numerous other socio-economic factors described previously which can impact negatively on the health status of the socially disadvantaged. As long as the focus remains on the symptom (poor health) rather than the root causes of these prevailing health inequalities, it is unlikely that the most pertinent contributory factors will be effectively addressed in any substantive way.

1.7.1. Tackling Health Inequalities in Ireland

It is clear that strategies to reduce health inequalities in Ireland must address several fundamental issues:

- Overall socio-economic inequalities must be reduced.
- The nature and origins of the SES differences in health-subversive behaviours which prevail among disadvantaged people must be identified and described.
- The aspects of social disadvantage which specifically coincide with these adverse health behaviours must be identified.
- The ways in which these elements of social disadvantage precipitate adverse health behaviours must be fully characterised.
- Once the nature of the relationships between low SES and adverse health behaviours have been established, resources must be targeted to address these precipitants, as part of a concerted overall preventative health programme.

1.8. Research Gaps and Priorities

Evidence from other countries has demonstrated that socio-economic disparities in food group and nutrient intake are key mediators of poor health status among disadvantaged groups (James *et al.,* 1997). In this context, the current study is justified by the paucity of recent Irish data describing the dietary habits of young urbanised women in the very lowest socio-economic groups.

Of the evidence which does exist in Ireland, the Survey of Lifestyles, Attitudes and Nutrition (SLAN) (National Nutrition Surveillance Centre, 2003) revealed generally better dietary compliance with the recommendations of the food pyramid among those in the higher occupational social classes, especially with regard to cereals, breads and potatoes in men, and fruit and vegetables, meats, poultry and fish among women. Kelleher *et al.*, (2002) reported that these differences in food group intake coincided with poorer macronutrient guideline compliance among those of low occupational social class and education, while later, Friel *et al.,* (2003) also demonstrated less favourable micronutrient intakes among these low SES respondents.

With specific regard to socially disadvantaged *women*, another Irish study which examined food and nutrient intake patterns among poor, urbanised women in Dublin (Gibney & Lee, 1993), reported similar findings, with the low intakes of dietary fibre and vitamin C observed among these disadvantaged women attributed to their lower consumption of fruit, vegetables, cereals and pulses. More recently, Friel *et al.,* (2005) described a strong inverse association between socio-economic status and fruit and vegetable consumption which was particularly pronounced among females.

This group concluded that “material and structural influences matter very much for females in respect to compliance with fruit and vegetable recommendations. For males, while these factors are important, they appear to be mediated through other more socially contextual type factors”.

In order to generate further preliminary data of this nature for the current research, permission was obtained to conduct a socio-economic examination of food and nutrient intakes among young women in the NSIFCS database (n=269). It was hoped that these exploratory analyses of the NSIFCS database might further inform the development of the current quantitative study, beyond a reliance on the previously published Irish data cited above.

The North/South Ireland Food Consumption Survey (NSIFCS) was conducted among a representative sample of 1379 Irish adults (662 men and 717 women) aged 18-64 years in 1997-1999. The survey was carried out by the Irish Universities Nutrition Alliance (IUNA), a formal alliance of the academic nutrition centres at Trinity College Dublin (TCD), University College Cork (UCC) and the University of Ulster, Coleraine (UU). Detailed information was collected on habitual dietary consumption (using a 7-day estimated food diary) and on habitual physical activity patterns. Data were also gathered on health behaviours including smoking, alcohol consumption and dietary supplement use, on attitudes to health, diet and exercise, and on anthropometry. In addition, socio-economic parameters including employment status, education, and occupational social class, but not income, were recorded for each respondent. A full description of the survey design and methodology is given by Harrington *et al.*, (2001) and may also be found at www.iuna.net.

The final NSIFCS database contained 269 women aged 18-35 years. In order to improve the integrity of our analyses, cut-off values for physical activity level (PAL) were calculated for this population according to the procedures outlined by Goldberg *et al.,* (1991), and later refined by Black (2000). These operations enabled the exclusion of dietary data from women who were deemed likely to be misreporters at the individual level. Of the original 269 women in the database, 68 fell outside the 1.05 to 2.5 PAL range which defined "valid" reporters. These women were designated misreporters and excluded from the dataset, as the presence of under-reporters would potentially skew group mean and median nutrient intakes downwards, while the presence of over-reporters would have the opposite effect.

The food and nutrient intakes of the remaining 201 "valid" reporters were then analysed according to their socio-economic status. The parameters employed to describe these differences were formal educational status, for which 199 of the women were classified, and occupational social class, for which 187 were classified, as these were the only relevant socio-economic parameters available for such analysis in this database. Educational status was dichotomised according to the highest level achieved into low education (none, primary, intermediate) and high education (secondary and tertiary). Occupational social class was dichotomised into low social class (social classes 4 (skilled manual), 5 (semi-skilled) and 6 (unskilled)) and high social class (social classes 1 (professional), 2 (managerial and technical) and 3 (non-manual)). The results of these socio-economic analyses of the NSIFCS dataset are shown in Tables 1.2 to 1.5.

1. Food Groups	Social Class NSIFCS 1999 (Valid Reporters Only)					Education NSIFCS 1999 (Valid Reporters Only)				
	Low (n=53)		High (n=134)		p value	Low (n=57)		High (n=142)		p value
	Mean (SD)	Median (IQR)	Mean SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Fruit & Fruit Juices* (g/day)	88 (104)	51 (110)	125 (105)	99 (155)	0.005	84 (105)	49 (97)	126 (102)	107 (149)	0.001
Vegetables* (g/day)	95 (66)	87 (81)	114 (67)	98 (74)	0.040	100 (75)	82 (75)	114 (65)	98 (74)	0.041
Fruit & Vegetables* (g/day)	183 (136)	146 (141)	239 (143)	227 (182)	0.003	185 (155)	146 (130)	240 (136)	231 (179)	<0.001
Breakfast Cereals* (g/day)	20 (33)	8 (24)	25 (31)	17 (30)	0.052	20 (29)	16 (30)	26 (32)	14 (33)	0.239
Sweet Foods* (g/day)	83 (62)	72 (77)	84 (51)	77 (59)	0.582	87 (70)	76 (76)	85 (52)	77 (64)	0.730
Meat & Meat Products (g/day)	153 (75)	152 (90)	141 (80)	140 (90)	0.366	139 (67)	132 (74)	144 (82)	142 (100)	0.695
Fish & Fish Products* (g/day)	12 (17)	4 (18)	22 (26)	14 (36)	0.025	14 (20)	6 (18)	23 (29)	14 (37)	0.080
Dairy Foods* (g/day)	227 (144)	197 (226)	227 (141)	193 (179)	0.909	242 (143)	213 (184)	223 (145)	195 (178)	0.312
Starchy Carbohydrates (g/day)	162 (58)	152 (62)	180 (62)	177 (78)	0.062	158 (65)	147 (89)	183 (58)	175 (76)	0.009
Potatoes & Potato Products* (g/day)	195 (94)	183 (98)	152 (96)	125 (109)	0.001	189 (106)	190 (150)	149 (90)	124 (101)	0.007

† Social Class dichotomised into low social class (classes 4, 5 and 6) and high social class (classes 1, 2 and 3)
‡ Education dichotomised into low education (none, primary and intermediate education) and high education (secondary and tertiary education)
§ Valid population for this sub-group of NSIFCS defined by EI/BMR greater than 1.0534 and less than 2.5.
* Median and interquartile range instead of mean and standard deviation compared for fruit and fruit juices, vegetables, fruit and vegetables combined, breakfast cereal, sweet foods, fish and fish products, dairy foods and potatoes and potato products due to non-normal distributions of data.

Table 1.2 Social Class and Educational Differences in Food Group Intake among Valid Reporting Women aged 18-35 Years in NSIFCS

Macronutrients	Estimated Average Requirement (EAR) FSAI (1999)	Social Class NSIFCS 1999 (Valid Reporters Only)					Education NSIFCS 1999 (Valid Reporters Only)				
		Low (n=53)		High (n=134)		p value	Low (n=57)		High (n=142)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Energy (kcals)	~2000kcals/day	2053 (412)	2013 (500)	1961 (347)	1914 (504)	0.121	1958 (405)	1879 (489)	1994 (341)	1956 (500)	0.524
Energy (MJ)	~8.4MJ/day	8.64 (1.72)	8.53 (2.12)	8.25 (1.45)	8.05 (2.15)	0.115	8.24 (1.69)	7.91 (2.08)	8.39 (1.43)	8.23 (2.13)	0.537
Dietary Fibre SOUTHGATE (g/day)	>25g/day (WHO/FAO, 2003)	18.3 (5.3)	17.4 (8.2)	18.4 (5.0)	17.1 (7.1)	0.895	17.7 (5.2)	16.9 (7.8)	18.6 (5.1)	17. (7.6)	0.269
Non-Starch Polysaccharide (NSP) ENGLYST (g/day)	>18 g/day (UK DH, 1991)	12.4 (4.0)	11.9 (5.4)	12.9 (4.0)	11.9 (5.2)	0.501	12.3 (4.3)	11.4 (6.1)	12.8 (3.9)	11.9 (5.1)	0.471
Carbohydrate (% Total Energy)	>47% Total Energy (UK DH, 1991)	45.9 (6.9)	47.5 (10.8)	45.7 (5.8)	46.7 (7.6)	0.763	47.1 (6.8)	48.8 (9.4)	45.2 (5.7)	46.2 (7.0)	0.024
Total Fat (%Total Energy)	<33% Total Energy (UK DH, 1991)	36.9 (4.3)	38.8 (5.5)	35.3 (5.0)	37.0 (7.2)	0.025	35.5 (5.7)	37.1 (6.6)	35.7 (4.6)	37.2 (6.7)	0.946
Saturated Fat (%Total Energy)	<10% Total Energy (UK DH, 1991)	14.3 (3.6)	14.0 (4.6)	13.9 (2.9)	14.4 (4.1)	0.426	13.9 (3.8)	14.3 (4.9)	14.1 (2.7)	14.2 (3.8)	0.774
Mean Monounsaturated Fat (%Total Energy)		12.4 (1.8)	12.6 (2.4)	11.6 (1.8)	11.8 (2.4)	0.004	11.9 (2.0)	12.6 (2.8)	11.7 (1.7)	11.9 (2.2)	0.322
Mean Polyunsaturated Fat (%Total Energy)		7.6 (2.2)	7.6 (2.8)	7.0 (2.1)	6.9 (2.5)	0.073	7.0 (2.3)	6.9 (2.7)	7.2 (2.1)	7.2 (2.4)	0.717
Mean Cholesterol (mg/day)	<300mg/day	223 (98)	216 (153)	216 (82)	209 (98)	0.645	215 (104)	195 (130)	221 (78)	217 (95)	0.666
Mean Protein (%Total Energy)	10-15% Total Energy (UK DH, 1991)	13.1 (2.2)	13.6 (2.9)	13.9 (2.9)	13.9 (3.5)	0.083	13.5 (3.5)	13.6 (3.5)	13.8 (2.5)	13.9 (3.4)	0.604
Median Alcohol (%Total Energy)*		4.1 (5.2)	1.5 (7.1)	5.2 (5.4)	4.1 (8.1)	0.132	4.0 (4.9)	2.2 (5.9)	5.4 (5.7)	4.1 (7.9)	0.091

† Social Class dichotomised into low social class (classes 4, 5 and 6) and high social class (classes 1, 2 and 3)
‡ Education dichotomised into low education (none, primary and intermediate education) and high education (secondary and tertiary education)
§ Valid population for this sub-group of NSIFCS defined by EI/BMR greater than 1.0534 and less than 2.5.
* Median and interquartile range instead of mean and standard deviation compared for alcohol where population intakes are non-normally distributed.

Table 1.3 Social Class and Educational Differences in Energy, Dietary Fibre and Macronutrient Intake among Valid Reporting Women aged 18-35 Years in NSIFCS

Vitamins	Estimated Average Requirements (EAR) FSAI (1999)	Social Class NSIFCS 1999 (Valid Reporters Only)					Education NSIFCS 1999 (Valid Reporters Only)				
		Low (n=53)		High (n=134)		p value	Low (n=57)		High (n=142)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Vitamin B1* (mg/day)	0.6mg/day (72µg/MJ/day)	1.5 (0.5)	1.4 (0.7)	2.2 (4.0)	1.5 (0.8)	0.038	2.3 (6.1)	1.4 (0.7)	1.9 (1.1)	1.5 (0.7)	0.096
Vitamin B2* (mg/day)	1.1mg/day	1.5 (0.6)	1.4 (0.8)	2.2 (3.5)	1.5 (0.9)	0.035	2.2 (5.3)	1.5 (0.7)	1.9 (1.1)	1.5 (1.0)	0.041
Vitamin B3* (mg/day)	1.3mg/MJ/day	17.8 (4.9)	18.2 (6.7)	22.2 (10.0)	20.8 (7.9)	0.003	19.0 (10.6)	17.8 (6.9)	21.9 (8.3)	20.9 (8.4)	0.001
Vitamin B5* (mg/day)	None defined	4.3 (1.4)	4.4 (1.5)	5.2 (4.8)	4.1 (2.0)	0.406	5.3 (6.8)	4.3 (2.0)	4.8 (2.2)	4.1 (1.7)	0.649
Vitamin B6* (mg/day)	13µg/g protein/day	2.1 (0.6)	2.0 (0.7)	3.3 (5.7)	2.2 (1.2)	0.024	2.9 (5.5)	2.0 (1.0)	3.0 (4.4)	2.2 (1.2)	0.084
Vitamin B12* (µg/day)	1.0µg/day	3.1 (1.3)	3.0 (1.4)	4.0 (3.7)	3.4 (2.1)	0.124	3.9 (4.2)	3.2 (1.4)	3.8 (2.7)	3.4 (2.2)	0.265
Folate* (µg/day)	230µg/day	221 (79)	199 (114)	287 (137)	238 (142)	0.001	236 (113)	211 (122)	281 (127)	238 (118)	0.004
Vitamin C* (mg/day)	46mg/day	61 (33)	52 (40)	120 (248)	78 (70)	<0.001	115 (359)	54 (45)	97 (93)	77 (64)	0.003
Vitamin A* (µg/day)	400µg/day	419 (472)	280 (390)	539 (535)	346 (336)	0.054	483 (605)	280 (300)	520 (469)	358 (397)	0.048
Carotene* (µg/day)	None defined	1818 (1522)	1415 (1431)	2236 (1591)	1897 (1418)	0.021	2219 (2188)	1581 (1469)	2029 (1218)	1783 (1361)	0.551
Vitamin D* (µg/day)	5µg/day	2.3 (1.9)	1.8 (0.8)	3.6 (3.8)	2.4 (2.7)	0.009	2.4 (2.4)	1.7 (1.3)	3.6 (3.6)	2.4 (2.6)	0.002
Vitamin E* (mg/day)	None defined	6.7 (3.2)	6.1 (3.5)	11.3 (24.5)	7.2 (5.1)	0.023	8.6 (10.8)	5.5 (4.5)	10.5 (23.0)	7.0 (5.0)	0.011

† Social Class dichotomised into low social class (classes 4, 5 and 6) and high social class (classes 1, 2 and 3)
‡ Education dichotomised into low education (none, primary and intermediate education) and high education (secondary and tertiary education)
§ Valid population for this sub-group of NSIFCS defined by EI/BMR greater than 1.0534 and less than 2.5.
* Median and interquartile range instead of mean and standard deviation compared for all vitamins due to non-normal population intake distributions.

Table 1.4 Social Class and Educational Differences in Vitamin Intake (including Dietary Supplements) among Valid Reporting Women aged 18-35 Years in NSIFCS

Minerals	Estimated Average Requirements (EAR) FSAI (1999)	Social Class NSIFCS 1999 (Valid Reporters Only)					Education NSIFCS 1999 (Valid Reporters Only)				
		Low (n=53)		High (n=134)		p value	Low (n=57)		High (n=142)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Sodium (mg/day)	None defined	2668 (616)	2621 (901)	2680 (652)	2657 (805)	0.903	2650 (648)	2661 (1087)	2704 (624)	2671 (785)	0.589
Potassium (mg/day)	None defined	2835 (585)	2864 (775)	2805 (602)	2783 (816)	0.758	2717 (647)	2649 (757)	2834 (566)	2795 (752)	0.209
Iron* (mg/day)	10.8 mg/day	15.9 (23.1)	10.2 (3.6)	15.8 (21.2)	11.1 (5.6)	0.024	11.7 (13.6)	9.0 (3.8)	17.3 (23.2)	11.2 (6.9)	<0.001
Calcium* (mg/day)	615 mg/day	706 (228)	676 (276)	793 (340)	743 (295)	0.065	718 (247)	676 (257)	794 (329)	743 (292)	0.073
Magnesium (mg/day)	None defined	240 (56)	240 (83)	261 (64)	255 (80)	0.038	240 (74)	240 (83)	262 (56)	261 (74)	0.023
Zinc* (mg/day)	5.5 mg/day	7.6 (2.8)	7.6 (2.7)	8.5 (4.9)	7.1 (3.3)	0.988	8.2 (4.8)	7.3 (3.2)	8.2 (4.1)	7.2 (3.2)	0.587
Copper* (mg/day)	0.8 mg/day	1.1 (0.5)	1.0 (0.4)	1.3 (0.7)	1.1 (0.4)	0.134	1.2 (0.8)	1.0 (0.4)	1.2 (0.6)	1.1 (0.4)	0.023
Phosphorous (mg/day)	400 mg/day	1132 (255)	1105 (401)	1169 (246)	1160 (360)	0.355	1108 (271)	1087 (378)	1182 (231)	1171 (337)	0.054
Selenium* (µg/day)	40 µg/day	53 (16)	55 (15)	58 (22)	55 (24)	0.297	53 (20)	51 (19)	59 (20)	55 (22)	0.057
Iodine* (µg/day)	100 µg/day	118 (63)	103 (97)	124 (68)	104 (81)	0.553	119 (64)	111 (96)	126 (66)	106 (84)	0.457

† Social Class dichotomised into low social class (classes 4, 5 and 6) and high social class (classes 1, 2 and 3)
‡ Education dichotomised into low education (none, primary and intermediate education) and high education (secondary and tertiary education)
§ Valid population for this sub-group of NSIFCS defined by EI/BMR greater than 1.0534 and less than 2.5.
* Median and interquartile range instead of mean and standard deviation compared for iron, calcium, zinc, copper, selenium and iodine due to non-normally distributed population intakes.

Table 1.5 Social Class and Educational Differences in Mineral Intake (including Dietary Supplements) among Valid Reporting Women aged 18-35 Years in NSIFCS

1.8.1. SE Differences in Food Group Consumption from NSIFCS

There are significant social class and educational differences in the intake of several food groups among these young women from the NSIFCS. Fruit, vegetable and fish intakes are significantly lower among those of lower occupational social class (i.e. skilled manual, semi-skilled and unskilled subjects), while these women also tend towards lower breakfast cereal consumption. Intakes of potatoes and potato products are also significantly greater among the women of lower social class. The educational differences in food group intake are less pronounced. However, those in the lower educational group do display lower intakes of fruit, vegetables and starchy carbohydrates. They also have higher intakes of potatoes and potato products than their more educated peers, and tend non-significantly towards lower fish consumption.

1.8.2. SE Differences in Energy, Dietary Fibre & Macronutrients from NSIFCS

The differences in food group intakes described above are reflected in some differences in these parameters. For example, the women of lower social class have a potentially deleterious higher fat intake. However, in their favour, those of lower education have higher total carbohydrate intakes than their more educated peers.

1.8.3. SE Differences in Vitamin Intakes from NSIFCS

The socio-economic differences in vitamin intakes among these women are considerably more pronounced than those for energy, dietary fibre and macronutrients. For several of these vitamins (folate, vitamin A, vitamin D), median intakes among those of lower social class and education fall below the estimated average requirement, while for vitamin C median intakes are marginal. Additionally, women of lower social class have lower intakes of vitamins B1, B2, B3, B6, folate, vitamin C, carotene, vitamin D and vitamin E than those in the higher social classes. These trends are similar to those observed across the educational strata, where women in the lower groupings have significantly lower intakes of vitamins B2, B3, folate, vitamin C, vitamin A, vitamin D and vitamin E.

1.8.4. SE Differences in Mineral Intakes from NSIFCS

There is also a tendency towards lower mineral intakes among women of low social class and education (Table 1.5). Women in the lower social classes have significantly lower iron and magnesium intakes than their more affluent peer group, while their tendency towards lower calcium intake just fails to reach statistical significance (p=0.065). The educational gradients in mineral intake are even more pronounced. Here, women of lower educational status have significantly lower iron, magnesium and copper intakes than their more educated peers, while there may also be a weak tendency towards lower calcium (p=0.073) and selenium (p=0.057) intakes. Median iron intakes overall, but particularly those among the lower educational and social classes, present a significant cause for concern.

The socio-economic differences in food group and nutrient intakes revealed by these analyses of the NSIFCS database, particularly the variations in vitamin and mineral intake described above, provide further evidence to suggest the widespread presence of sub-optimal diet and nutrient patterns among young, disadvantaged women in Ireland. It is important to realise too, that the NSIFCS failed to capture the very lowest social groupings due to methodological and practical difficulties in this regard, further strengthening the justification for dedicated research in this area.

1.9. Study Aims and Objectives

In this context, the current work aims to firstly describe the dietary patterns, nutritional intake and other health behaviours of young socially disadvantaged women in the Greater Dublin area. The specific socio-economic and attitudinal correlates of poverty which associate with variations in diet, physical activity and other health behaviours among these women will then be explored by both quantitative (survey) and qualitative (focus group) techniques. By describing these associations more fully, future interventions aimed at improving the health of socially disadvantaged young women can be more effectively focussed to address the barriers to healthy diet and lifestyle which are particularly pertinent to this important target group.

1.9.1. The Quantitative Study

This study aims to fill the research gaps highlighted previously, by providing a detailed quantitative examination of the dietary and nutrient intakes of young women from the *very lowest* socio-economic groupings at various urban centres around Dublin. These dietary and nutrient intake patterns, along with other health behaviours (smoking, dietary supplement use, alcohol intake, physical activity, infant feeding practices) and bodyweight status, will be compared against those of an age and sex matched reference cohort of "non-poor" women, to establish if they deviate from those of their non-disadvantaged peers.

The quantitative study will employ a number of indicators of social disadvantage including income, deprivation, household structure, primiparous age, accommodation tenure, ethnicity, unemployment, occupational social class, level of indebtedness and savings, welfare and medical card entitlement and education, to establish which (if any) of these dimensions of poverty coincide preferentially with poor diet and health behaviours. It will also gather data regarding local environmental and ecological parameters (the built environment, local facilities, crime, social support, psychological stress), to establish if these present a significant impediment to healthy diet and lifestyle among this group.

General, health and dietary attitudinal data will also be collected to establish whether poorer dietary and health behaviours are predicted by any of these psychometric traits. Subsequent correlation of these attitudinal factors with the socio-economic parameters outlined above, will help to establish if these attitudinal traits may be legitimately considered to be proximate mediators or precipitants of adverse behavioural patterns among the disadvantaged women.

In carrying out such quantitative analyses therefore, not only will the extent of any differences in diet and health behaviours between the disadvantaged and advantaged women be identified, but the nature and origin of these differences from the socio-economic and attitudinal perspectives, and the ways in which these differences may be most effectively addressed should become clearer.

1.9.2. The Qualitative Study

Despite the wealth of information which can be derived by quantitative assessments of the socio-economic and attitudinal parameters described above, these methods may still not always yield a fully comprehensive understanding of the nature of poverty and its relationship with health behaviours including diet.

This is because quantitative analyses will always be predicated on the researcher's assumptions that the parameters being investigated are those which are most indicative of poverty and its impact on health. Despite having an *a priori* knowledge of many of the most pertinent issues at hand however, this may not always be the case. For example, eating behaviour may be strongly influenced by factors such as family dynamics, or other unanticipated issues which will remain elusive if they are not addressed by the quantitative assessment tool (questionnaire) being used. For this reason, some researchers have augmented their use of quantitative methods by including additional qualitative techniques when assessing the attitudes and beliefs of lower SES groups concerning health-related behaviours (Fade *et al.,* 2003).

Similarly, in order to gain a comprehensive insight into the impact of poverty on health and health behaviours (including diet) in the current study, it will be necessary to gain an understanding of the nature of life in disadvantaged environments beyond the scope of quantitative research tools employed for the assessment of disadvantage.

To this end, a qualitative analytical technique called grounded theory approach (Strauss & Corbin, 1998) was used to encourage participants from these groups to express their *practical experience* of living in such an environment. In this way, more nebulous or elusive issues such as the pervasive influence of social conditioning on the prioritisation of health by individuals could be more fully explored in the focus group setting. Overall, these sessions provided a rich contextual narrative to elaborate on themes which emerge from the quantitative fieldwork, as well as providing insights into the nature of poverty, generated by the respondents themselves.

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Chapter 2

Methodology

2.1. The Quantitative Survey

2.1.1. Development of the Quantitative Questionnaires

The questions included in the quantitative instrument were largely derived from previous large scale public health nutrition surveys. Principal among these were the North/South Ireland Food Consumption Survey (NSIFCS) (Harrington *et al.,* 2001) and three pan-European attitudinal databases, namely the Survey of Consumer Attitudes to Food, Nutrition and Health (Kearney *et al.,* 1997) the Survey of Consumer Attitudes to Physical Activity, Bodyweight and Health (Kearney *et al.,* 1999) and the Survey of Older Adults' Attitudes to Food, Nutrition and Health (Allen & Newsholme, 2003). The Irish data from these datasets were initially analysed to provide context and to inform the development of the quantitative survey work.

The primary objective of the NSIFCS was "to establish a database of habitual food and drink consumption among a representative sample of Irish adults aged 18-64 years" (Harrington *et al.,* 2001). This database was examined to ascertain some of the socio-demographic and lifestyle factors influencing food and nutrient intakes.

The NSIFCS survey employed a seven-day dietary intake record to estimate habitual dietary intakes, along with six further questionnaires covering issues including health, lifestyle and socio-demographic factors, physical activity, eating behaviour and attitudes relating to food, diet and health. Of these, the current study derived questions from the health, lifestyle and socio-demographic questionnaire, the eating behaviours questionnaire and the attitudinal questionnaire, with particular emphasis on those elements which had yielded discriminatory differences upon socio-economic analysis of the NSIFCS dataset. These included questions on health status (birthweight, breastfeeding), health practices (smoking, alcohol consumption, dietary supplement use, physical activity and inactivity) and socioeconomic status (occupational social class, education, ethnicity).

The pan-European Surveys on Food, Nutrition and Health (Kearney *et al.,* 1997) and Physical Activity, Bodyweight and Health (Kearney *et al.,* 1999) derived attitudinal data from over 15,000 individuals aged 15 years and older across the then 15 EU member states, of whom 1,009 and 1,001 respectively were Irish. The Survey of Older Consumers' Attitudes to Food, Nutrition and Health (Allen & Newsholme, 2003) collected data from 6400 persons aged 65 years and over from the then 15 EU states, of whom 466 were Irish.

The first of these studies aimed to elucidate the attitudes and beliefs of the public regarding food, diet and health, and to further elaborate on the factors which motivate and discourage people from pursuing a healthy diet. From this study methodology, previously published attitudinal questions (Kearney *et al.,* 1997) regarding definition of the healthy diet, perceptions of own diet, barriers to healthy eating, stage of dietary change and other more specific dietary issues were derived.

The second of these studies (Kearney *et al.,* 1999) provided attitudinal questions regarding perceived adequacy of physical activity and appropriateness of current bodyweight. Questions regarding general health including perceived influences on health, locus of health control and barriers to healthy lifestyle were adopted from all three attitudinal studies.

The final "Lifestyle" Instrument of the current study (Appendix I) comprised six discrete questionnaires in total covering demographics, local environment and facilities, general, health and dietary attitudes, health status, socioeconomic status and health behaviours. Apart from the adaptation and use of previously employed questions from other studies, some of these areas were specifically expanded to meet the requirements of the current study. In particular, the socioeconomic questionnaire was extended to include a more comprehensive range of socioeconomic indicators including income, welfare entitlement, medical card status, household structure, accommodation tenure, location, income, deprivation, debt and assets, as well as further indicators of educational status such as literacy, numeracy and age of school leaving. Some of these questions were adapted from those used by the ESRI in their LIIS (Watson, 2004), while some were developed *de novo*. The attitudinal questionnaire was also augmented by supplementary questions regarding future salience (Wardle and Steptoe, 2003), health locus of control (Walston *et al.,* 1976), dietary stage of change (Prochaska & DiClemente, 1983) and self-perceived health (Balanda & Wilde, 2003), while the health status questionnaire included a newly developed question which enquired about the frequency of respondents' self-perceived psychological stress.

The local environment questionnaire consisted of largely newly developed questions. These were formulated to determine the existence and extent of any food supply, leisure amenity, healthcare provision, and informational deficits which might compromise diet or other health behaviours in that particular area. The collection of such data is predicated on the assertion that environmental deprivation is an important dimension of disadvantage in Dublin (Watson *et al.,* 2005).

Habitual dietary intake was assessed by three separate methods, namely seven day diet history, food frequency questionnaire (FFQ) and 24 hour diet recall (Appendix II-IV respectively). The seven day diet history was developed from first principles and comprised sections with commonly consumed foods as *aides memoires* for each period of the day. Both the food frequency questionnaire and the 24 hour diet recall methodology were adapted from protocols used by the LipGene international study conducted by Trinity College Dublin aimed at assessing overall dietary intake (McCarthy, S.N. – personal communication), with additions to capture foods which appeared to be more commonly consumed in the pilot disadvantaged groups (e.g. take-aways). The triangulation of these dietary assessment methods as a means of estimating their relative comparability or "agreement" is described in detail in Chapter 3.

The questionnaires were piloted in October 2005 and again in May 2006 to ensure that they were comprehensible and culturally acceptable to the target group. Following each pilot, each of the instruments was altered and abbreviated through several draft phases to produce the final instrument used for data collection. The elimination of superfluous elements in this way reduced the total time required for participation to approximately one hour.

2.1.2. Study Design

For the current study, the demographic group selected for investigation was young disadvantaged women aged 18-35 years. This relatively discrete group was selected to avoid the problem of data evaporation, where a demographically disparate study population is compared with a similarly disparate or varied control group. In such a case, the heterogeneous study and control populations break down into many small groups e.g. men aged 18-30, men aged 40-50, women aged 50-64 etc. The numbers contained in such sub-groups are often insufficient to provide adequate statistical power in the comparison of the study and control populations. From this perspective a cross-sectional, observational study design among age- and sex-matched populations was selected to elucidate differences between the disadvantaged and advantaged respondent cohorts (Daly & Bourke, 2000). This cross-sectional design was also preferred from the pragmatic perspective, in order to avoid the difficulties inherent in following up cohorts of low SES individuals, who have demonstrably lower rates of participation in such research.

From the sociological perspective, there is substantial evidence to indicate that Irish women are more vulnerable to poverty than their male peers (CSO, 2006). In both of the EU-SILC surveys to date (CSO, 2005 & 2006), young women living in deprived, urban environments demonstrate a significant preponderance of the traits independently associated with poverty, as described in Chapter 1. For example, they are at greater risk of relative income poverty, deprivation and consistent poverty, and these trends are even more pronounced for certain sub-groups including particularly single mothers, but also those who are unemployed or engaged exclusively in home duties.

Previous research described at the end of Chapter 1 also identified young women of low SES as a demographic group at particular risk of sub-optimal food group, micronutrient and macronutrient intakes. These socio-economic analyses of the NSIFCS database indicated significantly lower fruit and vegetable intakes, lower fish intakes, lower starchy carbohydrate (rice, pasta etc.) intakes and higher potato and potato product intakes among those of lower social class and educational status. The less affluent respondents in this study also tended towards lower breakfast cereal intakes. These differences in food intake were reflected in considerably lower vitamin (B1, B2, B3, B6, folate, vitamin C, vitamin A, carotene, vitamin D and vitamin E) and mineral (iron, magnesium and copper) intakes among young women of low social class and education when compared with their more affluent peers, although with the exception of folate, vitamin C, vitamin A, vitamin D and iron, population mean and median intakes for the lower SES groups appeared adequate.

Earlier analyses had shown that compliance with several micronutrient intake guidelines (e.g. iron, folate, calcium and vitamin C) was also lower among those of low social class and education in the full NSIFCS female study population (n=717) (data not shown). While the provenance of these differences in food and nutrient intake is the prime subject of the current investigation, previous evidence suggests that women may be particularly susceptible to negative sociological (peer influence), economic and structural barriers to healthy diet and other health-related behaviours (Friel *et al.,* 2005). Elucidation of these barriers may thus inform interventions aimed at addressing their consequences.

Young women, because of their traditional role as home makers, are also more likely to play a pivotal role in the nutritional adequacy of their children's and family members' diets.

Addressing any deficits in nutritional knowledge or other factors which might influence the adequacy of the diets offered by these young women to their families, is likely to yield a value-added dimension in the amelioration of nutrition-related health inequalities among the entire disadvantaged population. Hence research data gathered to inform interventions among this group may have additional utility from the public health perspective.

There are also pragmatic reasons for the selection of this discrete demographic population. Women may be more likely to respond to recruitment requests relating to health and social research and this would be a key factor in surveying the disadvantaged population in particular, one of whose primary characteristics is the tendency to disengage from society (Gordon *et al.,* 2000). The perception of endemic disengagement among those living in disadvantage was highlighted by a lower than 10% response rate in the initial pilot of the questionnaire, when a door-to-door recruitment technique was employed among a previously "primed" population who had received postal notification of the study the previous week. So, among a population typically reticent to take part in such research, it was decided to survey only the group where participation might be most likely.

Finally, apart from their greater tendency to participate in such research, young women as home makers, may have a more comprehensive knowledge of many issues pertinent to food consumption. For example, they are traditionally thought to be more involved in food shopping (including budgeting), food preparation and cooking than their male counterparts. Because they are likely to be more conversant with the issues surrounding food provision (e.g. cost barriers, food portion sizes etc.), this functional knowledge of food may enhance the quality and accuracy of the food-related data gathered.

2.1.2.1. Derivation of the Required Sample Size

The required sample size for the comparative analyses between the disadvantaged and advantaged populations was calculated according to the guidelines described in Daly & Bourke (2002). Here, the minimum sample size required in each group for comparison of means between two independent samples is calculated from the equation:

$$\mathbf{n \geq 2\ K\ \sigma^2 / \Delta^2}$$

Where, n = the minimum number required in each group

K = the constant describing the required significance level and power

σ = the estimated variation (standard deviation) of the parameter under investigation

Δ = the minimum difference in the means that the study is required to detect at the chosen power and significance level.

By convention, a significance level of 5% and a power of 80% were selected in this instance, as this limits the chance of type I error (false positive findings) to less than 5%. The constant *K*, relating to a 2-sided comparison of this significance level and power is 7.8.

The standard deviations employed in this equation must, by necessity, be estimated from existing data in similar populations. For this reason, the standard deviations derived in the analysis of energy and macronutrient intakes (i.e. energy, carbohydrate, total fat, saturated fat and protein) among 18-35 year old women in the NSIFCS were referred to.

In each instance, the standard deviation for that parameter among women aged 18-35 years classified as “valid” dietary reporters was calculated. This standard deviation was then used in the subsequent calculations to derive the required sample size.

The minimum difference in the means required to reveal a true difference between the groups was estimated for energy and each of the macronutrients tested at half the standard deviation for that parameter among the 18-35 year old women in the NSIFCS.

Five calculations were performed in total, to estimate the required sample size for the current study based on these energy and macronutrient SDs from the NSIFCS cohort.

Energy (MJ)

$n \geq 2\ K\ \sigma^2 / \Delta^2 = 15.6\ (1.52)^2 / (0.76)^2 = 36.04 / 0.58 = \mathbf{62.1}$

Total Fat (% Total Energy)

$n \geq 2\ K\ \sigma^2 / \Delta^2 = 15.6\ (4.93)^2 / (2.46)^2 = 379.16 / 6.05 = \mathbf{62.7}$

Saturated Fat (% Total Energy)

$n \geq 2\ K\ \sigma^2 / \Delta^2 = 15.6\ (3.07)^2 / (1.53)^2 = 147.03 / 2.34 = \mathbf{62.8}$

Carbohydrate (% Total Energy)

$n \geq 2\,K\,\sigma^2 / \Delta^2 = 15.6\,(6.08)^2 / (3.04)^2 = 576.67 / 9.24 = \mathbf{62.4}$

Protein (% Total Energy)

$n \geq 2\,K\,\sigma^2 / \Delta^2 = 15.6\,(2.79)^2 / (1.39)^2 = 121.43 / 1.93 = \mathbf{62.9}$

The calculations estimated that a minimum of 63 respondents would be required in each category for comparison of the disadvantaged and advantaged populations' food and nutrient intakes.

For this reason, 221 disadvantaged respondents and 74 advantaged respondents were recruited for the study, allowing a 10-20% surplus for contingency in the smaller advantaged group. Despite the removal of 68 misreporters from the disadvantaged group and 11 misreporters from the advantaged group (see Chapter 3), the 153 and 63 respondents remaining in each of these groups respectively, were deemed sufficient to provide adequate statistical power for the subsequent food and nutrient analyses between these groups. Furthermore, by prioritising the recruitment of disadvantaged respondents, data from a sufficient sample size of these subjects was collected to permit "stand-alone" descriptive and sub-group analyses among the disadvantaged respondents only, which would provide an "overall picture" of this group's diet and health behaviours. For example, after exclusion of misreporters, there should still be sufficient *disadvantaged* respondents ($n \geq 63$) to compare nutrient intakes between two equally-sized attitudinal or SES sub-categories.

2.1.2.2. Derivation of the Sampling Frame

Following identification of the demographic group and the required sample size for investigation, the practical means of recruiting both the sample and control populations was considered. The issue of representativeness is key to this discussion. In order to extrapolate the findings of such research to the wider population of young disadvantaged women in the greater Dublin area, the study participants had to be as representative of this wider population as possible. This requires that geographical bias and other potential confounders of diet and health behaviour, apart from the structural correlates of poverty whose influence we are examining, are minimised as much as possible. In order to achieve this, a sampling frame was defined.

The derivation of an appropriate sampling frame is crucial to enhance the scientific integrity and rigour of the sampling process. The quasi-experimental study design employs a self-selected control group which should show a high degree of equivalence with the experimental group in all parameters, apart from those whose impact on outcome is being assessed. In other words, strenuous efforts should be made to ensure that the sample and comparison ("reference") populations resemble each other in most basic respects apart from their socio-economic status, so that any differences in diet, health behaviours or related attitudes may be reliably attributed to differences in these socio-economic parameters, rather than other extraneous factors.

While other dietary surveys have employed the electoral register to ensure the collection of a randomised population, this methodology was not deemed appropriate in the current study. This was because of the time, cost and accessibility issues involved, as well as the likely poor response rate which would call into question the validity of such results in a self-selected population. Other "purposive sampling" protocols are more appropriate than use of the electoral register in this context, as these will identify specific areas where the group of prime interest may be targeted more efficiently. A further consideration in this regard is electoral registration, which has been proposed to be disproportionately low in disadvantaged communities – this might preclude some of the most disadvantaged people from participation.

Nonetheless, the study and comparison populations did need to be selected carefully in an attempt to maximise the applicability of the study's findings to their wider peer groups. It was decided to employ the Small Area Population Statistics (SAPS) available from the CSO through the Irish Social Sciences Data Archive (ISSDA) at University College Dublin (UCD) to identify geographical areas in the Greater Dublin Area (encompassing a total of 335 electoral districts (EDs) across North Dublin City, South Dublin City, Dun Laoghaire-Rathdown, Fingal and South Dublin) which had a high level of disadvantage. A spatial or "geographical" sampling frame was preferred, since the generation of a structural sampling frame based on one or more specific indicators or risk factors for poverty (e.g. unemployment, low education), would preclude the use of this variable in subsequent discriminatory analyses. For example, if all of the study group were unemployed and of low education, it would not be possible to ascertain the association between these factors and the variant dietary, nutritional or attitudinal characteristics in this population. Because one of the primary objectives of the study was to elucidate the nature and extent of the relationship between the various dimensions of disadvantage and these attitudinal and behavioural variables, with a view to developing structurally targeted interventions, this would not be appropriate. In order to optimise the validity of this geographical sampling frame, several structural correlates or "indicators" of poverty and disadvantage were chosen, to capture the broad range of elements which determine the overall spatial distribution of disadvantage. These were as follows:

- Educational attainment
- Occupational Social Class
- Family structure (particularly lone parentage)
- Employment/unemployment
- Socio-economic group
- Housing tenure/ownership

While each of these represents a different dimension of poverty, they are all thought to be associated with disadvantage relevant to food and nutritional practices and other health behaviours to varying degrees (Turrell *et al.,* 2003). The selection of these poverty dimensions for the construction of an index of disadvantage was informed by Watson *et al.,* (2005), whose ESRI publication *Mapping Poverty: National, Regional and County Patterns*, had identified these parameters, along with environmental deprivation, as key indicators of disadvantage.

For each construct of poverty, each of the 335 electoral districts (EDs) was ranked from 1 to 335 using Small Area Population Statistics (SAPS) from the 2002 National Census (CSO, 2002), with 1 designated the most advantaged (e.g. the ED with highest proportion of tertiary educated adults), and 335 being the least advantaged. Within each of the six constructs of poverty, the ranks for the constituent parameters used to define and measure that construct were combined. For example, the educational status of each area comprised data including the proportion of the population with primary or no education, the percentage with tertiary education, and also the proportion that left school early as shown in Table 2.2 on the following page.

In combining the data for each construct, two approaches were tested. In the first instance, an overall score for the construct (e.g. education) was derived by *adding* the ranks for each of the constituent parameters (e.g. the ED's rankings for prevalence of low education, prevalence of early school-leaving). The second method tested *multiplied* the ranks for these parameters together. In both cases, the total combined "scores" for that construct (e.g. education), whether derived by addition or multiplication of the constituent ranks, were ranked to give the ED's relative position for that construct (e.g. an overall rank from 1 to 335 for education).

When this procedure had been completed for each of the six poverty constructs, these six ranks were either added together (in the case of those derived by addition) or multiplied together (for those derived by multiplication) to give an overall poverty or "disadvantage" score for that ED. The EDs were then ranked from 1 to 335 based on this score, to provide an estimation of their relative levels of overall disadvantage.

SE Parameter	Indicators Used
Education	% of population with primary only or no formal education. % of population with tertiary education % of population with post-graduate education % of population with any tertiary education % of population ceasing formal education aged 16 years or under % of population ceasing formal education aged 21 years or over
Occupational Social Class*	% in Occupational Social Class I and II % in Occupational Social Class V and VI
Family/Household Structure	% of lone parent households % of population living in lone parent households % of children living in lone parent family units % of lone parent family nuclear units
Employment Status	% of total labour force aged 15 years and over unemployed
Socio-economic Group (SEG)*	% of population in SEG A, B and C % of population in SEG F and G % of population living in SEG A, B and C households % of population living in SEG F and G households
Housing Tenure	% of households which are owner-occupied % of households which are rented/being bought from local authority % of people living in owner-occupier households % of people living in local authority dwellings Average weekly rent (all types of accommodation) in €

* Prevalence of high and low social class and SEG only used to characterise EDs (i.e. prevalence of middle classes poorly informative for SES).

Table 2.1 Parameters Used to Define Constructs of Poverty for the Novel Sampling Frame

Ultimately, the multiplicative method was selected for derivation of the sampling frame, as this precluded the possibility of tied scores which had been observed with the additive method, although the relative ranking for each of the 335 EDs differed very little between the two methods tested.

The composite "poverty index" developed as described above was applied to determine the most disadvantaged quintile of electoral districts in the Greater Dublin area, from which areas were then randomly selected from the north, south, west and inner city to maximise the geographical distribution of the study population. Within the designated "disadvantaged" EDs, respondents (*n*=221) were recruited via local community education and training programmes, community development groups or crèches. These were deemed appropriate data collection sites for a number of reasons. Firstly, they are centred within the local community where participants are likely to feel more at ease and hence convey more accurate information. Secondly, from a pragmatic perspective, they are locations where significant numbers of young women congregate, often for extended periods, providing sufficient time for the completion of the required questionnaires. Additionally, these centres provide access to these young women via trainers or community leaders who as trusted and familiar figures, are often able to facilitate the recruitment process within that centre, and provide resources such as classrooms to conduct group sessions for data collection.

Unfortunately, such local assistance with the recruitment of respondents precludes any reliable characterisation of those who declined to take part. It can also be legitimately argued that the use of such convenience sampling, despite the purposive designation of the "disadvantaged" recruitment areas, might introduce a selection bias in terms of respondents' civic participation in back to education programmes, and this is a difficult limitation to overcome. Although the very poorest young women may be characterised by their marked lack of participation in such programmes, these are a very difficult group to capture for that very reason.

For example, door-to-door recruitment had previously yielded a response rate of less than 10%, while the facilitation of one-to-one interviews at a large health centre had also proved impractical. In this latter case, piloting had discounted such interviews based on the excessive time requirement for the sample size sought, as well as the very high rate of absenteeism for interview appointments, which might also yield a self-selection bias.

In order to describe the food and nutrient intake patterns, health behaviours and attitudes of the disadvantaged study population in comparison to their more advantaged peers, a reference "non-poor" population of young women was also recruited (n=74). Here, the objective was to provide a sample which was broadly representative of socio-economically advantaged young women in Dublin. This was necessary as data from the 18-35 year old women in the NSIFCS had been collected nine years previously on a *nationally* representative population (i.e. rural and urban) using different dietary assessment protocols, and as such would not be directly comparable with that from the current disadvantaged women. A convenience sampling method was again selected, with participants recruited from large multinational corporations, third level institutions and local clubs and societies. *Post-hoc* analyses were then performed to confirm that all of these women were resident in the highest 80% of electoral districts previously identified by the sampling frame.

While the sampling frame was applied in order to recruit young women with similar demographic characteristics (age, gender, urban residence etc.) apart from the dimensions of disadvantage under investigation, those in the disadvantaged group had a final mean age (25.1 +/- 5.7 years) which was significantly younger than that of the advantaged sample (26.9 +/- 3.9 years) (p=0.011), and the potential confounding effect of this difference in terms of diet and health behaviours must be recognised as a limitation of the current study.

2.1.2.3. Discussion

The factors selected for the derivation of the sampling frame are largely in keeping with those identified by the Combat Poverty Agency (CPA, 2001) as key indicators of urban disadvantage. Although this report cites proxies such as crime and social disorder and poor infrastructure as indicators of further poverty dimensions such as social disintegration and environmental decay respectively, these elements are not captured by national census data at the disaggregated level of the ED, precluding their use in the sampling frame. The over-reliance on census data for small area estimation of disadvantage is cited by Pratschke & Haase (2000) as a significant flaw in urban poverty mapping in Ireland.

Old age and infirmity were also excluded as indicators of poverty in the sampling frame, although Pratschke & Haase (2000) suggest demographic decline and labour market deprivation as key drivers of disadvantage. The reason for excluding these data relates to the effect of premature mortality among the lower SES groups. In such circumstances, the use of advanced age to predict areas of disadvantage (predicated on the economic inactivity of a high proportion of individuals), may actually identify *affluent* areas where a greater proportion of people survive longer after retirement age giving an older overall age profile. Hence age was deemed an inappropriate indicator of disadvantage *at the area level* for the requirements of the current sampling frame.

With regard to the multiplicative combination of poverty constructs, it might be argued that this method provides a disproportionate weighting for those constructs or dimensions defined by multiple variables or parameters. The choice of this option essentially removes the possibility of tied scores and ranks however, which had occurred when using the additive method, while retaining the overall relative ranking ability of this additive method. The additive system has also been criticised by Folwell *et al.,* (1995) in Pratschke & Haase (2000), due to its implied equal weighting of the underlying variables used to define each dimension of poverty. This increases the likelihood of bias arising from the use of poverty dimensions defined by multiple parameters.

These problems are largely overcome by the use of "ranking scores" at each iterative step of the process, although this in itself implies an equal weighting of each of the six dimensions of disadvantage in the final derivation of the index. Pratschke & Haase (2000) recommend the use of latent variables analysis derived from structural equation modelling in the generation of detailed disadvantage indices which reflect the theoretical constructs postulated by the researcher, and this methodology was employed to select areas for the Revitalising Areas by Planning, Investment and Development (RAPID) programme in Dublin, from 2001 onwards. The use of such elaborate analyses in sampling frame development is deemed unnecessary for the current project however, as the objective is merely to identify the approximate lowest quintile of EDs across Dublin. While specific paradigms for optimising poverty and food insecurity mapping have also been proposed (Davis & Siano, 2001), limited availability of such food poverty data precludes the use of a similar tool in this context. This is perhaps fortuitous, as the objective of the current sampling frame is to identify representative spatial pockets of disadvantage whose respective populations' food and health behaviours can be assessed, rather than an *a priori* focus on food poverty and insecurity which may or may not be representative of the wider disadvantaged community.

2.1.2.4. Socio-economic Characteristics of the Study Population

Table 2.2 below describes the socio-economic characteristics of the current study population derived by the sampling frame. Among the "disadvantaged" population, the high proportion of respondents categorised in the lower grouping for each of these socio-economic indices, confirms that this population is indeed disadvantaged, while the "advantaged" population are confirmed to be "non-poor" by the same markers of low SES.

SE Indicator	Definition	% of Disadvantaged Population (n=221)	% of Advantaged Population (n=74)
Disadvantage	Recruited from a site within the lowest quintile of Electoral Districts (EDs)	100.0	0.0
Low Social Class	Social class 4) Skilled manual, 5) Semi-skilled, or 6) Unskilled	63.3	0.0
Low Socio-economic Group	Socio-economic group E) Manual skilled, F) Semi-skilled, or G) Unskilled	43.4	0.0
Low Education	None, primary or intermediate education	54.8	0.0
Early School Leaving	Left school aged 16 years or under	46.6	2.7
Relative Income Poverty*	Equivalised income less than 60% of median income (i.e.<€208.71 per week)	51.1	2.7
Relative Deprivation	Lacking one or more of 8 basic indicators of deprivation (see Chapter 1)	40.5	4.1
Consistent Poverty	Equivalised income < €208.71/week **&** lack ≥ 1of 8 basic deprivation indicators	25.0	1.4
Benefit Entitlement	Entitled to social welfare payments	63.6	10.8
Medical Card Status	Entitled to a medical card	69.2	1.4
Single Adult Family Unit	Family unit comprising a single adult and one or more children	44.8	0.0

* Equivalised income calculated on 1.0 (first adult), 0.5 (second and subsequent adults), 0.3 (children under 14 years) scale used by the CSO.

Table 2.2 Socio-economic Characteristics of the Current Study Population

Overall, 90.7% of respondents were Caucasian Irish, with 3.6% from other EU member states, 3.4% of Black African ethnicity, 1.7% classified as travellers and 0.6% from Asia.

2.1.3. Fieldwork

2.1.3.1. Informed Consent

A brief introductory letter (Appendix V) was prepared to inform respondents about the nature and purpose of the study, and this was distributed to prospective participants by local facilitators (trainers, community leaders etc.). These local coordinators also facilitated the exclusion of participants who knew themselves to be pregnant or lactating, in advance of the survey session, as these might influence dietary intake and anthropometry. Explicit focus on diet was omitted from the introductory letter to avoid conditioning responses based on perceived social desirability. In addition, a verbal introduction at the start of each interview session outlined the information requested from participants, confirmed that participants were not pregnant or lactating and provided reassurance regarding the security and confidentiality of all personal data. The anonymisation and aggregation of data and findings from the study prior to analysis, publication or dissemination was also assured.

In this way, subjects were assured that no information provided by them would ever be passed to a third party or personally identify them in any way. This is important from both the ethical perspective, but also from the methodological viewpoint as it encourages an honest and frank disclosure of information without fear of censure or embarrassment, issues which can disproportionately affect socio-economic research of this nature. Participants were requested to sign the front page of the first questionnaire to indicate that they had received information regarding their involvement in the study and were happy to proceed. The consent protocol was part of the study's ethics submission which received approval from the Dublin Institute of Technology (DIT) Ethics Committee in May 2005.

2.1.3.2. Data Collection

Data collection was carried out between June 2006 and April 2007, with simultaneous collection of the sample and control populations to rule out seasonal bias in diet or other health behaviours between the two groups. Local facilitators described the study as an investigation of "lifestyle habits" to prospective respondents, to prevent the pre-conditioning of answers based on social desirability of a healthy diet. Respondents were recruited from a total of 20 sites across north, south, west and inner city Dublin according to the provisions of the sampling frame described above. These recruitment sites are documented in Appendix VI.

Data collection by two distinct methods was explored. Initially, individual interviews were conducted. In this instance, novel Structured Query Language (SQL) software was developed in conjunction with the Department of Computer Science at DIT Kevin Street. This software was loaded onto a palm held computer (PDA), into which responses to the "Lifestyle" questionnaires were entered during the interview. These responses were then uploaded directly onto a database at the conclusion of the interview, obviating the need for laborious manual data transfer and reducing the possibility of error in this regard. While this method had the additional advantage of minimising potential comprehension or literacy deficits among respondents, reliability issues with the software proved difficult to overcome. Additionally, the use of individual interviews proved prohibitive due to the frequent non-attendance of prospective respondents at scheduled appointment times.

For these reasons, a group protocol was developed, which allowed the collective administration of all elements of the survey in a paper-based format, to a number of respondents at each session. These groups varied in size from 3 to 18 individuals, and were facilitated by three fieldworkers (one qualified dietitian (DMC) and two final year human nutrition and dietetics students) working together in most instances. A standard script was developed to instruct candidates at the beginning of the session. These standardised instructions addressed challenges and queries expressed by respondents during the pilot sessions, and therefore pre-empted many of the potential difficulties which participants might encounter during the interview process. Nonetheless, the three fieldworkers were on hand to assist with any comprehension, literacy or other problems during the interview process, according to standardised protocols agreed prior to the commencement of the fieldwork (e.g. responses to queries regarding portion size, food frequency, income etc.) (see Appendix VII).

The group sessions were conducted among peers in a settings-based environment, facilitating a relaxed atmosphere and avoiding the issue of interviewer-conditioned responses which can sometimes arise in the one-to-one setting. The collection of primary paper records also reduced the possibility of data loss due to system failure, as could occur if records were held exclusively in electronic format. Although the issue of systematic bias arising from respondent fatigue arose as a possibility, it was deemed more appropriate to deliver the questionnaires in the same order at each session, with the more complex dietary intake assessments administered first; to coordinate the facilitation of the session as it progressed. The data collection sessions took from 45-75 minutes, dependent on group size and the degree of comprehension and literacy difficulties encountered by respondents.

The dietary data collection required respondents to estimate food intake by three methods. The diet history protocol and the food frequency questionnaire (FFQ) required participants to estimate the habitual frequency and portion size of foods typically consumed, while the 24 hour diet recall requested dietary intake data from the previous day only. Respondents were asked to express food amounts in typical household measures (cupfuls, teaspoons etc.) and assistance was provided with estimation where required, according to the agreed protocols mentioned previously.

2.1.3.3. Anthropometry

Basic anthropometrical measurements were taken for each respondent. These measurements were taken by one of three fieldworkers, again according to standardised protocols (McCarthy *et al.*, 2001) in order to rule out inter-observer bias. These anthropometric data were documented contemporaneously in all cases.

The measurements taken were weight, height and waist circumference. Weight was measured to the nearest 0.2kg using a Seca Compact Digital Floor Scale IIII, model 888. Height was measured to the nearest 0.5cm using a collapsible "Leicester Height Measure" stadiometer (CMS Weighing Equipment, Camden, London NW1 OJH, UK). Waist circumference was measured on the left hand side around the umbilicus, at the mid-point between the lower rib margin and the supra-iliac crest on the mid-axillary line. These measurements were taken to the nearest 0.5cm with a Seca Circumference Measuring Tape, model 200 held snugly against the skin as described by McCarthy *et al.* (2001) in the NSIFCS. The anthropometric data described were collected for 292 of the 295 respondents.

2.1.3.4. Incentivisation

Following data collection, each respondent was presented with a €15 voucher for a local food and clothing retailer. While other studies (e.g. The Low Income Diet & Nutrition Survey in the UK (Nelson *et al.,* 2007) have incentivised dietary survey work among low SES groups in this way, this remains a contentious issue. There are justifications from the pragmatic and methodological perspective in this regard however. From the pragmatic viewpoint, recruitment proved almost impossible without this inducement, even with the assistance of local facilitators, with participation rates prohibitively low. From the methodological standpoint, these inducements are a useful means of adjusting for selection bias in any self-selected cohort. Without such a reward, it can be legitimately argued that those offering to take part are likely to be individuals with an existing interest in the issue under investigation. This has the potential to yield a self-selected study population with a specific interest in health and diet, many of whom may display more favourable behaviours which are unrepresentative of their wider socio-economic population group. Incentivisation limits this effect, with respondents now motivated to participate by factors other than their pre-existent interest in these issues. The funding for this incentivisation was provided by *Safe*Food, the Food Safety Promotion Board (FSPB), the primary sponsors of the study, following a discussion meeting in June 2006.

The final quantitative sample population comprised 295 respondents, of whom 221 were recruited from the lowest quintile of areas in the sampling frame, while 74 were derived from “non-disadvantaged” recruitment sites with *post hoc* analysis confirming their residence in EDs among the top four quintiles of those described by the sampling frame.

2.1.4. Data Management

2.1.4.1. Quantitative Data

The quantitative data were separated for data entry into "lifestyle" and dietary questionnaires. The entry of lifestyle data was relatively straightforward as pre-coded, closed categorical questions had been used predominantly throughout these questionnaires. These data were entered directly into a spreadsheet database (Microsoft Excel® 2003). Once this data entry was complete, the entire dataset was exported into a statistical analysis package (SPSS v 14.0, SPSS Inc., 2006).

The management and processing of the dietary data was significantly more complex. Here, data derived from the three dietary assessment methods was initially entered into a spreadsheet data base (Microsoft Excel® 2003), using standard portion sizes derived from the Food Standards Agency Food Portion Sizes Handbook (MAFF, 1994) in cases where respondent estimation was lacking. The dietary data contained in these Excel spreadsheets was then entered into a food and nutrient analysis software package (WISP v 3.0, Tinuviel Software Ltd., 2005). Preliminary comparative analysis was carried out on 72 records (55 low SES, 17 high SES) where food intake had been estimated in triplicate using the three dietary assessment methods. This analysis indicated the seven day diet history as the method of choice, and data from this method only were entered for the remaining 223 respondents. A full description of this preliminary triangulation and validation work is contained in Chapter 3.

When data from all of the 295 dietary history records had been transferred to the food and nutrient analysis package, these data were analysed to yield a dataset comprising estimated daily intakes of nutrients and food groups for each of the 295 respondents. This dataset was generated as a Microsoft Excel® v 5.0 spreadsheet which was then exported and appended to the lifestyle data in the SPSS statistical analysis package to produce a relational database containing demographic, local environment, attitudinal, health status, anthropometric, health behaviour, socioeconomic, dietary intake and nutrient intake data for each of the 295 individuals.

2.1.4.2. Data Manipulation

The data in this relational database were subsequently manipulated to yield further categorical variables prior to statistical analysis. For example, participants' occupational social class was categorised as 1) Professional, 2) Managerial and technical, 3) Non-manual, 4) Skilled manual, 5) Semi-skilled, 6) Unskilled and 7) Occupation unknown or insufficiently described, according to the occupational classifications employed in the national census (CSO, 2006). These occupational social classes were subsequently aggregated for ease of use to professional (which included those from managerial and technical occupations), non manual, skilled manual and unskilled (which included semi-skilled). Ultimately, these aggregated social class groupings were further collapsed into high (professional, managerial and technical and non-manual) and low (skilled manual, semi-skilled and unskilled) to generate a dichotomous variable for social class.

Participants' socio-economic group (SEG) was similarly classified according to occupation as A) Employers and managers, B) Higher professional, C) Lower professional, D) Non-manual, E) Manual skilled, F) Semi-skilled, G) Unskilled, H) Own account workers, I) Farmers, J) Agricultural workers, Z) Occupation unknown or insufficiently described, again according to the socio-economic group classifications described in the national census (CSO, 2006). These SEG categories were ultimately dichotomised into high (groups A, B, C and D) and low (groups E, F and G).

In cases where the respondent was not working or had not worked before (n=4), social class and SEG were estimated from the occupation of the index person in the household.

Piloting of the socio-economic questionnaire had suggested a common reluctance to report specific household weekly income among these women. For this reason, ranges of household weekly income were employed for this purpose, with the final total household income estimated from the mid-interval values of these categories. An equivalence scale of 1 (first adult in the household), 0.5 (second and subsequent adults aged over 14 years in the household) and 0.3 (each child aged under 14 years in the household) was used to estimate the total number of adult equivalents in the household, in accordance with the system employed by the EU-SILC (CSO, 2006). The estimated household weekly income was then divided by this figure to yield the equivalised individual income for each respondent. Those whose equivalised income fell below 60% of the median weekly Dublin income (i.e. below €208.71 per week) (Layte, R, ESRI, 2006 – pers. comm.) were judged to be living in relative income poverty.

Those who experienced an enforced lack of one or more of the eight basic indicators of deprivation outlined in Chapter 1 were classified as living in relative deprivation, while those who experienced relative income poverty and relative deprivation simultaneously, were categorised as consistently poor.

The derivation of each of the eleven dichotomous variables used to define social disadvantage is described in Table 2.2 on page 95.

With regard to attitudinal variables, these were initially assessed by means of a four or five point Likert scale (Likert, 1932) as shown in Appendix I (e.g. strongly agree, tend to agree, tend to disagree, strongly disagree). Data from all of these variables were subsequently dichotomised from their original format into two mutually exclusive categories (e.g. yes or no, agree or disagree, often or seldom, selected or not selected), to increase the sample size and hence enhance the power of subsequent statistical analyses.

In manipulating the dietary and nutrient intake data, records were assessed for misreporting to improve the overall integrity and quality of the data. The procedures followed for the exclusion of implausible dietary records are fully described in Chapter 3. Where required for food group versus nutrient intake analyses, and for food group versus socio-economic and attitudinal analyses, food group intakes were dichotomised around the population median intake for valid dietary reporters only (n=216) to create categorical variables of high and low intake. Dichotomising around the mean in this way provided roughly equal sample sizes to enhance the power of subsequent analyses, and is also justified by the absence of explicit intake guidelines (thresholds) for many of the food groups examined.

2.1.4.3. Statistical Analysis

When the database was finalised, descriptive analyses were performed to describe the characteristics of the overall population in terms of their demographic, environmental, socioeconomic, attitudinal, health behavioural, anthropometric, dietary intake and nutrient intake characteristics. Continuous data including food group and nutrient intakes were tested for normality to ascertain whether parametric or non-parametric methods should be employed for subsequent univariate analyses of these parameters. Some descriptive analyses were also performed on the "disadvantaged" and "advantaged" groups separately, to further elucidate the characteristics of these distinct groups, and also to confirm that the sampling frame had effectively captured a socially disadvantaged population and a "non-disadvantaged" reference population as illustrated in Table 2.2.

Univariate analyses (independent t-tests for normally distributed data and non-parametric Mann-Whitney U tests for non-normally distributed data) were next performed to describe associations between the different continuous variables and the dichotomised variables described previously. The associations of prime interest in this regard were those between the various socioeconomic parameters and the dietary intake, nutrient intake, health behavioural (e.g. alcohol, physical activity level) and anthropometric variables. Analyses were carried out for the full panel of eleven socio-economic indicators against dietary intakes, health behaviours and general-, health- and dietary attitudes. It was deemed sufficient to describe energy, dietary fibre, macronutrient and micronutrient intake differences according to differences in recruitment site alone (i.e. advantaged vs. disadvantaged), as these variations will occur as a *consequence* of the differences in dietary intake and dietary supplement use already characterised for all of the SES parameters. However, univariate analyses were performed between dichotomised food group intakes and nutrient intakes to elucidate the potential nutritional impact of socio-economic variation in the consumption of each food group.

Apart from the association between socio-economic status and diet, health behaviours, anthropometry and attitudes, the inter-relationships between these latter variables was also of specific interest. For example, it would be pertinent to examine whether adverse health behaviours co-segregated preferentially with one another, or whether the attitudinal variables which predicted adverse health behaviours, poor diet or unfavourable anthropometric status occurred with higher frequency among those of low SES. If this were found to be the case, these attitudinal traits might constitute mediators or functional effectors of socioeconomic variation in behavioural patterns including diet.

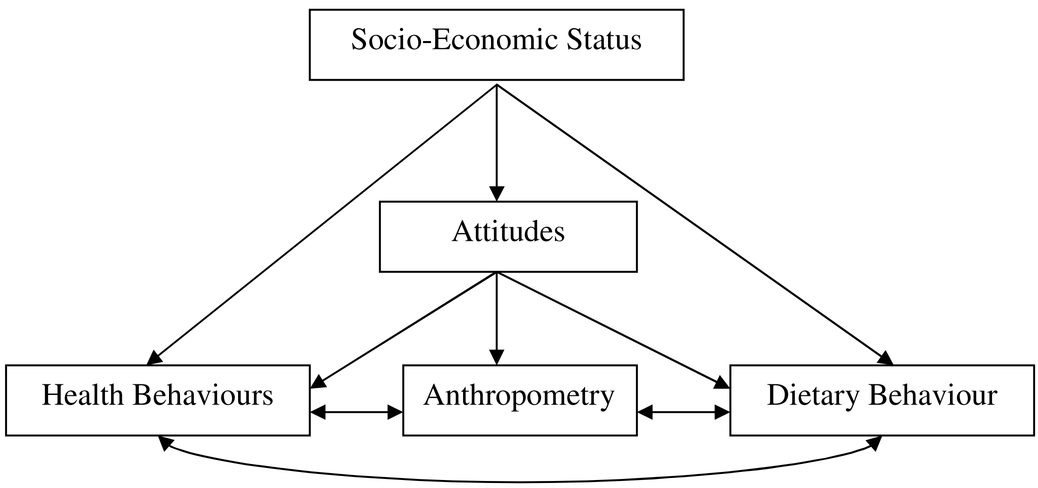

Figure 2.1 Suggested Interactions Influencing Diet and Health Behaviours

Crosstabulation with Chisquare analyses was employed to examine associations between categorical variables such as attitudinal traits, health behaviours, and anthropometric status, in each case reporting a Yates' correction coefficient (Yates, 1934; Plackett, 1964) for the dichotomous relationships under examination. This method adjusts for the increased likelihood of chance findings where outcomes in the dichotomous dependent variable are confined to one or other of two possibilities. By convention, a significance level of $p<0.05$ was selected to designate statistical significance for all of the analyses performed.

2.2. The Qualitative Study

2.2.1. Development of the Qualitative Topic List

The initial qualitative topic list for the focus group discussions was by necessity, predicated on a range of *a priori* themes which had been highlighted in the literature as issues influencing diet and health behaviours among low SES groups. The list was also informed by observations from the quantitative fieldwork, both from data captured by the questionnaires, and from further *ad hoc* commentary by participants. The provisional topic list was piloted with a group of five women aged 28-35 years of differing occupational social class in DIT Kevin Street, and amendments made as appropriate. The topics for discussion in subsequent focus groups divided into six overarching themes in the revised topic list; future salience, locus of health control, perceptions of a healthy diet, perceived barriers to health and healthy eating, perceptions of poverty and psychosocial stress. More sensitive issues such as household finance, poverty and deprivation and their impact on psychological well-being and health-related behaviours (including diet) were positioned towards the end of the list, to encourage frank and open discussion of these issues as participants became more comfortable with the process. The topic list was intended as a non-prescriptive, non-exhaustive series of discussion points for exploration during the 5 subsequent focus group sessions. As a fluid and dynamic template to merely guide these discussions, it evolved from one session to the next as previously unanticipated themes were raised or became more prominent (e.g. the role of housing tenure and psychosocial stress in dietary behaviour), requiring further exploration with following focus groups.

By ensuring that discussants are free to speak about issues which are important to them in regard to health and diet, rather than focusing on the pre-conceived notions of the researcher in this regard, the use of this unstructured interview technique ensures greater authenticity of the data generated (Fade, 2003). The initial and final topic lists are provided as appendices VIII and IX.

2.2.2. Administration of Focus Groups

All participants for the five focus groups in the main qualitative study were recruited from two sites, one in north Dublin and one in the inner city, which fell within the lowest quintile of areas previously identified by the sampling frame. Such purposive selection of subjects for qualitative focus groups has previously been described in the literature (Mays & Pope, 2000). Both of the sites were community education schemes for young women, and subjects were recruited to the focus groups by trainers and group coordinators at these centres. Five focus groups in total were conducted between March and April 2007. The focus groups contained five to eight participants each, all aged 18-35 years.

According to best practice guidelines (Britten, 1995; Kitzinger, 1994; Kitzinger, 1995); the focus groups were coordinated by a facilitator (DMC) who led the round-table discussion, and a raporteur (BW) who took notes regarding all aspects of the focus group including notable comments by participants, but also more subtle interactions and group dynamics which could not be captured by audio-tape.

Prior to each focus group, all participants were provided with an introductory letter explaining the purpose and nature of the session, and giving assurances of confidentiality and anonymity. These issues were revisited verbally with the groups immediately beforehand, when participants were requested to sign a declaration confirming that the purpose and requirements of the research had been fully explained to them, and that they consented to take part. The introductory letter and the informed consent declaration are included as Appendices X and XI respectively. The sessions were recorded digitally on an Olympus VN-2100 Digital Voice Recorder, and ranged in duration from 33 minutes to 77 minutes. Immediately after the discussion, participants were presented with a €10 voucher for a local food and clothing retailer as a token of appreciation for their contribution.

Following each focus group, the facilitator and the rapporteur listened to the sound recordings of the session individually, making independent notes. The facilitator and the raporteur then met for a debriefing session to discuss the meeting overall, examine both sets of notes and arrive at a consensus regarding the main issues which had emerged from the discourse. Such triangulation and consensus measures greatly enhance the credibility of qualitative data analyses by limiting or negating inter-observer bias (Edstrom & Devine, 2001).

2.2.3. Transcription & Analysis of Qualitative Data by Grounded Theory

The recorded sound file from each of the focus groups was transcribed by a contracted secretary, with speech inflections and nuances noted as appropriate. These transcripts were then examined by the facilitator and the raporteur independently. A grounded theory approach was selected for the analysis of these transcribed data, as described by Strauss & Corbin (1998). This technique follows an inductive format, in that it allows theory to evolve from data as a result of line by line analysis, identification of themes and comparison within and across themes (Fade, 2003). A fundamental precept of the grounded theory approach is that it enables a constant and dynamic comparison of individuals, groups and themes to generate a clearer picture of the process in question. Examination of data from one focus group informs the topics discussed in the following group, until data saturation or "informational redundancy" (Lincoln & Guba, 1985) is reached.

Both the facilitator and the raporteur separated out the constituent elements of the discussion into thematic categories in accordance with these grounded theory techniques. This categorisation and re-categorisation of content, along with subsequent discussion between the two researchers, yielded a consensus regarding the principle themes generated by each focus group, and finally, by the five focus groups combined.

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Chapter 3

Dietary Assessment Methods

3.1. Introduction

The use of the correct methodology for assessment of dietary intake is fundamental to gaining accurate information regarding nutrient and food group intake patterns among the target population. The differentiation between precision and accuracy is central to this discussion. Precision or "reproducibility" is "the extent to which a tool is capable of producing the same result when used repeatedly in the same circumstances" (Nelson *et al.,* 2004). Accuracy or "validity" is an expression of the degree to which a measurement is a true and accurate measure of what it purports to measure" (Nelson *et al.,* 2004). While one method may give a consistent measure of the parameter being measured, it does not necessarily follow that this reliably represents the parameter under examination. In other words, it is a precise (repeatable) but inaccurate method of measurement. Conversely, a method which is accurate can also be imprecise. In other words, it is reasonably representative of the parameter being measured if performed a number of times, but is inconsistent in that it yields slightly different measures of the same parameter when applied in a consistent manner.

The measurement of dietary intake is fraught with difficulty, and this applies particularly to the measurement of intakes among socio-economically disadvantaged populations (Stallone *et al.,* 1997; Kubena, 2000).

The dietary assessment methods which are typically applied among general populations include 7 day weighed intake records, 7 day recorded diet histories, 7 day typical diet histories, food frequency questionnaires (FFQ) and 24 hour diet recalls (either singly or on repeated days) (Bingham, 2007). Each of these methodologies has its own merits based on the particular characteristics of the group being surveyed. Each of the methodologies also has its drawbacks however, not least in the context of examining the dietary habits of socially disadvantaged groups. Here issues such as poor literacy, reduced comprehension and difficulty of follow-up serve to militate against the use of several of the data collection methods described previously. These would include 7 day weighed intake records, 7 day recorded diet histories and multiple 24 hour diet recalls.

The remaining methods including 7 day typical diet histories, food frequency questionnaires and single 24 hour diet recalls (alone or in combination with one of the other methods) were hence deemed the most suitable of the commonly used dietary intake assessment instruments for examination of intakes among this disadvantaged population. Even here, however, considerable difficulty can arise. For example, the effective use of food frequency questionnaires is predicated on an *a priori* knowledge of the individual foods and food groups most commonly consumed by the target population. In dealing with a particular ethnographic sub-group of the population, a FFQ which is appropriate for the wider population, might well contain significant omissions in terms of the foods regularly consumed in the diets of disadvantaged subjects. While the 24 hour diet recall method is quick, simple and easy to comprehend, it gives a very limited "snap shot" of the respondent's overall diet, which is often unrepresentative of their typical dietary intake.

In the current context, the difficulties encountered with the recruitment of our socio-economically disadvantaged population severely compromised the likelihood of obtaining multiple 24 hour diet recalls from the same individuals. Finally, the use of habitual diet histories, where the respondent is asked to document a "typical weekly diet" is open to several significant difficulties including recall inaccuracies, subjective bias, poor comprehension and duration of the recording process (Nelson *et al.,* 2004).

3.2. Methods

Dietary data were collected using the three methods deemed most feasible for this disadvantaged population. These were the 7 day typical diet history method, the single 24 hour diet recall method and the food frequency questionnaire (FFQ) method. The accuracy of these methods and their comparability (i.e. the degree to which the findings for each method correlated with the others) was then assessed for the full pilot population (n=72), as well as discrete “disadvantaged” (n=55) and “advantaged” (n=17) groups within this pilot population. In doing so, it was hoped that this would help to identify the most appropriate dietary assessment method for this population of young, socio-economically disadvantaged women.

3.2.1. Internal Validation

Internal validation refers to the comparison of several methods against one another, in the absence of an external reference. In essence, therefore, these procedures are not tests of "validity" in its strictest sense, but are rather tests of comparability between the different methods under examination.

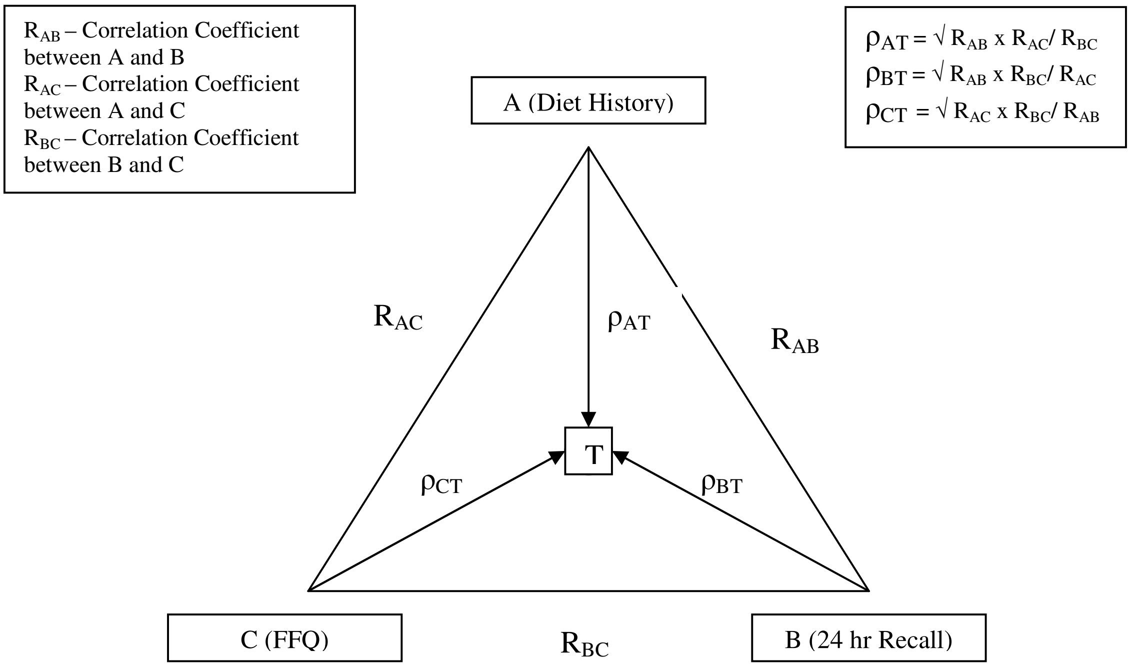
Bland & Altman (1986) described a methodology of internal validation where the difference in outcome (e.g. overall energy intake) between the two methods being assessed is compared against the mean difference between the methods and these values are then plotted against one another. Good agreement between the two methods (indicated by a high proportion of cases falling within the 95% confidence interval bands) reveals a high degree of internal consistency between these methods. This procedure yields a graphic illustration of the level of agreement between the two methods and can be employed to supplement other univariate analyses which aim to elucidate the differences in outcome results obtained by the two different methods. Being primarily illustrative in nature however, and therefore open to some degree of subjective interpretation, it is important that this method be accompanied by further quantitative statistical analyses in these assessments.

Among the univariate analyses which might be used to compare outcomes between pairs of dietary assessment methods, paired t-tests were preferred, as these capture not just differences in the outcomes for the methods at a population level, but also the significant *intra-individual* variations which can exist between outcomes generated by each of the two methods.

3.2.1.1. Triangulation

"Triangulation" techniques have also been employed to estimate internal validity in the absence of an external reference. In the current context, this technique may be used to compare intakes derived by two different methods for the same individual against one another. For example, for energy, the difference in overall energy intake (kcals) between the diet history, the 24 hour diet recall and the FFQ may be compared against one another in pairs, to ascertain the estimated validity of each method. Triangulation methods are formulated on the assumption that the outcome values which have been measured the same by two or more different methods represent "accurate" results, and create a basis against which other outcome results for each of the methods under investigation may be compared. In simple terms, the common findings of the different methods become the "internal reference" or basis for assessment of each of the individual methods.

Nelson *et al.,* (2004) describe such a triangulation method as depicted below. By determining the correlation coefficients for each of the three pairs of methods, the relative consistency of each method in relation to the internal reference T (i.e. the consensus "truth" generated from the outcomes of all three methods) may be calculated.



$\rho_{AT=}$ The internal correlation coefficient of method A with the assumed "truth".
$\rho_{BT=}$ The internal correlation coefficient of method B with the assumed "truth".
$\rho_{CT=}$ The internal correlation coefficient of method C with the assumed "truth".

Figure 3.1 Triangulation of Three Dietary Assessment Methods

3.2.2. External Validation

In the past, where two dietary assessment methods yielded similar results, there was a tacit assumption that both provided an accurate measurement of food and nutrient intake. With the advent of external reference measures from the mid-nineteen eighties onwards however, it became clear that this was not the case (Prentice *et al.,* 1986; Goldberg *et al.,* 1991). From this time onwards, techniques such as whole body calorimetry and biomarkers such as urinary nitrogen excretion and doubly-labeled water (DLW) were employed to validate estimates of energy intake derived from various dietary assessment methods (Livingstone & Black, 2003). It was found that in virtually all published dietary intake studies, there was a significant proportion of "misreporters", with a strong bias towards underreporting in most instances (Schoeller, 1990). As a result of these findings, it was recommended that all dietary intake studies include an independent external measure of validity (Black *et al.*, 1993). The logistics and considerable cost associated with such provision however, preclude this in many instances. Nonetheless, it is imperative that some evaluation of reported energy intakes be undertaken in any such study to improve the general quality of the dietary data (Livingstone & Black, 2003).

3.2.2.1. Dietary Under-reporting

To this end, Goldberg *et al.*, (1991) developed equations to assess the overall quality of dietary intake data gathered in nutritional research studies. These formulae took cognisance of the sample size, the duration of dietary intake assessment, the within-subject variation in dietary energy intake, the precision of estimated basal metabolic rate (BMR) measurements and the overall variation in physical activity levels (including inter- and intra-individual variation and methodological error). They were based on the correlation of data from metabolic studies to that date, which compared overall energy expenditure from doubly-labeled water or whole body calorimetry (the "gold standards" for estimation of energy expenditure) with measured energy intake (EI), which equals total energy expenditure (TEE) in a weight-stable population. As TEE comprises BMR and energy expended in physical activity (PAL), the following equation was derived.

$$EI = BMR \times PAL = TEE$$

This has been further manipulated to express PAL as a function or multiple of BMR as follows:

$$EI/BMR = PAL$$

These formulae were revised by (Black, 2000a) based on the further collection of data from metabolic studies over the intervening period. The application of these formulae elicits a series of thresholds or "cut-offs" for physical activity level (EI/BMR), below which it is assumed that metabolic stability (assumed weight homeostasis) is implausible based on the findings of previous metabolic studies. Because weight homeostasis is always assumed at the sample population level, those subjects who fall beneath the lower threshold, which is generally delineated at the 95% lower confidence interval, have only a 2.5% statistical chance of being classified as accurate reporters. As such, they may be designated misreporters or "underreporters" with some degree of confidence.

The equation for the derivation of misreporting thresholds is shown below:

$$\text{Lower cut-off} = \text{PAL} \times \exp\left[\, SD_{Min} \times ((S/100)/\sqrt{n}) \,\right]$$

Where, PAL = the estimated group physical activity level of the population.

SD_{Min} = -2 for the lower 95% confidence interval.

n = the sample size of the population.

The expression S in the formula above is derived as follows:

$$S = \sqrt{\left[\, (CV^2_{WEI}/d) + CV^2_{WB} + CV^2_{tP} \,\right]}$$

Here, CV_{WEI} = the mean within-individual coefficient of variation energy intake.

CV_{WB} = the mean coefficient of variation for BMR estimated from Schofield (1985).

CV_{tP} = The mean coefficient of variation for PAL.

d = The number of days of dietary assessment.

In the derivation of CV_{WEI}, (Black, 2000a) cited a number of studies where this intra-individual variation in dietary energy intake ranged from 14 to 45%, with a pooled mean of 23%, and hence this latter figure was adopted as an appropriate estimate.

For CV_{WB}, the author suggested a general figure of 8.5%, an increase from the 8.0% suggested in the original paper of Goldberg *et al.*, (1991).

Black (2000a), however, recognised that age and sex specific data for this variable were available from Schofield (1985). On examination of these data, the CV_{WB} for females aged 18-30 years is 9.3%, while that for females aged 30-60 years is 8.3%, indicating that the suggested figure of 8.5% will be appropriate for the current population of 18-35 year old women.

Black (2000a) estimated CV_{tP} at 15%, an increase from the 12.5% quoted in Goldberg *et al.*'s original paper, due to the subsequent accumulation of data from further metabolic studies which had a pooled mean of 15.4%. The cut-offs for methods which purport to measure habitual intake such as FFQ and diet history vary little as *d* increases above 21 days, and hence 21 is recommended as a reasonable estimate of this term (Black, 2000a). For short periods of assessment such as 24 hour diet recalls which estimate intake over one single day, *d* will be 1.

The use of the appropriate PAL to estimate the group physical activity level of the population under examination is critical to the derivation of suitable cut-off thresholds. It is also fraught with difficulty, as estimates of habitual physical activity levels among free living populations vary widely. In 1985, the FAO/WHO/United Nations Universities (UNU) reported that a PAL of 1.27 reflected the minimum "survival requirement" which allows for "minimal movement not compatible with long term health" and “makes no allowance for.... the energy needed to earn a living or prepare food". This report used factorial calculations to estimate the average PAL associated with a sedentary lifestyle to be 1.55 (FAO/WHO/UNU, 1985).

Goldberg *et al.,* (1991) however, estimated the average PAL to be 1.35 using whole body calorimetry data from a number of studies, with an average lower 95% confidence threshold of 1.16. This low threshold was attributed to subject error (moving during BMR estimation), and particularly to the very sedentary nature of the calorimetry protocol which can inappropriately suppress typical PAL. The doubly-labeled water studies reported in the same paper (Goldberg *et al.*, 1991), estimated *free living* energy expenditure over 10-15 days, a more robust measure of habitual EE. In the studies examined, PAL from this method averaged 1.67 for the full population (1.62 in women), with an average minus lower 95% confidence threshold of 1.28, which is largely in agreement with the 1.27 estimated by the FAO/WHO/UNU (1985). This group therefore concluded that it was reasonable to assume a minimum PAL of 1.35 for all “normal” circumstances.

However, there is also a substantial body of research which indicates habitual PALs lower than 1.6-1.7 among the general ambulant population. Black *et al.*, (1996) estimated energy expenditure in industrialised societies using data from 574 doubly-labeled water measurements derived from 1614 measurements among 1156 male and female subjects of various ages. This study suggested that previous estimates of PAL associated with a typical sedentary lifestyle were largely correct, at least for the modal PAL levels at the lower end of the range. The FAO/WHO/UNU (1985) report estimated an average PAL of 1.56 for women with sedentary occupations, rising to 1.64 for moderately active occupations. The UK Department of Health (1991) estimated average PAL values *based on both recreational and occupational activity*, attributing a level of 1.4 to 1.6 to women in the non-active to moderately active categories.

Of the studies cited by Black *et al.,* (1996), those which assessed PAL in women aged 18-29 years (n=89) and 30-39 years (n=76) estimated a mean PAL of 1.70 and 1.68 respectively. However, among these studies, two which controlled physical activity levels estimated a PAL of 1.59 (Bingham *et al.*, 1989) and 1.53 (Westerterp *et al.*, 1992) respectively, for adult women engaged in only limited amounts of physical activity. Overall, Black *et al.*, (1996) estimate a PAL of 1.4-1.5 for those who are "in seated work with no option of moving around and little or no strenuous activity" and 1.6-1.7 for those who are in "seated work with discretion and requirement to move around, but little or no strenuous activity".

It has been suggested that to optimise both the sensitivity (the ability to accurately identify misreporters) and the specificity (the ability to accurately identify "non-misreporters"), that some measure of physical activity must be collected, which permits stratification of subjects into various activity levels. Individual PAL values may then be applied in the derivation of separate cut-offs for each of these activity groups (Black, 2000d).

This is the approach which was taken in the evaluation of the three dietary assessment methods (diet history, 24 hour diet recall, FFQ) among the pilot population in the current study (n=72). Four physical activity strata were accordingly derived from respondents' strenuous activity and sedentarism data by means of a composite index. The index was used to classify individuals as low, low to moderate, moderate to high or high activity, based on measures of both sedentarism (sitting time per day) and strenuous physical activity participation. Initially, the subjects were classified into three levels of sedentarism and two levels of strenuous activity (participation or non-participation).

These parameters measure different dimensions of physical activity, and were therefore both included to give a more accurate reflection of each individual's overall PAL relative to their peers. Those with greatest sitting time (least active) were given a rank of 1, those in the middle tertile of sitting time a rank of 2 (moderately active), and those with the lowest sitting time (most active) a rank of 3. For vigorous physical activity, those not participating in strenuous activity (least active) were assigned a rank of 1, while those who participated in any vigorous activity were given a rank of 2.

The scores from these parameters were then multiplied together to give an overall physical activity score from 1 (least active) to 6 (most active). Subjects were then collapsed into four groups based on these index scores, with those in group 1 being designated low activity, those in group 2 having low to moderate activity, those in group 3 having moderate to high activity, and those in group 4 having high activity. While the development of this overall PAL index in the current study relies on relatively crude measures, it does provide some estimation of *relative* PAL levels among the population based on their available PAL data.

The PAL classification of individuals among the pilot group of 72 individuals is illustrated below. Overall, 69 of the 72 subjects in this group were categorised in this way.

Tertiles of Sitting Time	**Sedentarism Score**	**Participation in Strenuous Activity**	**Vigorous PA Score**	**Overall PAL Index Score**
Highest	1	No	1	1
Highest	1	Yes	2	2
Middle	2	No	1	2
Middle	2	Yes	2	4
Lowest	3	No	1	3
Lowest	3	Yes	2	6

Table 3.1 Creation of the Composite Index to Estimate Physical Activity Level (PAL)

PAL Index Score	Number (%)	PAL Category	Assumed Activity Level	Number (%)	Estimated Group PAL
1	14 (20.3)	1	Low	14 (20.3)	1.40
2	25 (36.2)	2	Low to moderate	25 (36.2)	1.48
3	16 (23.2)	3	Moderate to high	16 (23.2)	1.56
4	8 (11.6)	4	High	14 (20.3)	1.64
6	6 (8.7)				

Table 3.2 Assignment of Subjects in the Pilot Population (n=69) to Estimated PAL Categories Based on PAL Index Scores

Hence, four groups of roughly equal size were generated based on their respective physical activity levels. The estimation of each of these groups' population physical activity level is critical to the generation of appropriate cutoff thresholds, and is predicated on an *a priori* knowledge of typical physical activity levels among young adult female populations, and upon the actual physical activity data derived from this population.

While Black *et al.,* (1996) estimated a PAL of 1.4-1.5 for those who are "in seated work with no option of moving around and little or no strenuous activity" and 1.6-1.7 for those who are in "seated work with discretion and requirement to move around, but little or no strenuous activity", the FAO/WHO/UNU (1985) report estimated an average PAL of 1.56 for women with sedentary occupations, rising to 1.64 for moderately active occupations, and subsequent review of these estimates in the context of further evidence from DLW experiments stated that "the data do not suggest that the recommendations are seriously wrong" (Black *et al.,* 1996). Goldberg *et al.,* (1991) estimated *free living* physical activity level (PAL) over 10-15 days at 1.62 in women, using data from DLW experiments.

Examining the current study population, there is substantial evidence to suggest that the group PAL of these women lies towards the lower end of the documented spectrum. The mean estimated daily sitting time is over 4 hours, while the mean estimated daily participation in strenuous exercise (structured physical activity) is just under 11 minutes. There is also evidence that this mean strenuous physical activity level is disproportionately elevated by a small number of "exercisers", with a median level of 0 minutes per day and 82% partaking in an average of less than 10 minutes per day. Two-thirds of these women do not participate in any strenuous physical activity at all.

Despite the inherent uncertainty which arises in "mapping" these physical activity groupings to estimated group PALs, values of 1.40, 1.48, 1.56 and 1.64 were selected for PAL categories 1 to 4 respectively. These group PAL values are located primarily in the lower reaches of the PAL spectrum for young women, but also extend into the moderate range of PAL for this group. The adoption of these values takes account of the published literature described above, while also considering the characteristics of the group under investigation. As such they are judged to be largely representative of the actual physical activity levels of the four PAL categories in this population.

Using these estimated group PALs, cutoffs were calculated for each of the three dietary assessment methods. The duration (*d*) used for calculation of the diet history and food frequency questionnaire cutoffs was 21 days (habitual intake methods), while that used for the 24 hour diet recall was 1 day. In each case, different sample sizes (*n*) were used to calculate the cutoff for the particular group under examination.

The *n*=1 sample size was used to generate cutoffs which could be employed to categorise *individuals* as valid reporters or underreporters in each population. The *n*=72 sample size was used to generate cutoffs which could be used to comment on the *general quality* of the data derived from each dietary assessment method. Cutoffs were also calculated at each PAL, for the "advantaged" and "disadvantaged" cohorts separately, to ascertain whether any of the methods was particularly suitable or unsuitable for use with socio-economically disadvantaged groups.

3.2.2.2. Dietary Over-reporting

The issue of dietary over-reporting in population studies has received significantly less attention than that of dietary under-reporting due to the preponderance of the latter in virtually all studies examined. It does, however, warrant inclusion in any comprehensive discussion of dietary misreporting as it too will compromise the validity of not just the reported energy intakes, but also of the macro- and micronutrient intakes reported.

This is particularly pertinent in any study examining the adequacy of food and nutrient intakes among socio-economically disadvantaged groups. Here, findings from the vast majority of national and international studies which have examined social inequalities in food and nutrient consumption, have pointed towards universally lower micronutrient intakes among disadvantaged groups (James *et al.*, 1997, Friel *et al.,* 2003). If the issue of dietary over-reporting is ignored, the inclusion of these respondents in any grouped nutrient intake analysis will falsely elevate the mean nutrient intake of that group, potentially masking any micronutrient intake deficiencies which exist in that population.

While a case can be made for the comparison of group median rather than group mean intakes between populations, this falls far short of an ideal solution as the disproportionately high number of low nutrient consumers would still artificially suppress the intake attributed to the 50^{th} percentile individual (i.e. the median).

For this reason, several studies have more recently employed a "cut-off" threshold to classify and eliminate over-reporters prior to analysis of population food and nutrient intakes (Okubo & Sasaki, 2004, Bazelmans *et al.*, 2007). Black *et al.*, (1996) suggest a PAL range of 1.2-2.5 for sustainable lifestyles, where 2.5 represents a very physically active lifestyle, and state that these are the boundaries within which the activity levels of the general population may be evaluated.

In this derivation study, 14.8% of the population fell within the 2.0-2.5 PAL, indicating that "although these levels of activity would be considered very active, they are not necessarily unusual among the general population" (those in athletic and military training had already been removed before the derivation was performed). Notwithstanding the fact that women are poorly represented in the higher PAL levels, Black *et al.*'s study population contained "very few manual workers" (only 3 in total out of 574) indicating that 2.5 may even be a conservative estimate for the upper PAL threshold among the wider population.

This further supports the selection of this 2.5 level as opposed to a level of 2.0 or 2.4 as the upper cutoff for our own study population. For these reasons, an upper PAL cutoff of 2.5 was used in all cases to designate over-reporters in the current study.

The critical importance of identifying and eliminating both underreporters (false underestimation of deleterious elements such as fats, saturates, *trans*-PUFAs, etc.) and over-reporters (false overestimation of beneficial micronutrient intakes) in a study seeking to elucidate the nature of nutritionally mediated health inequalities should now be clear.

3.2.3. Comparison with Existing Data

The final method to be utilised in the external validation of data from each of the three dietary assessment methods, is the comparison of energy and nutrient intakes derived by these methods against those obtained by other methods for similar population groups. To achieve this, data from women aged 18-35 years who participated in the North/South Ireland Food Consumption Survey (NSIFCS) (n=269) were analysed to examine the mean intake of several key nutrients for this group. These values, which were derived from 7-day estimated dietary intake records were then compared with those obtained by each of the three dietary assessment methods for the current pilot population. While overall, this examination should indicate whether data from the current study are broadly comparable with those derived from young women of low SES in a nationally representative study, these data need to be interpreted with several important caveats in mind. Most notably, although the young women of low social class and education in the NSIFCS are the most socially deprived group of young women *in that population*, they are still likely to be of a higher socio-economic status than the "disadvantaged" young women in the current study. The level of disadvantage, and by inference, the dietary intakes of this NSIFCS cohort, are therefore not exactly comparable with those of the current study population, and cannot be reliably assumed to be representative of young women of low SES in the wider context.

3.2.4. Identification of Misreporters in the Full Study Population

The internal and external validation techniques used in the pilot population were employed to select the dietary assessment method of choice for the full study population. When this dietary assessment technique had been selected, four physical activity (PAL) groupings were generated for the full population (*n*=295) in the same manner as described previously, and new cut-off thresholds calculated for each of these PAL categories based on the sample size and duration of assessment. Thresholds were calculated at the individual (*n*=1), population (*n*=295), and group ("disadvantaged" (*n*=221) and "advantaged" (*n*=74)) levels. The *n*=1 threshold enabled *individuals* to be designated as "valid-" or "under-reporters", while the *n*=295 threshold permitted an assessment of the overall quality of the dietary data. The group thresholds similarly permitted an assessment of the overall dietary data quality derived from the disadvantaged and advantaged cohorts. The same upper PAL threshold of 2.5 was used to designate over-reporters in all cases.

3.2.5. Characterisation of Misreporters

The application of the *n*=1 and 2.5 PAL thresholds to the full population generated a group of under- and over-reporters who collectively may be referred to as "misreporters". In the final section of this chapter, the socio-economic, attitudinal, dietary, nutritional and anthropometric characteristics of these mis-reporters were compared against those from the "valid" reporters, to ascertain whether differences existed between the two groups from these perspectives.

The distribution of food group, energy, dietary fibre and macronutrient (fat, NMES) intakes, and anthropometric data from these respondents was assessed for normality. This was done by reference to the kurtosis and skewness of these distributions, Kolmogorov-Smirnoff tests of normality, and a visual inspection of their distribution histograms.

Where normal distribution of data was identified, parametric independent t-tests were used to elucidate differences in these continuous variables between the two populations, while for non-normally distributed data, non-parametric Mann-Whitney U tests were used to assess differences in the median between the two groups. Crosstabulation with Chisquare analysis, reporting Yates' continuity correction was employed for comparison of categorical variables between the two groups.

By defining the population of mis-reporters prior to the main analytical work, the data from these implausible dietary records may be excluded from subsequent analyses. This will qualify and significantly enhance the integrity of the findings from this study.

3.3. Results

3.3.1. Internal Validity Studies

3.3.1.1. Agreement Between Dietary Assessment Methods

The generation of Bland-Altman plots permits a visual interpretation of how each of the three dietary assessment methods compare with one another. Four plots are shown below describing the relationship between the three pairs of dietary assessment methods, and finally, the agreement between all three methods when plotted on the same axes.

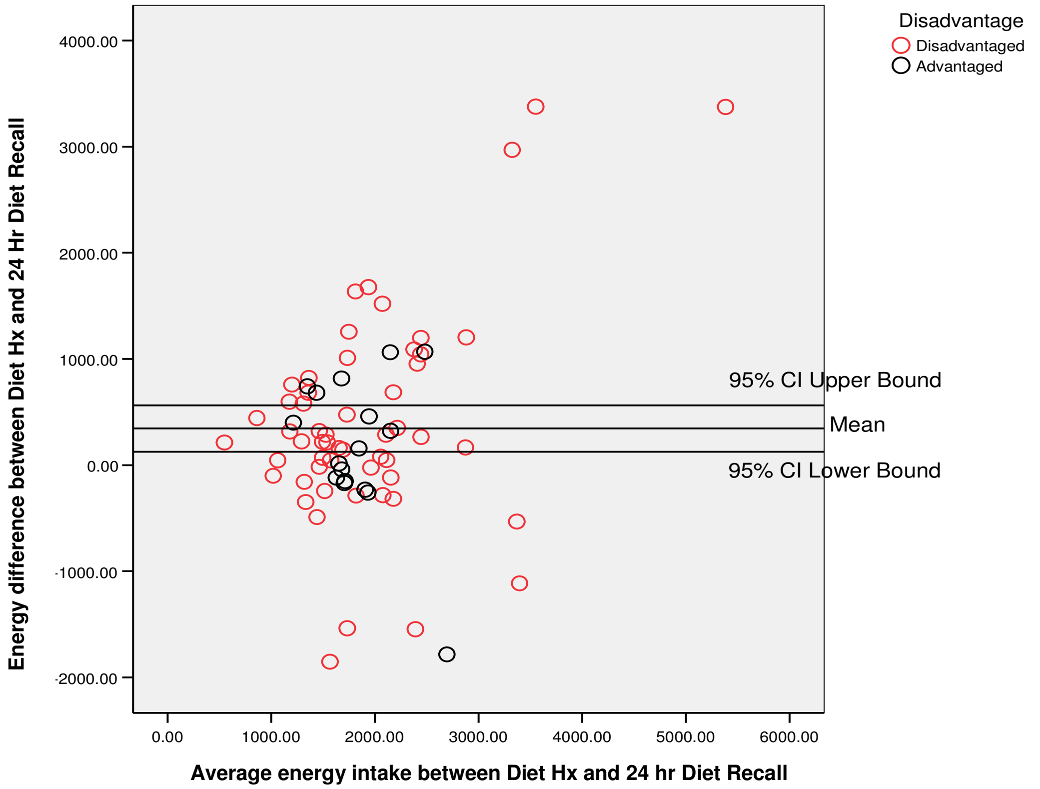


Figure 3.2 Bland-Altman Plot for Diet History and 24 Hour Diet Recall

Figure 3.2 describes the intra-individual difference in energy intakes between the diet history method and the 24 hour diet recall method, expressed as a function of the mean energy intake by these two methods. The mean is set above 0, indicating the tendency for the 24 hour diet recall method to yield lower energy intake estimates than the diet history method. While there is reasonably good agreement between the two methods at lower energy intakes, this agreement declines at higher intakes as shown by the increasing scatter of the individual data points from the mean at these higher intakes.

The greater concentration of "advantaged" (black) data points within the 95% confidence intervals, and the more scattered distribution of the "disadvantaged" (red) data points, indicates a greater agreement of energy estimates for the two methods among the advantaged population.

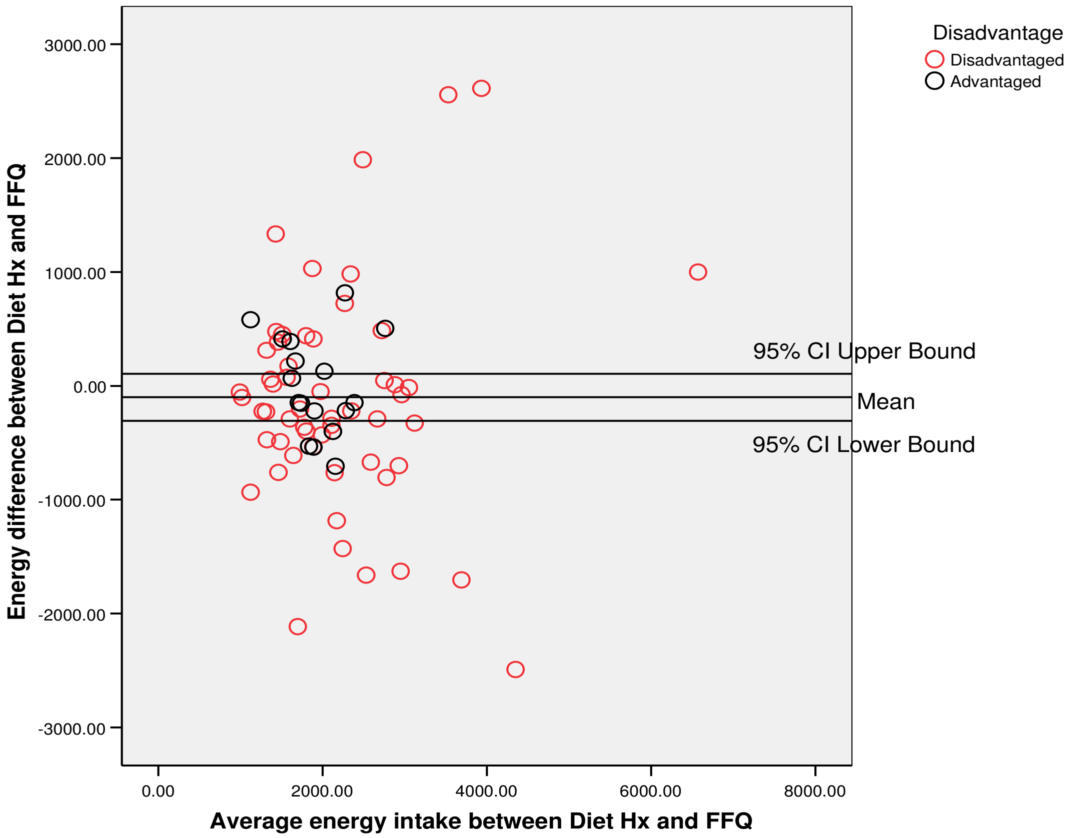


Figure 3.3 Bland-Altman Plot for Diet History and FFQ

Figure 3.3 describes the intra-individual difference in energy intakes between the diet history and FFQ methods, expressed as a function of the mean energy intake by these two methods.

The mean is set below 0, indicating the tendency for the FFQ method to yield higher energy intake estimates than the diet history method (Diet Hx-FFQ<0). While there is good agreement between the two methods at lower energy intakes, the plot again becomes more scattered at higher intakes, indicating generally poorer agreement between these two methods in this range. The greater concentration of "advantaged" (black) data points within the 95% confidence intervals, and the more scattered distribution of the "disadvantaged" (red) data points, again indicates a stronger agreement between energy estimates for the two methods among the advantaged population, than among the disadvantaged group.

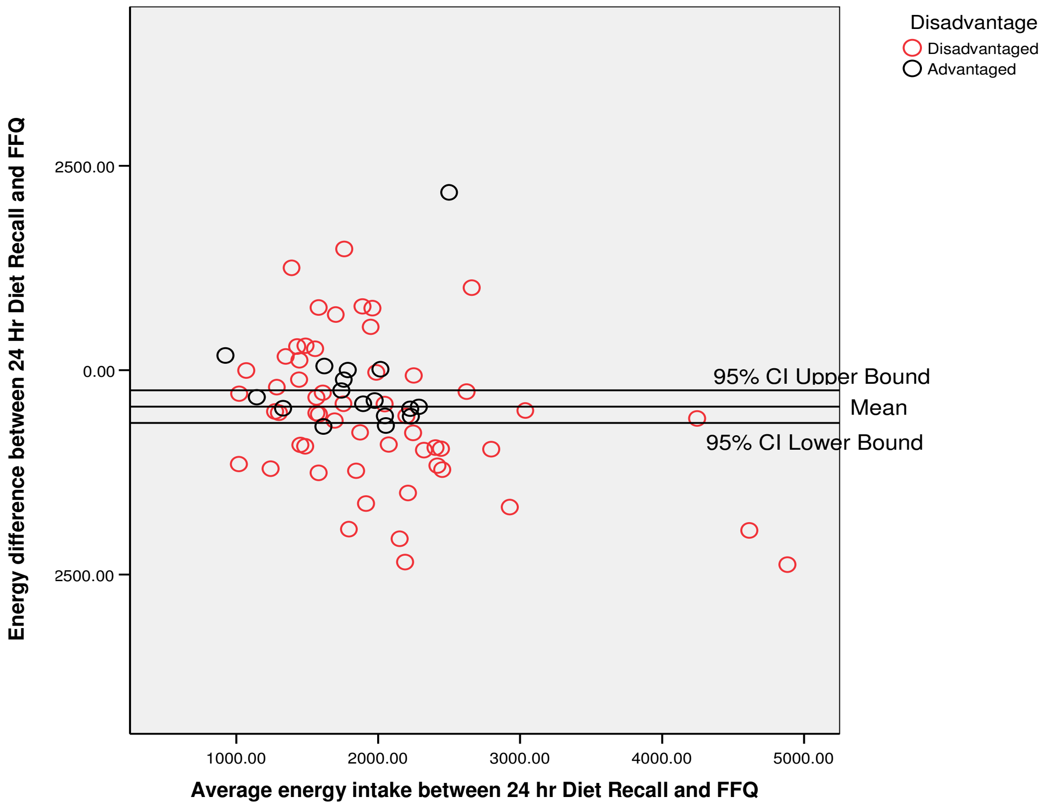


Figure 3.4 Bland-Altman Plot for FFQ and 24 Hour Diet Recall

Figure 3.4 depicts the intra-individual difference in energy intakes between the 24 hour recall and FFQ methods, again expressed as a function of the mean energy intake by these two methods. The mean is set below 0, indicating the tendency for the FFQ method to yield higher energy intake estimates than the 24 hour recall method (24 hour-FFQ<0). The scatter of the plot is considerably greater than in either of the two previous examples, even at lower energy intakes, indicating a poorer agreement between these two methods. There is however, strong intra-individual agreement between the two methods among the "advantaged" population (black points), indicating that the observed inconsistency (scatter) in energy estimates relates primarily to the "disadvantaged" population (red points).

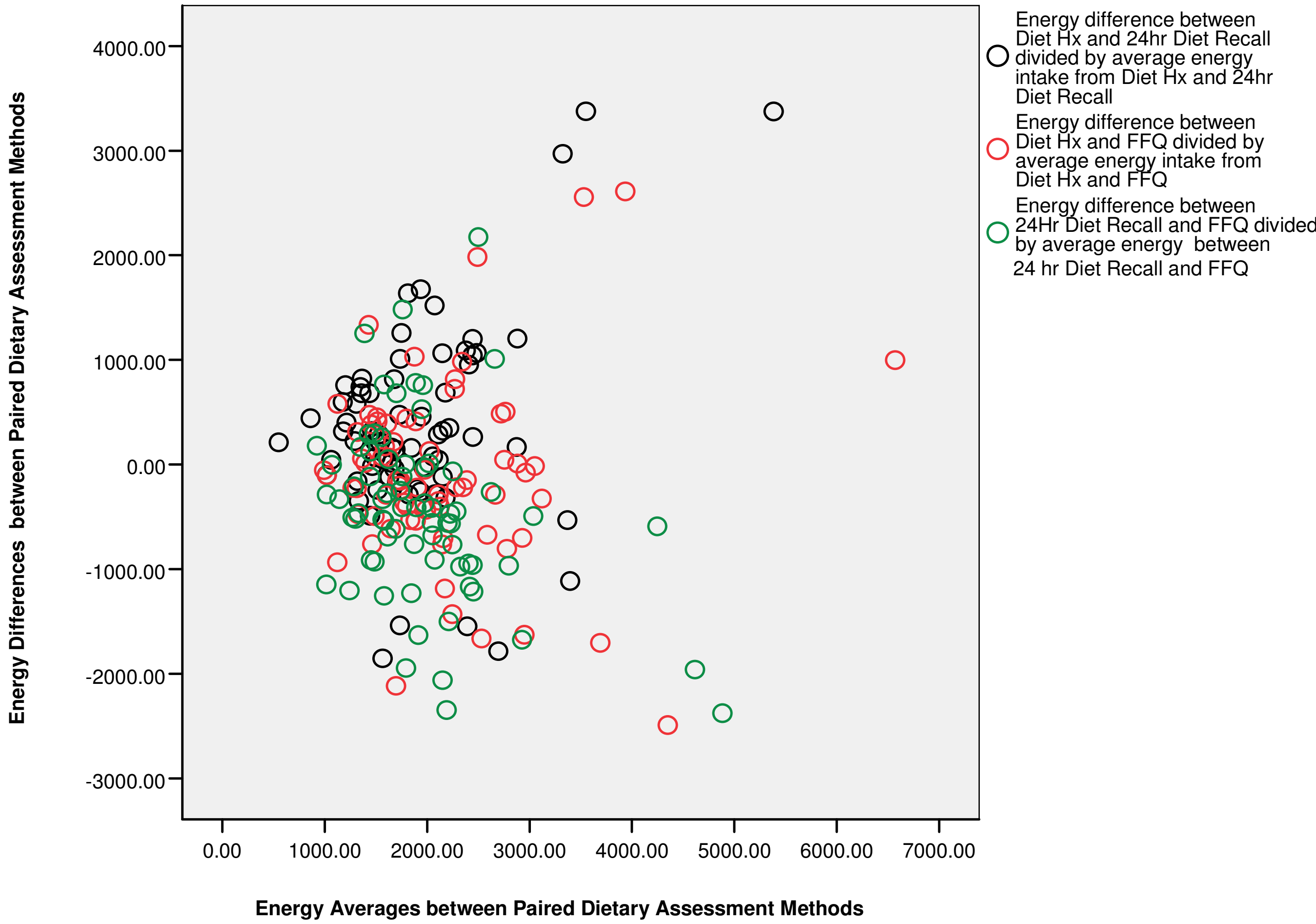


Figure 3.5 Bland-Altman Plots for Three Pairs of Dietary Assessment Methods Plotted on the Same Axes

Figure 3.5 illustrates data from the three previous figures plotted on the same axes for ease of comparison. Here, the expected increase in scatter at higher energy intakes is observed for all 3 pairs of methods. The plot demonstrates a generally greater degree of agreement between the diet history and the FFQ (red points), than either of the other two pairs of methods among the full pilot population, indicating that the 24 diet recall appears to deviate from these other two methods in terms of overall energy intake assessment.

3.3.1.2. Paired T-tests

Population	Paired Methods	Pearson's Correlation Coefficient for Energy Intake	Mean Difference (kcals/day)	p value
Full Pilot Cohort (n=72)	Diet History - 24 hour Diet Recall	0.440	+345.0	0.003
	Diet History – FFQ	0.597	-100.4	0.335
	FFQ - 24 hour Diet Recall	0.514	-445.4	<0.001
Disadvantaged Pilot Cohort (n=55)	Diet History - 24 hour Diet Recall	0.481	+397.5	0.005
	Diet History – FFQ	0.597	-132.5	0.318
	FFQ - 24 hour Diet Recall	0.559	-530.0	<0.001
Advantaged Pilot Cohort (n=17)	Diet History - 24 hour Diet Recall	0.126	+175.2	0.301
	Diet History – FFQ	0.527	+3.4	0.975
	FFQ - 24 hour Diet Recall	0.237	-171.8	0.298

Table 3.3 Paired T-tests describing the Correlation between the Three Dietary Assessment Methods

The generation of paired t-test analyses further elucidates the level of agreement between energy intakes derived by the three dietary assessment methods. Again, the methods are compared in pairs, with Pearson's correlation coefficients and significance of difference (p values) derived in each case.

These statistical analyses confirm the findings of the previous Bland-Altman plots. Among the full pilot population, the correlation is greatest for the diet history-FFQ pair (0.597), and indeed this is the only pair where the differences in estimated intake do not reach statistical significance (p=0.335 for the pilot population). A similar trend is observed among the disadvantaged population only, with the energy intake estimates from the diet history and FFQ again significantly more comparable than those of the other pairs.

For the advantaged population, the mean differences are smaller, particularly for the diet history-FFQ pair. While this is likely to relate to the lower sample size of the advantaged cohort as this reduces the likelihood of frequent large variations among this group, it also alludes to a possible greater agreement of intake estimates for all methods among this advantaged population. The important implication of this finding is that the judicious selection of dietary assessment method may be much more important in populations of disadvantaged respondents, than in more affluent populations where intake estimates may be largely comparable irrespective of the method used.

3.3.1.3. Triangulation

For the full pilot population (n=72), the triangulation procedure yields the following coefficients.

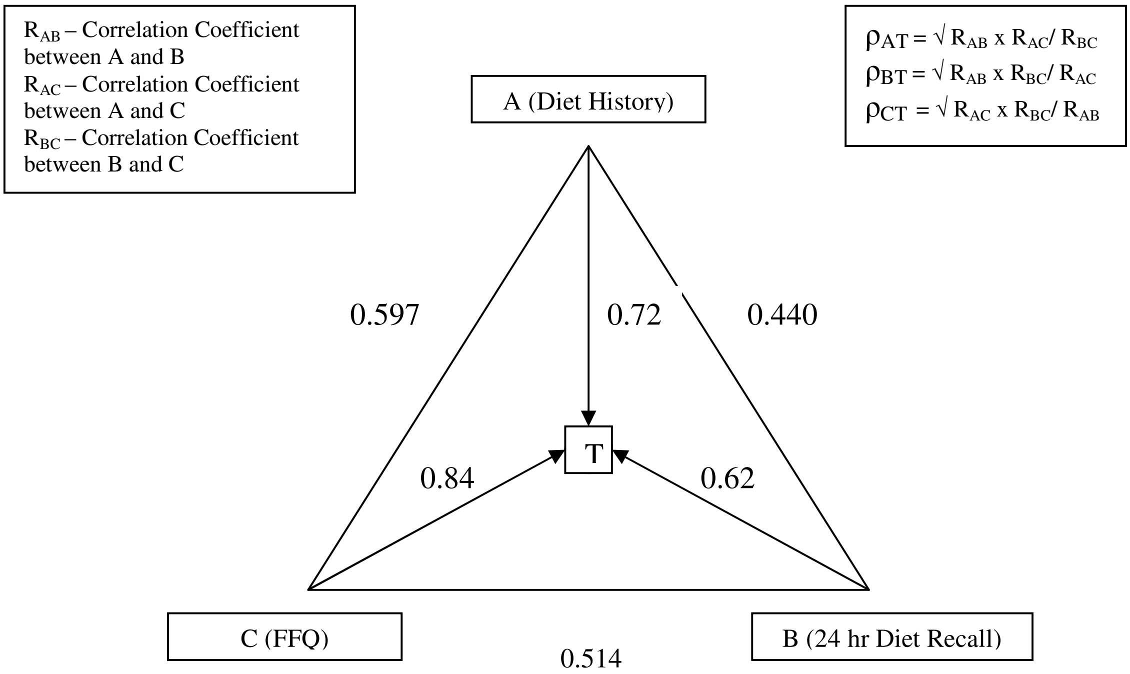


Figure 3.6 Triangulation of Dietary Assessment Methods among the Full Pilot Population using Correlation Coefficients

Figure 3.6 illustrates the internal correlation coefficient of each method with the assumed "truth" generated from intake data derived by all three methods, for the full pilot population. The FFQ method (0.84) shows a greater correlation coefficient than either the diet history (0.72) or 24 hour diet recall (0.62), suggesting the FFQ as the method of choice for this population, based on the internal validation studies.

For the disadvantaged population only (n=55), the following coefficients are generated. As for the full pilot population, the FFQ (0.83) shows a higher correlation coefficient with the assumed "truth" than either of the two alternative methods, again suggesting this as the method of choice among the disadvantaged population.

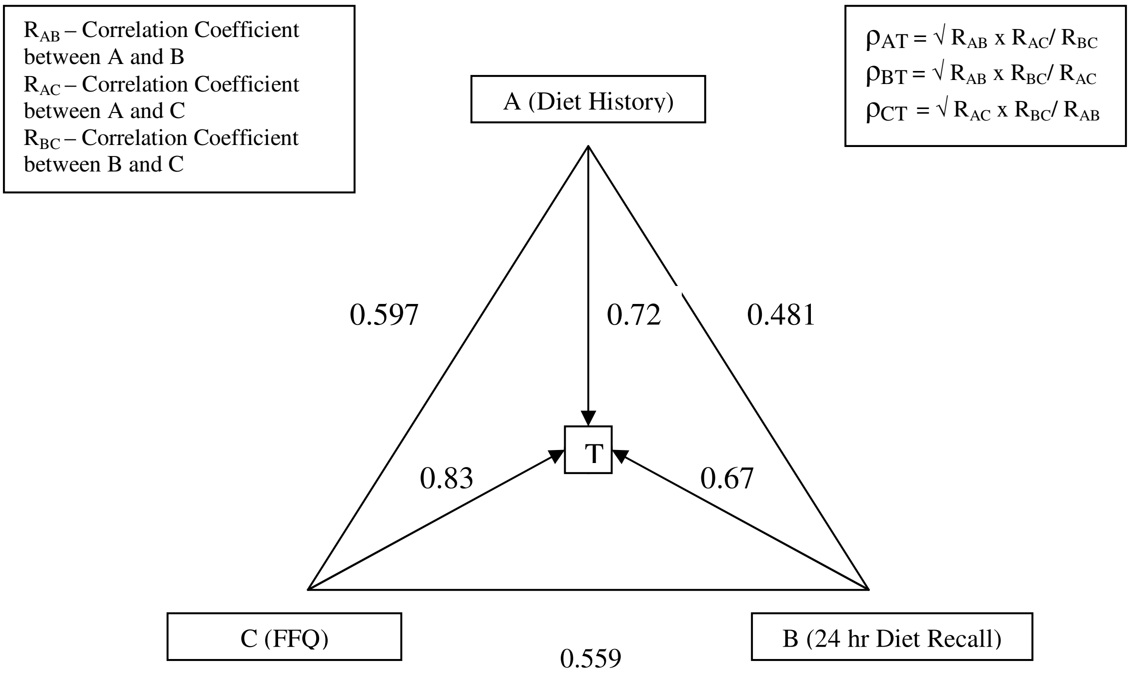


Figure 3.7 Triangulation of Dietary Assessment Methods among the Full Pilot Population using Correlation Coefficients

In summary, the findings of the internal validation studies indicate better agreement between the diet history and FFQ methods, than either the diet history and 24 hour diet recall or the FFQ and 24 hour diet recall when these methods are applied in consistent, standardised manner. This applies particularly to the disadvantaged population, with those in the advantaged cohort demonstrating largely comparable intake results irrespective of the method employed. Overall, the FFQ tends to yield the highest intake estimates, with the 24 hour diet recall generating the lowest estimates and the diet history method falling somewhere between these two.

The triangulation method generates correlation coefficients which suggest that the FFQ may yield more valid results than either of the other two methods among both the full and disadvantaged populations.

It must be emphasised however, that this triangulation is predicated on the comparison of results derived from each method against a standard generated from data derived from all three methods. As such, it is a merely a consensual approach, with no external reference to elucidate the veracity of these findings. Hence, the internal validity studies should be considered as preliminary investigations to identify whether any of the methods under examination deviates significantly from the others, while precedence should be given to the external validation studies for the identification of the optimal dietary assessment method.

3.3.2. External Validity Studies

3.3.2.1. Cut-off Methodology for Misreporters

In order to externally evaluate the relative merits of each of the dietary assessment methods, the pilot population of 72 individuals for whom dietary data had been collected by each of these methods was examined. Because the calculation of cut-offs based on estimated EI/BMR is based upon formulae developed using data from published and verifiable metabolic studies, it may be viewed as a means of comparing dietary data with an external, objective reference.

Cut-offs were derived for each of the three dietary assessment methods based on the relevant sample sizes and duration of assessment in each case. When all of these cutoffs had been calculated, they were applied to their discrete groups within the pilot population and the results tabulated as illustrated in Tables 3.4, 3.5 and 3.6.

PAL Group	Individual (n=1) 95% lower Cut-off	Misreporters n (%)	Population (n=72)* 95% lower Cut-off	Misreporters n (%)	Disadvantaged (n=55)** 95% lower Cut-off	Misreporters n (%)	Advantaged (n=17)*** 95% lower Cut-off	Misreporters n (%)
1.40	0.98	2 (14.3)	1.27	5 (35.7)	1.26 (11)	3 (27.3)	1.14 (3)	0 (0)
1.48	1.03	3 (12.0)	1.38	14 (56.0)	1.37 (20)	9 (45.0)	1.26 (5)	2 (40.0)
1.56	1.09	3 (18.8)	1.42	7 (43.8)	1.40 (11)	5 (45.5)	1.33 (5)	2 (40.0)
1.64	1.15	7 (50.0)	1.49	12 (85.7)	1.46 (10)	9 (90.0)	1.37 (4)	2 (50.0)
1.40	>2.5	1 (7.1)	>2.5	1 (7.1)	>2.5	1 (9.1)	>2.5	0 (0)
1.48		1 (4.0)		1 (4.0)		1 (5.0)		0 (0)
1.56		2 (12.5)		2 (12.5)		2 (18.2)		0 (0)
1.64		0 (0)		0 (0)		0 (0)		0 (0)
Total		**19 (26.4)**		**42 (58.3)**		**30 (54.5)**		**6 (35.3)**

Table 3.4 Misreporters in the Pilot Population by the Diet History Method

PAL Group	Individual (n=1) 95% lower Cut-off	Misreporters n (%)	Population (n=72)* 95% lower Cut-off	Misreporters n (%)	Disadvantaged (n=55)** 95% lower Cut-off	Misreporters n (%)	Advantaged (n=17)*** 95% lower Cut-off	Misreporters n (%)
1.40	0.79	3 (21.4)	1.20	5 (35.7)	1.18	4 (36.4)	1.00	0 (0)
1.48	0.83	6 (24.0)	1.32	11 (44.0)	1.30	10 (50.0)	1.14	1 (20.0)
1.56	0.88	5 (31.3)	1.35	13 (81.3)	1.31	8 (72.7)	1.21	2 (40.0)
1.64	0.92	5 (35.7)	1.41	10 (71.4)	1.37	7 (70.0)	1.23	2 (50.0)
1.40	>2.5	1 (7.1)	>2.5	1 (7.1)	>2.5	1 (9.1)	>2.5	0 (0.0)
1.48		1 (4.0)		1 (4.0)		0 (0)		1 (20.0)
1.56		1 (6.3)		1 (6.3)		1 (9.1)		0 (0.0)
1.64		0 (0)		0 (0)		0 (0)		0 (0)
Total		**22 (30.6)**		**42 (58.3)**		**31 (56.4)**		**6 (35.3)**

Table 3.5 Misreporters in the Pilot Population by the 24 Hour Diet Recall Method

* Population sizes are low activity (14), low-moderate activity (25), moderate-high activity (16) and high activity (14), total classified (69).
** Population sizes are low activity (11), low-moderate activity (20), moderate-high activity (11) and high activity (10), total classified (52).
*** Population sizes are low activity (3), low-moderate activity (5), moderate-high activity (5) and high activity (4), total classified (17).

PAL	Individual (n=1) 95% lower Cut-off	Misreporters n (%)	Population (n=72)* 95% lower Cut-off	Misreporters n (%)	Disadvantaged (n=55)** 95% lower Cut-off	Misreporters n (%)	Advantaged (n=17)*** 95% lower Cut-off	Misreporters n (%)
1.40	0.98	2 (14.3)	1.27	5 (35.7)	1.26	4 (36.4)	1.14	0 (0)
1.48	1.03	6 (24.0)	1.38	9 (36.0)	1.37	7 (35.0)	1.26	2 (40.0)
1.56	1.09	2 (12.5)	1.43	7 (43.8)	1.40	5 (45.5)	1.33	2 (40.0)
1.64	1.15	9 (64.3)	1.49	11 (78.6)	1.46	8 (80.0)	1.37	2 (50.0)
1.40	>2.5	1 (7.1)	>2.5	1 (7.1)	>2.5	1 (9.1)	>2.5	0 (0)
1.48		1 (4.0)		1 (4.0)		1 (5.0)		0 (0)
1.56		2 (12.5)		2 (12.5)		2 (18.2)		0 (0)
1.64		1 (7.1)		1 (7.1)		1 (10.0)		0 (0)
Total		**24 (33.3)**		**37 (51.4)**		**29 (52.7)**		**6 (35.3)**

Table 3.6 Misreporters in the pilot population by the FFQ Method

* Population sizes are low activity (14), low-moderate activity (25), moderate-high activity (16) and high activity (14), total classified (69).
** Population sizes are low activity (11), low-moderate activity (20), moderate-high activity (11) and high activity (10), total classified (52).
*** Population sizes are low activity (3), low-moderate activity (5), moderate-high activity (5) and high activity (4), total classified (17).

Examining the data above, it is clear that the diet history method yields more valid data at the individual level, with a total of 19 respondents (26.4%) classified as misreporters, compared with 22 (30.6%) by the 24 hour diet recall method and 24 (33.3%) by the FFQ method. This is an area of prime interest, as the objective will be to classify and characterise individual respondents as misreporters based on their reported EI/BMR.

Regarding the estimation of general data quality, all methods show a high proportion of misreporters based on the application of cutoffs derived using the group population sizes within the pilot population. Here the diet history method classifies 42 (58.3%) respondents as misreporters, compared with 42 (58.3%) by the 24 hour diet recall method and 37 (51.4%) by the FFQ method.

Examining the proportion of misreporters among the “advantaged” and “disadvantaged” populations, all three methods yield very similar results. Among the disadvantaged cohort, 30 (54.5%) are classified as misreporters by the diet history method, compared with 31 (56.4%) by the 24 hour diet recall protocol and 29 (52.7%) by the FFQ method. All three methods classify 6 respondents (35.3%) as misreporters among the advantaged cohort.

It is also noteworthy that the diet history method yields a lower proportion of over-reporters than the FFQ method, although more than the 24 hour diet recall. The latter may relate to the propensity of the 24 hour diet recall method to underestimate intakes at all levels. Overall, these results suggest that the diet history method yields fewer underreporters 15 (20.8%) at the individual level than either the 24 hour diet recall 19 (26.4%) or the FFQ 19 (26.4%). This method also classifies slightly fewer subjects as overreporters than the FFQ.

At the individual level, 26.4% of respondents are classified as misreporters by the diet history method, compared with 30.6% by the 24 hour diet recall method and 33.3% by the FFQ. These initial external validity studies therefore favour the use of the diet history as the dietary assessment method of choice.

3.3.3. Comparison with Data from National Studies

The plausibility of data from each of the three dietary assessment methods was next considered in the context of findings from previous studies which have examined dietary intake among young women, as shown in Tables 3.7 and 3.8.

The NSIFCS includes dietary and nutrient intake data for 269 women aged 18-35 years of differing socio-economic status, collected by 7 day weighed records. While this data set of 18-35 year old women also contains a significant number of misreporters (25.3% at the individual level and 73.2% at the group level), it is nonetheless useful as a comparative cohort of young Irish women, against which to assess the plausibility of estimated nutrient intakes in the current study population.

Dietary Assessment Method	Mean Energy Intake (kcals/day)		Mean EI/BMR (Std. Deviation)	
	Pilot Population (n=72)	Disadvantaged Population (n=55)	Pilot Population (n=72)	Disadvantaged Population (n=55)
Diet History	2082	2132	1.52 (0.88)	1.56 (0.98)
24 Hour Diet Recall	1737	1735	1.26 (0.55)	1.25 (0.59)
FFQ	2183	2265	1.57 (0.77)	1.62 (0.84)
NSIFCS	1848 (n=269)	1897 (n=75)*	1.32 (0.38) (n=269)	1.37 (0.44) (n=75)

* Disadvantage among NSIFCS women designated as social class 5, 6 or 7 (n=75).

Table 3.7 Energy Intakes and Mean PALs from Three Dietary Assessment Methods and among Women aged 18-35 Years in the NSIFCS

It may be seen from these results, that overall energy intakes are considerably higher for the diet history method, and particularly the FFQ, than those obtained from the 24 hour diet recall protocol. The latter are more consistent with the estimated energy intakes from the NSIFCS. The EI/BMR results from both the NSIFCS and especially the 24 hour recall however, lie at or below the typical levels required for long term health, and are thus strongly suggestive of significant misreporting.

The diet history and FFQ EI/BMR levels reported for the pilot population in the current study are similar to those cited in (Black *et al.*, 1996) for women with sedentary lifestyles. Furthermore, the mean EI/BMR levels for both of these methods lie above all of the population cut-offs (even those generated from a group PAL of 1.64), further supporting the validity and integrity of the data collected by these methods.

Estimated intakes of several important nutrients were next compared between the three dietary assessment methods, and with the intakes reported for young women in the NSIFCS as shown in Table 3.8.

Food/Nutrient	**Diet History (n=72)**	**24 hour Diet Recall (n=72)**	**FFQ (n=72)**	**NSIFCS (n=269)**
Total Energy	2083	1738	2183	1848
EI/BMR	1.52	1.26	1.57	1.32
Dietary Fibre (Southgate)	10.0	8.2	8.4	17.4
NSP* (Englyst)	11.4	9.1	12.2	12.1
% Energy from Fat	33.7	34.2	33.8	36.2
% Energy from Saturated Fat	12.6	12.8	13.9	13.9
Iron (mg/day)	13.6	12.0	12.9	14.3
Calcium (mg/day)	812	669	1145	715
Folate (µg/day)	275	224	270	248
Vitamin C (mg/day)	124	98	140	99

* Non-starch polysaccharide

Table 3.8 Energy and Nutrient Intakes from Three Dietary Assessment Methods and among Women aged 18-35 Years in the NSIFCS

Among the full population of young women aged 18-35 years, the energy intakes and EI/BMR levels reported from the diet history and FFQ appear to be more biologically plausible than those from the 24 hour diet recall or the NSIFCS. Dietary fibre intakes are significantly higher in the NSIFCS cohort, than those reported for any of the three methods in the current study. However, non-starch polysaccharide (NSP) intakes are much more consistent between these groups. While mean intakes of total fat and saturated fat are slightly lower in the current study than those reported in the NSIFCS, they are similar for all three of the dietary assessment methods under examination. It is primarily in the examination of micronutrient intakes where significant differences begin to arise. While iron and folate intakes are similar between the diet history (13.6 mg/d and 275 μg/d), FFQ (12.9 mg/d and 270 μg/d), and NSIFCS (14.3 mg/d and 248 μg/d) cohorts, they are considerably lower in the 24 hour diet recall group (12.0 mg/d and 224 μg/d). Vitamin C intake is also significantly higher when assessed by the FFQ (140 mg/d) than by the other methods (98-124 mg/d). It is with calcium that the greatest differences are observed however. Here, intakes are much higher when estimated by the FFQ (1145 mg/d), than by the diet history (812 mg/d) or the 24 hour diet recall (669 mg/d), and are also considerably higher than those reported in the NSIFCS (715 mg/d) (and most other national surveys).

This suggests a systematic bias in the FFQ, which perhaps over estimates intake of dairy products or some other rich source of calcium, as well as fruit and vegetables perhaps. This suspicion that dairy produce is over-estimated by the FFQ is strengthened by the considerably higher mean intakes of riboflavin observed using the FFQ method (2.27mg/day), when compared against those from the diet history (1.82mg/day) or the 24 hour diet recall (1.55mg/day).

Similarly, mean carotene intakes from the FFQ method (4541µg/day) are higher than those from the diet history (3498µg/day) or the 24 hour diet recall (2110µg/day), supporting the likelihood of fruit and vegetable over-estimation by the FFQ. This is a common pitfall when using FFQs developed for use in the general population, or ones developed to investigate the intake of a specific nutrient, factors which may fail to take account of the specific dietary habits, customs or preferences of the population sub-group in which it is being used. This has significant implications for the overall validity of these FFQ data.

3.3.3.1. Comparisons with Disadvantaged Women aged 18-35 years

Food/Nutrient	Diet History	24 hour Recall	FFQ	NSIFCS
Total Energy (kcals)	2133	1735	2265	1897
EI/BMR	1.56	1.25	1.62	1.37
Dietary Fibre (Southgate)	9.5	7.8	8.2	17.1
NSP (Englyst)	10.8	8.0	11.9	11.7
% Energy from Fat	34.4	35.1	34.9	37.2
% Energy from Saturated Fat	12.8	13.0	14.1	14.3
Iron (mg/day)	13.6	12.0	13.0	13.8
Calcium (mg/day)	794	631	1124	676
Folate (µg/day)	268	212	272	219
Vitamin C (mg/day)	103	77	136	60

NSP = non-starch polysaccharide, EI/BMR = Energy Intake / Basal Metabolic Rate

Table 3.9 Energy and Nutrient Intakes among Low SES Women from Three Dietary Assessment Methods and among Low SES Women aged 18-35 Years from the NSIFCS

Similar patterns to those observed in the full pilot and NSIFCS populations are observed among the young disadvantaged women only as shown in Table 3.9. Here, even more so than in the wider population, the diet history method seems to occupy the middle ground between the under-estimating 24 hour diet recall and the over-estimating FFQ. Again, the profound elevations in vitamin C and especially calcium intakes when estimated by the FFQ are clearly evident. Among this group, the findings of the diet history method are generally reasonably closely aligned with the nutrient intakes reported from the NSIFCS, notwithstanding the lower socio-economic status of the former group.

3.3.4. External Validation of the Full Study Population

Following selection of the diet history protocol as the dietary assessment method of choice, based particularly on the outcome of external validation tests, the prevalence of misreporting by this method among the full population was next examined. PAL cutoffs were again calculated for each of the physical activity strata at the individual and population levels, and also for the full disadvantaged and advantaged populations. The application of these cutoffs to their relevant population groups yielded the results tabulated in Table 3.10.

At the individual level, 76 respondents (25.8% of the population) are classified as misreporters, with 53 underreporters and 23 overeporters. The overall prevalence of misreporting is therefore similar to that in the comparable cohort of the NSIFCS (25.3%), although there is a greater propensity towards overreporting in the current study. These individual (n=1) cutoffs are the criteria by which misreporters will be classified and excluded for subsequent analyses.

PAL Group	Individual (n=1) 95% lower Cut-off	Misreporters (n=76) (%)	Population (n=295)* 95% lower Cut-off	Misreporters (n=169) (%)	Disadvantaged (n=221)** 95% lower Cut-off	Misreporters (n=121) (%)	Advantaged (n=74)*** 95% lower Cut-off	Misreporters (n=42) (%)
1.40	0.98	13 (20.3)	1.34	30 (46.9)	1.33	18 (41.9)	1.29	11 (52.4)
1.48	1.03	10 (10.4)	1.43	42 (43.8)	1.42	31 (42.4)	1.37	9 (40.9)
1.56	1.09	12 (18.2)	1.49	35 (52.2)	1.49	28 (50.9)	1.40	6 (54.5)
1.64	1.15	18 (27.3)	1.57	39 (57.4)	1.56	21 (44.6)	1.51	16 (80.0)
1.40	>2.5	2 (3.1)	>2.5	2 (3.1)	>2.5	2 (4.6)	>2.5	0 (0)
1.48		8 (8.3)		8 (8.3)		8 (10.8)		0 (0)
1.56		7 (10.6)		7 (10.4)		7 (12.5)		0 (0)
1.64		6 (9.1)		6 (8.8)		6 (12.5)		0 (0)
Totals		**76 (25.8)**		**169 (57.9)**		**121 (54.8)**		**42 (56.8)**

* Population sizes are low activity (64), low-moderate activity (96), moderate-high activity (66) and high activity (66), total classified (292).
** Population sizes are low activity (43), low-moderate activity (73), moderate-high activity (55) and high activity (47), total classified (218).
*** Population sizes are low activity (21), low-moderate activity (22), moderate-high activity (11) and high activity (20), total classified (74).

Table 3.10 Misreporters in the Full Study Population by the Diet History Method

3.3.5. Characterisation of Misreporters

The next task was to characterise the respondents classified as underreporters at the individual level. Previous studies have described significant differences in the socio-economic, attitudinal, anthropometric and dietary intake profiles of misreporters (especially undereporters) when compared with valid reporters in the same populations.

3.3.5.1. Underreporters

Parameters	Variables	% Under-reporters	p value*
Socio-economic	Disadvantaged (n=195)	21.5	0.290
	Advantaged (n=74)	14.9	
	Low Education (n=102)	19.6	1.000
	High Education (n=165)	20.0	
	Deprived (≥1 indicators) (n=78)	21.8	0.642
	Not Deprived (no indicators) (n=190)	18.4	
Attitudinal	Diet is an Influence on Health (n=54)	11.1	0.110
	Diet is not an Influence on Health (n=214)	22.0	
	Chance Health Locus (n=41)	17.1	0.796
	No Chance Locus (n=222)	20.3	
	External Health locus (n=31)	22.6	0.923
	No External Locus (n=225)	20.0	
	Pre-contemplation Stage of Change (n=25)	8.0	0.197
	No Pre-contemplation Stage of Change (n=243)	21.0	
	Action/Maintenance Stage of Change (n=103)	24.3	0.193
	No Action/Maintenance Stage of Change (n=165)	17.0	
	Usually try to eat healthily (n=160)	20.6	0.755
	Don't usually try to eat healthily (n=104)	18.3	
	Feel diet is already good enough (n=96)	17.7	0.667
	Feel diet is not already good enough (n=164)	20.7	
	Usually try to limit fat in the diet (n=168)	20.2	0.536
	Don't usually try to limit fat in the diet (n=81)	16.0	
	Feel current weight is fine for age (n=132)	15.9	0.129
	Don't feel current weight is fine for age (n=119)	24.4	
	Consider fruit and vegetable intake sufficient (n=156)	18.6	0.519
	Consider fruit and vegetable intake insufficient (n=106)	22.6	
Anthropometric	BMI ≥25kg/m^2 (n=111)	23.4	0.258
	BMI <25kg/m^2 (n=158)	17.1	
	Waist Circumference ≥88cm (n=107)	24.3	0.166
	Waist Circumference <88cm (n=162)	16.7	

* Yates' Correction Coefficient reported in each case for crosstabulation of dichotomous variables

Table 3.11 Differences in Prevalence of Underreporting according to Socio-economic, Attitudinal and Anthropometric Status

Table 3.11 describes the differences in underreporting prevalence according to various socio-economic, attitudinal and anthropometric variables. For each row, *n*= the total number of underreporters and valid reporters combined in that category. The results indicate little association between the selected socio-economic factors and underreporting vs. valid reporting status. The slightly greater proportion of undereporters among the disadvantaged respondents compared with their advantaged peers fails to reach statistical significance (p=0.290).

Regarding the attitudinal differences between the two groups, while a considerably lower proportion of those who cite diet as an influence on health are classified as underreporters this again fails to reach statistical significance (p=0.110). There is no significant difference in prevalence of underreporting between the groups in terms of action or maintenance stage of dietary change, which is often used as an indicator of dieting behaviour (p=0.193). However, there is an almost threefold lower prevalence of underreporting in those reporting themselves to be in the pre-contemplation stage of change. While this trend does not reach statistical significance (p=0.197), due to the small numbers in this pre-contemplation stage, it does indicate that this group may be less influenced by social desirability in their dietary reporting. Regarding health locus of control, there is no difference in underreporting prevalence according to subjects' belief in chance or external locus of control.

Neither is there any significant difference observed for any of the other indicators of dieting behaviour (trying to eat healthily, trying to limit fat in the diet, perception that diet is already good enough). Underreporting prevalence does not appear to vary according to perception of bodyweight status.

Anthropometrically, there is no difference in underreporting prevalence according to whether respondents are classified as normal weight or overweight, nor whether they are classified with grade I abdominal obesity.

Parameters	Variables	Valid Reporters (n=216)	Under-reporters (n=53)	* p value
Socio-economic	% in Disadvantage	70.8	79.2	0.290
	% of Low Education	38.3	37.7	0.938
	% Deprived (≥1 indicators)	28.2	32.7	0.642
Attitudinal	% Who View Diet as an Influence on Health	22.3	11.3	0.110
	% Reporting a Chance Health Locus	16.1	13.5	0.796
	% Reporting an External Health locus	11.8	13.5	0.738
	% in Pre-contemplation Stage of Dietary Change	10.7	3.8	0.197
	% in Action/Maintenance Stage of Dietary Change	36.3	47.2	0.193
	% who Report usually trying to eat healthily	59.9	63.5	0.755
	% who Feel diet is already good enough	37.8	33.3	0.667
	% who Report usually trying to limit fat in the diet	66.3	72.3	0.536
	% who Feel current weight is fine for age	55.2	42.0	0.129
	% who Feel they eat enough fruit and vegetables	60.8	54.7	0.519
Anthropometric	BMI ≥25kg/m^2	39.4	49.1	0.258
	Waist Circumference ≥88cm	37.5	49.1	0.166

* Yates' Correction Coefficient reported in each case for crosstabulation of dichotomous variables

Table 3.12 Socio-economic, Attitudinal and Anthropometric Differences between Valid Reporters and Underreporters

In profiling the underreporters, no significant socio-economic gradient in underreporting status is detected, as illustrated in Table 3.12 above. However, although these differences do not reach statistical significance, a considerably greater proportion of under-reporters are overweight and have central obesity, while a lower percentage of these underreporters deem their weight to be acceptable for their age. Further analyses reveal that mean BMI (26.2kg/m^2 vs. 24.6kg/m^2) and mean waist circumference (89.5cm vs. 85.1cm) are significantly higher among the underereporters (p=0.050 and p=0.043 respectively) when compared with their valid reporting peers (data not shown).

Food Group or Nutrient	Valid Reporters (n=216)		Under-reporters (n=53)		p value
	Mean	Median	Mean	Median	
Energy (kCals)$^{\pi}$	2226 (539)	2117 (791)	1275 (286)	1291 (372)	<0.001
Fibre Southgate (g/day)*	10.8 (4.2)	10.2 (5.8)	7.7 (3.1)	8.3 (4.7)	<0.001
% Total Energy from Fat$^{\pi}$	35.0 (6.1)	35.0 (8.7)	29.8 (9.3)	30.3 (14.0)	<0.001
% Total Energy from NMES*	12.1 (7.8)	10.5 (9.2)	9.4 (7.2)	7.5 (9.0)	0.009
Fruit and Vegetables (g/day)*	279 (226)	225 (293)	246 (201)	201 (258)	0.385
Breakfast cereals (g/day)*	21 (31)	12 (27)	22 (33)	9 (30)	0.752
Potatoes (g/day)*	140 (83)	126 (121)	75 (62)	64 (91)	<0.001
Meat & Meat Products (g/day)$^{\pi}$	172 (72)	170 (92)	134 (66)	138 (99)	<0.001
Biscuits, cakes, puddings, sugar & confectionery (g/day)*	81 (72)	65 (72)	33 (36)	26 (37)	<0.001

NMES – Non-milk Extrinsic Sugars, kcals – kilocalories, g - grams.

* Non-normally distributed data. Non-parametric statistical analyses (Mann-Whitney U tests) used to assess differences.
$^{\pi}$ Normally distributed data. Parametric statistical analyses (Independent t-tests) used to assess differences.

Table 3.13 Dietary and Nutritional Differences between Valid Reporters and Underreporters

With regard to food and nutrient intake differences between the two groups, substantial differences are observed. As expected, the energy intake of the undereporters is significantly lower than that of the valid reporters (p<0.001). By examining the percentage of total energy derived from fat and sugar, indices which do not take account of the absolute intake of these macronutrients, it is possible to investigate whether there is preferential underreporting of certain foods (i.e. whether the underreported diets differ qualitatively from those of the valid reporters). Here, percentage total energy from both fat and refined sugars are significantly lower for the underreporting group (p<0.001 and p=0.009 respectively).

Examining the food group intakes which might have contributed to such a disparity, there are no significant differences observed for intake of fruit and vegetables (p=0.385), nor breakfast cereals (p=0.752) between the groups. Large differences are observed for intake of potatoes and potato products (p<0.001), meat and meat products (p<0.001), and confectionery and sweet foods (p<0.001), with underreporters describing lower mean intakes for all of these. Such trends suggest that these food groups are being preferentially underreported by the underreporting group.

Adjusting the intake of these food groups for overall energy intake, those in the undereporter category are seen to have significantly greater mean fruit and vegetable (p=0.002), breakfast cereal (p=0.025) and meat and meat product (p<0.001) intakes than valid reporters per megajoule (MJ) of dietary energy, but also report a lower mean intake of sweet foods and confectionery per MJ (p=0.036) (data not shown).

3.3.5.2. Overreporters

Parameters	Variables	% Over-reporters	p value
Socio-economic	Disadvantaged (n=176)	13.1	0.006
	Advantaged (n=63)	0.0	
	Low Education (n=98)	16.3	0.008
	High Education (n=139)	5.0	
	Deprived (≥1 indicators) (n=73)	16.4	0.033
	Not Deprived (no indicators) (n=166)	6.6	
Attitudinal	Diet is an Influence on Health (n=50)	4.0	0.240
	Diet is not an Influence on Health (n=187)	10.7	
	Chance Health Locus (n=41)	17.1	0.094
	No Chance Locus (n=191)	7.3	
	External Health locus (n=26)	7.7	1.000
	No External Locus (n=198)	9.1	
	Pre-contemplation Stage of Change (n=28)	17.9	0.222
	No Pre-contemplation Stage of Change (n=210)	8.6	
	Action/Maintenance Stage of Change (n=83)	6.0	0.246
	No Action/Maintenance Stage of Change (n=155)	11.3	
	Usually try to eat healthily (n=134)	5.2	0.021
	Don't usually try to eat healthily (n=100)	15.0	
	Feel diet is already good enough (n=84)	6.0	0.244
	Feel diet is not already good enough (n=147)	11.6	
	Usually try to limit fat in the diet (n=144)	6.9	0.225
	Don't usually try to limit fat in the diet (n=78)	12.8	
	Feel current weight is fine for age (n=121)	8.3	0.832
	Don't feel current weight is fine for age (n=100)	10.0	
	Consider fruit and vegetable intake sufficient (n=141)	9.9	0.974
	Consider fruit and vegetable intake insufficient (n=90)	9.9	
Anthropometric	BMI ≥25kg/m^2 (n=90)	5.6	0.152
	BMI <25kg/m^2 (n=149)	12.1	
	Waist Circumference ≥88cm (n=86)	5.8	0.205
	Waist Circumference <88cm (n=153)	11.8	

* Yates' Correction Coefficient reported in each case for crosstabulation of dichotomous variables

Table 3.14 Differences in Prevalence of Overreporting according to Socio-economic, Attitudinal and Anthropometric Status

The results shown in Table 3.14 indicate a strong socio-economic gradient in the propensity to overreport. For each row, *n* represents the total number of overreporters and valid reporters combined in that category, with results indicating the association between the selected socio-economic, attitudinal and anthropometric factors and overreporting vs. valid reporting status.

A significantly greater proportion of the disadvantaged cohort (p=0.006), those with a low level of education (p=0.008) and those who cite one or more indicators of deprivation (p=0.033) are classified as over-reporters.

Attitudinally, a greater percentage of those with a "chance" locus of health control fall into this overreporter category (17.1% vs. 7.3%), although this trend does not reach statistical significance (p=0.094). A considerably greater proportion of those in the pre-contemplation stage of change are also over-reporters (17.9% vs. 8.6%), although again this finding fails to reach statistical significance (p=0.222). Although these findings *suggest* that overreporters may be less likely to actively pursue a healthy lifestyle or diet, they do not reach statistical significance, probably due to the low numbers of the population classified in the chance locus and pre-contemplation categories (i.e. inadequate statistical power). A significantly lower proportion of those who state that they usually try to eat healthily (p=0.021) are classified as over-reporters however, lending more weight to the suggestion that over-reporting may predict less favourable dietary attitudes.

Of the other indicators of dieting behaviour, a lower proportion of those who state that their current diet is sufficiently healthy (6% vs. 15%), and a lower proportion who consciously limit the fat in their diet (6.9% vs. 12.8%) are over-reporters. These findings do not reach statistical significance however, again possibly due to inadequate statistical power.

Although considerably lower proportions of those who are overweight (5.6% vs. 12.1%) or who have grade I abdominal obesity (5.8% vs. 11.8%) are categorized as over-reporters, these findings do not reach statistical significance (p=0.152 and p=0.205 respectively).

However, further examination reveals pronounced anthropometric differences between the over-reporters and the valid reporters however. The group who overreport have a significantly lower BMI (22.1 kg/m^2) than the valid reporters (24.6 kg/m^2) (p=0.019) (data not shown). They also have a lower mean waist circumference than the valid reporters (80.3cm vs. 85.1cm) (data not shown), although this does not reach statistical significance (p=0.110).

Parameters	**Variables**	**Valid Reporters (n=216)**	**Over-reporters (n=23)**	**p value**
Socio-economic	Disadvantage	70.8	100.0	0.006
	Low Education	38.3	69.6	0.008
	Deprivation ≥2 indicators	28.2	52.2	0.033
Attitudinal	Diet as an Influence on Health	22.3	9.1	0.240
	Chance Health Locus	16.1	33.3	0.094
	External Health locus	11.8	10.0	1.000
	Pre-contemplation Stage of Change	10.7	21.7	0.222
	Action/Maintenance Stage of Change	36.3	21.7	0.246
	Usually try to eat healthily	59.9	31.8	0.021
	Feel diet is already good enough	37.8	22.7	0.244
	Usually try to limit fat in the diet	66.3	50.0	0.225
	Feel current weight is fine for age	55.2	50.0	0.832
	Feel eat enough fruit and vegetables	60.8	63.6	0.974
Anthropometric	BMI ≥25kg/M^2	39.4	21.7	0.152
	Waist Circumference ≥88cm	37.5	21.7	0.205

* Yates' Correction Coefficient reported in each case for crosstabulation of dichotomous variables

Table 3.15 Socio-economic, Attitudinal and Anthropometric Differences between Valid Reporters and Overreporters

Profiling the over-reporters themselves, the socio-economic gradient in over-reporting is again evident, with a much greater prevalence of disadvantage, low educational status and deprivation observed among over-reporters. Conversely, the over-reporters are much less likely to report actively pursuing a healthy diet than the valid reporters. There is an appreciably lower prevalence of overweight (22% vs. 39%) and grade I central obesity (22% vs. 38%) among the over-reporters, although these trends do not reach statistical significance (p=0.152 and p=0.205 respectively), due to the low number of overreporters.

Food Group or Nutrient	Valid Reporters (n=216)		Over-reporters (n=23)		p value
	Mean	Median	Mean	Median	
Energy (kcals) $^{\pi}$	2226 (539)	2117 (791)	4098 (1032)	3734 (999)	<0.001
Fibre Southgate (g/day)*	10.8 (4.2)	10.2 (5.8)	14.2 (5.5)	12.3 (8.7)	0.005
% Total Energy from Fat $^{\pi}$	35.0 (6.1)	35.0 (8.7)	39.5 (4.3)	39.8 (4.3)	0.001
% Total Energy from NMES*	12.1 (7.8)	10.5 (9.2)	16.1 (8.7)	13.6 (13.5)	0.021
Fruit and Vegetables (g/day)*	279 (226)	225 (293)	300 (218)	278 (338)	0.585
Breakfast cereals (g/day)*	21 (31)	12 (27)	17 (26)	9 (27)	0.667
Potatoes (g/day)*	140 (83)	126 (121)	236 (122)	234 (120)	<0.001
Meat & Meat Products (g/day) $^{\pi}$	172 (72)	170 (92)	302 (163)	290 (211)	<0.001
Biscuits, cakes, puddings, sugar & confectionery (g/day)*	81 (72)	65 (72)	222 (165)	185 (146)	<0.001

NMES – Non-milk Extrinsic Sugars, kcals – kilocalories, g - grams.

* Non-normally distributed data. Non-parametric statistical analyses (Mann-Whitney U tests) used to assess differences.
$^{\pi}$ Normally distributed data. Parametric statistical analyses (Independent t-tests) used to assess differences.

Table 3.16 Dietary and Nutritional Differences between Valid Reporters and Overreporters

With regard to food and nutrient intakes, again, significant differences are observed between the two groups. As expected, energy intakes are significantly higher in the overreporter group (p<0.001). Percentage of total energy derived from fat (p=0.001) and sugar (p=0.021) are also significantly higher in the overreporting group, suggesting that some food groups may be preferentially overestimated in this group.

These qualitative differences in dietary intake are again explored by examination of food group intake patterns between the two groups. Here, no significant differences are observed for fruit and vegetable intake (p=0.585) or breakfast cereal intake (p=0.667) between the valid reporters and overreporters.

Reported mean intakes of potatoes and potato products ($p<0.001$), meat and meat products ($p<0.001$) and especially sweet foods and confectionery ($p<0.001$) are significantly higher among the overreporter group however, possibly indicating a bias towards overestimation of these foods in this group.

This issue is further investigated by adjusting the absolute intakes of these food groups for overall energy intake. In so doing, those in the overreporter category are found to have a significantly lower mean intake of fruit and vegetables ($p=0.026$), and a significantly higher mean intake of sweet foods and confectionery ($p=0.007$) per MJ of energy consumed than the valid reporters (data not shown). This supports the theory that those who overreport may selectively over-emphasise certain foods in their diet, strongly suggesting the existence of differential over-reporting in this population.

3.4. Discussion

3.4.1. Validation Studies

Taken in their totality, the external validity studies embracing the estimation of misreporting prevalence and the plausibility of nutrient intakes generated by the three dietary assessment methods, are strongly supportive of the diet history method as the protocol of choice for the current study population. While these findings are at variance with those of the internal validity tests, and notwithstanding the limitations of the modest pilot sample size, they are a more robust measure of the integrity of the data than these internal measures.

Although the internal studies seem to favour the FFQ method, based on the higher correlation coefficient achieved upon triangulation, the diet history protocol also achieves a favourable correlation coefficient by this examination.

Even within the external validity tests which examine estimated intakes in relation to EI/BMR, outcomes must be qualified by an assessment of the data in the context of findings from other similar population groups. For example, although overall energy intake levels from the FFQ method appear plausible in relation to the estimated BMR of individual subjects, the micronutrient intakes generated by this method deviate significantly from both established norms, and from the values derived by other methods. In this case, calculated energy intakes from the FFQ may have been derived by an over-emphasis on rich calcium sources (dairy, fruit, vegetables etc.), with a coincident under-emphasis or omission of some other important energy source in the diet (e.g. take-away foods etc.). In the context of assessing low SES diets, even if the assessment instrument has been previously employed effectively in another population, the introduction of such systematic bias may render it inappropriate in this setting.

There is also support for the use of the dietary assessment method in the literature. Black *et al.*, (1991) reviewed 37 studies providing 68 distinct groups for whom dietary intake data and EI/BMR data were available. They concluded that only 25% of results fell below the acceptable cut-off level for studies conducted by diet history, compared with 64% of diet record studies and 88% of diet recall studies. For the diet history method in this meta-analysis, the average EI/BMR was 1.60, which is largely in agreement with our own 1.55 for the total population and 1.62 for the disadvantaged population.

The overall quality of data from the diet history protocol in the current study also warrants discussion. The mean EI/BMR is 1.55 for the full population, and 1.62 for the disadvantaged cohort. The PAL-specific cutoffs for each of the four physical activity groups in the current study are 1.34, 1.43, 1.49 and 1.57. The mean EI/BMRs for each of these physical activity groups are 1.41, 1.61, 1.61 and 1.56 respectively, indicating that the group mean exceeds the group-specific cutoff in all but one case. This is in contrast to the majority of studies reviewed by Black *et al.*, (1991). Sixty-eight percent of the studies examined by these researchers had a mean EI/BMR below the study-specific cutoff, meaning that overall, their dietary intake data had only a 2.5% chance of accurately reflecting habitual dietary intakes, even for sedentary populations. Indeed, only 16% of the studies (5 out of 32) examining dietary intake in females, had a mean population EI/BMR greater than the study-specific cut-off, a feature which may reflect a greater propensity of women to underreport intakes, or perhaps a greater energy expenditure of men relative to their BMR. Overall, only 23% of all of the studies had a mean EI/BMR greater than 1.54. More recently, the EPIC study which examined dietary intakes among 35, 955 men and women aged 35-74 years reported a mean EI/BMR of 1.44 and 1.36 for men and women respectively, rising to 1.50 and 1.44 after exclusion of misreporters (Ferrari *et al.*, 2002).

At the population level, 169 respondents in the current sample (57.9% of the full population) are designated misreporters, and this compares favourably with the young female population in the NSIFCS, of whom 73.2% were classified as misreporters at the population level. The diet history appears to be suitable for the assessment of both the disadvantaged population, where 54.8% of the group are classified as misreporters at the population level, and the advantaged population where 56.8% are designated misreporters.

The high proportion of the advantaged population in physical activity category 4 (80.0%) who are classified as misreporters by the diet history method, may relate to a preponderance of advantaged women who have overestimated their physical activity level beyond the biologically plausible 2.5 times BMR.

Livingstone *et al.*, (1992) have also observed good agreement between diet history (but not weighed diet records) and overall measured energy expenditure using DLW among children. Black *et al.*, (2000) however, caution that the lower prevalence of underreporting achieved in many diet history studies, may mask some failings of this method in terms of ranking individuals accurately according to biological markers. This reduced internal consistency is revealed by greater standard deviations, and is indeed a feature of the current study, with an SD of 999 kcals for the diet history method, compared with 953 kcals for the FFQ and 699 kcals for the 24 hour diet recall. Unfortunately, the absence of a biomarker in this regard precludes the comparison of ranking ability between the various methods using an external validity reference.

Overall, it is imperative that some estimation of dietary data quality be made in nutritional research of this nature. Only by adjusting for misreporting bias can a valid assessment of food and nutrient intakes among different population groups be made. Such provision is also critical to any accurate appraisal of compliance with food and nutrient guidelines among individuals and populations.

3.4.2. Characterisation of Misreporters

Many studies have attempted to characterise dietary misreporters in an attempt to describe and adjust for their influence on group food and nutrient intake estimates. The traits of such misreporters are of interest from a wider perspective also, in that they may be used to anticipate and address the issue of misreporting in subsequent studies. For example, if a population group under examination is similar in nature to one in which previous research has identified a high prevalence of misreporting, then a larger sample size may need to be recruited to yield the requisite number of valid reporters.

The prevalence of both underreporting and overreporting in the current population was assessed according to socio-economic, attitudinal, anthropometric, food and nutrient intake and physical activity parameters. All of these factors have been associated with variant tendency to misreport in the literature (Tooze *et al.,* 2004; Mattisson *et al.*, 2005), and these analyses aimed to elucidate whether similar patterns existed in this instance.

3.4.2.1. Underreporters

3.4.2.1.1. Socio-economic Variables

Underreporting did not associate significantly with any of the socio-economic variables examined. Deprivation, low education, and general disadvantage, as defined by recruitment site, showed no predictive value for underreporting status.

These findings contrast with those of Stallone *et al.*, (1997), who identified a significant preponderance of underreporting among the lower occupational classes in the Whitehall II Study, a trend only accounted for to a small extent by occupational bodyweight and height gradients. More pertinently, the significantly higher fat and saturated fat intakes associated with higher occupational class, were attenuated or abolished altogether when underreporters were excluded or energy adjustment used. The latter point demonstrates the profound effect that such respondents can have on overall outcomes in such research. While some studies have also associated underreporting with low social class (Mattisson *et al.*, 2005), others have associated this underreporting with higher occupational grades (Lafay *et al.*, 1997). Overall, however, the weight of evidence is largely supportive of a greater prevalence of underreporting among the lower social classes.

Regarding other socio-economic parameters, several studies have associated a low education level with increased propensity to underreport (Bedard *et al.*, 2004, Mattisson *et al.*, 2005), while low literacy and numeracy have also been linked to underreporting in young women of low income (Johnson *et al.*, 1998).

The relationship between education and low energy reporting appears complex however, and may be influenced by differences in social desirability constructs between the educational strata which also affect dietary reporting. For example, Hebert *et al.*, (2001) found social desirability to mediate an increase in underreporting only among women of higher educational status. Educational differences in underreporting may also be influenced by bodyweight, with higher levels of underreporting in women of low education only arising among those of ideal bodyweight (Scagliusi *et al.*, 2003).

3.4.2.1.2. Attitudinal Variables

The current study yields very few statistically significant findings in terms of the differences in attitudinal variables between underreporters and valid reporters. However, a considerably greater proportion of valid reporters (22.0%) than underreporters (11.1%) cite diet as an influence on health, possibly reflecting a greater attention to overall dietary intake among this group. There is no difference in the tendency to try to eat healthily (p=0.755), nor in the tendency to consciously limit dietary fat (p=0.536) between valid- and underreporters. While other studies have suggested an increased level of dietary restraint in underreporters, these data do not support the existence of such a trend in this population.

The literature describes associations between underreporting and social desirability score (Hebert *et al.*, 2001; Novotny *et al.*, 2003; Tooze *et al.*, 2004), and fear of negative evaluation (Tooze *et al.*, 2004), among women. Dietary restraint and weight concerns or dissatisfaction with current body image have also been positively associated with an increased likelihood of underreporting (Lafay *et al.*, 1997; Novotny *et al.*, 2003), as has current dieting behaviour (Rennie *et al.*, 2006). Hebert *et al.*, (2002) concluded that "social desirability and social approval distort energy intake……….. in a way that appears to vary by educational status". Hebert *et al.*, (1997) had earlier also demonstrated gender differences between these social desirability indices.

In simple terms, these studies imply that women, especially those of higher educational status may be more susceptible to social pressures which predispose them to underestimate food intake than their less educated or male peers.

3.4.2.1.3. Food Group and Nutrient Variables

As described earlier, the significantly lower percentages of total dietary energy from fat ($p<0.001$) and refined sugar ($p=0.009$) among underreporters are strongly suggestive of underestimation of these nutrients' principle food sources among the underreporting population. Such preferential differences in fat intake (Voss *et al.*, 1998), and fat and sugar intake (Johansson *et al.*, 1998) have been previously reported among the general adult population, while lower fat intakes have also been described with reducing EI/BMR among young women (Okubo & Sasaki, 2004).

In order to clarify this issue of underreporting, direct examination of food group intakes between valid and underreporters was carried out. Significantly lower reported intakes of foods commonly perceived to be unhealthy or fattening (meat and meat products, sweet foods and confectionery, potatoes) among underreporters did indeed suggest a degree of preferential underreporting of these foods in absolute terms, while reported intakes of "healthier foods" (fruit and vegetables, breakfast cereals) did not differ between the groups. These differences need to be framed in the context of overall energy intake to definitively reveal whether the underreporters are selectively underestimating these foods (i.e. whether there is a lower intake of these foods per MJ of energy consumed among underreporters).

The significantly higher reported intakes of breakfast cereals, fruit and vegetables per MJ of energy consumed, and the significantly lower intake of sweet foods and confectionery per MJ energy consumed demonstrate that these foods have been selectively misreported, and cast considerable doubt on the validity of dietary data from such respondents.

Many studies have reported the underestimation of “unhealthy” foods (and their associated macronutrients) according to social desirability considerations among a range of population groups (Johansson *et al.*, 1998; Cook *et al.*, 2000; Kant, 2002; Scagliusi *et al.*, 2003) and it would appear that just such a tendency has arisen in this instance. Samaras *et al.*, (1999) strongly caution against the inclusion of such dietary data in nutritional epidemiology studies, as these systematic biases may significantly distort findings.

3.4.2.1.4. Anthropometric Variables

Perhaps the most consistent association regarding dietary misreporting, is that between overweight and obesity and the tendency to underestimate food intakes. High BMI (Lafay *et al.*, 1997; Stallone *et al.*, 1997; Voss *et al.*, 1997; Kretsch *et al.*, 1999; Samaras *et al.*, 1999; Bedard *et al.*, 2004; Okubo & Sasaki, 2004), large waist circumference (Mattisson *et al.*, 2005) and increased adiposity (Johnson *et al.*, 1998; Voss *et al.*, 1998) have all been associated with an increased propensity to underreport. The current study also demonstrates significantly higher mean BMI and waist circumference measurements among low energy reporters (p=0.050 and p=0.043 respectively). This illustrates the type of systematic bias which may be introduced by failing to consider the differential dietary reporting characteristics of the study population based on observable criteria (e.g. high prevalence of overweight and obesity in a study population might indicate a greater likelihood of underreporting in that population).

3.4.2.2. Overreporters

Although the sample size is modest (n=19), the current study also demonstrates the preponderance of certain socioeconomic, attitudinal, dietary and anthropometric traits among those who overreport food intake. It is plausible that social desirability again plays an important role in this context.

While Bazelmans *et al.*, (2007) reported a greater tendency to overreport among those of higher education, data from all of the socioeconomic parameters evaluated in this study (disadvantage (p=0.006), low education (p=0.008) and deprivation (p=0.033)), indicate that overreporting is much more common among the lower socio-economic strata.

Attitudinally, a significantly lower proportion of overreporters (31.8%) than valid reporters (59.9%) report that they usually try to eat healthily (p=0.021). This finding suggests suggest that these overreporters may have generally lower level of dietary interest or dietary restraint than their valid reporting peers.

The persistence of differential food group intakes between overreporters and valid reporters (lower fruit and vegetables, higher starchy carbohydrates and sweet foods and confectionery) even after adjustment for energy intake, indicates the presence of at least some systematic bias in these dietary intake data.

Finally, the anthropometric data indicate that the overreporters have significantly lower BMI (p=0.019), and also tend towards lower mean waist circumference (80cm vs. 85cm, p=0.110) than the valid reporters. This indicates that those who are of ideal body weight or below are more likely to overrestimate their food intakes, a finding which is also supported in the literature (Mattisson *et al.*, 2005; Bazelmans *et al.*, 2007).

Overall, while it must be borne in mind that the foods which are misreported in this study are those which together contribute most energy to the diet, and, therefore, will be largely responsible for individual subjects' designation as over- or under-reporters, the preferential misreporting of these foods cannot be ignored in any subsequent analyses. For this reason, analyses comparing food group, energy, dietary fibre, macronutrient and micronutrient intakes will be confined to those designated as "valid reporters" (n=216) by the procedures described earlier, throughout the following chapters.

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Chapter 4

Socio-economic Differences in Food Group and Nutrient Intakes

4.1. Introduction

There is a substantial body of international and domestic evidence (Balanda & Wilde, 2001; Barrington, 2004) which demonstrates a preponderance of chronic degenerative disorders including obesity, cardiovascular disease, cancer, diabetes mellitus and osteoporosis among socio-economically disadvantaged groups. There is also a wealth of evidence which suggests that these socio-economic health inequalities are mediated by poorer dietary patterns, nutrient intakes and health-related behaviours among those in the lower social echelons (James *et al.*, 1997). In the Irish context, much data have been generated regarding the high prevalence of health subversive behaviours such as smoking among low SES groups (Layte & Whelan, 2004). However, to date, there is a distinct paucity of data describing the food and nutrient intakes of the very poorest groups in Irish society, including young women. While the NSIFCS findings outlined in Chapter 1 are suggestive of less favourable dietary patterns and nutrient intakes among young women of low social class and educational status, this study failed to capture women at the extreme lower end of the socio-economic spectrum. A primary objective of the current study was therefore to elucidate the food group and nutrient intakes of these most disadvantaged young women.

This chapter will initially describe the association between different food groups and nutrients and various chronic degenerative diseases. It will then describe socio-economic differences in intake of several food groups among the current study population.

The associations between food group consumption and energy, dietary fibre, macronutrient and micronutrient intake will then be explored, to determine whether variations in specific food group intakes are predictive of differences in nutrient intake among this population. If this is the case, some of these food groups may represent useful targets for food-based public health interventions among young disadvantaged women. Descriptive data comparing the different food group contributors to energy, dietary fibre, macronutrient and micronutrient intakes between the disadvantaged and advantaged cohorts will also be provided to further elaborate this theme.

The energy, dietary fibre, macronutrient, vitamin and mineral intakes of the disadvantaged and advantaged groups will next be discussed in detail. For the macronutrients, comparison in terms of percentage total energy and dietary energy will be made between the two groups, to ascertain whether those in the disadvantaged cohort demonstrate less favourable intakes. For the vitamins and minerals, the disadvantaged and advantaged cohorts will be compared in terms of both their *absolute* intakes, but also in terms of their respective *nutrient densities* for each of these micronutrients. For dietary fibre, macronutrients, vitamins and minerals, the relative proportions of the disadvantaged and advantaged populations who comply with the recommended intake guidelines will also be assessed, to ascertain the *prevalence* of nutritional disadvantage in each of these groups.

The analyses described above will yield a comprehensive overview of the nature, extent and prevalence of adverse food and nutrient intake patterns among these young urbanised women of low SES. In order to address such issues effectively however, the factors which underpin these variations in food and nutrient intake must also be examined.

Food group intakes will first be compared against a panel of socio-economic indicators to determine whether any of these proxies is particularly predictive of less favourable dietary practices, and by inference, sub-optimal nutrient intake. These analyses may also elucidate whether poorer intakes associate more with markers of material disadvantage (e.g. relative income poverty, consistent poverty etc.) or socio-cultural disadvantage (e.g. low social class, low education).

The more proximal factors which may actually lead to poorer intake patterns among disadvantaged groups will also be investigated. For example, attitudinal characteristics are often viewed as potent predictors of behaviour, including dietary practice. The association between various attitudinal traits and deleterious dietary patterns and nutrient intakes among this population will be described. It is thought that some of these attitudinal characteristics vary according to socio-economic status, and hence may be viewed as antecedents of poor dietary behaviour which intervene at an intermediate stage of the causal pathway between poverty and poor diet.

It is also known that poor dietary intakes are often associated with other health subversive behaviours like smoking, high alcohol consumption and physical inactivity. The data will be examined to ascertain whether such co-segregation occurs within the current study population. If such trends do arise, they may be indicative of a wider cultural malaise, of which poor diet and other unhealthy behaviours are merely the symptoms. For example, they might exemplify pervasive social norms which place little value on health or healthy lifestyles, or where the stimuli to engage in unhealthy behaviours are more compelling.

The coincidence of these deleterious health behaviours might also aid the identification of sub-groups within the population of disadvantaged young women, where mixed health promotion interventions including those related to diet, might be most effectively targeted. The behavioural paradigm under investigation is depicted in Figure 4.1 below.

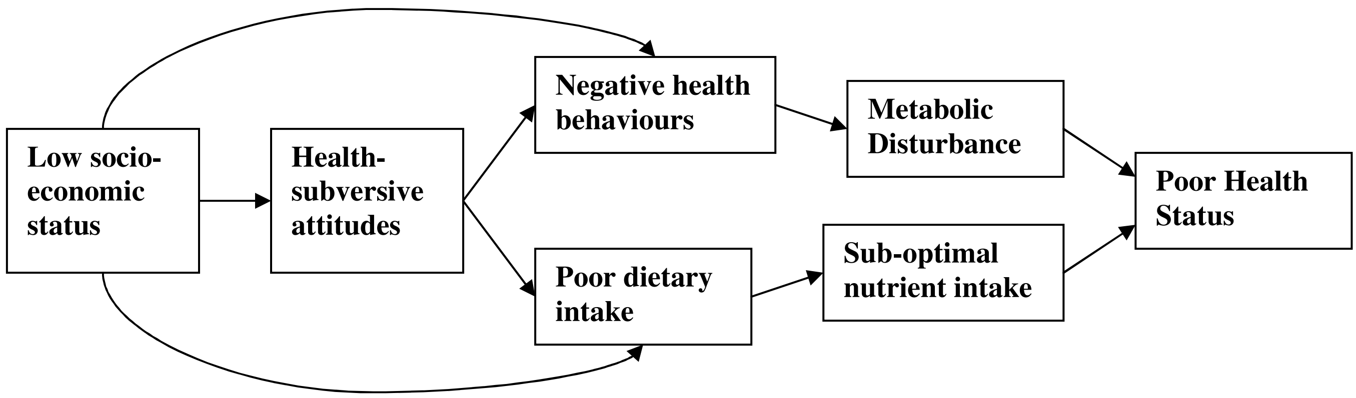

Figure 4.1 Mediators of Poor Health Status among Low SES Groups

4.1.1. Background

Traditionally, the diet perceived to be most effective for the prevention and treatment of overweight and obesity has been one low in total and saturated fat (Bray *et al.,* 2004), and low in simple sugars, refined carbohydrate and glycaemic index (Ludwig, 2003; Vermunt *et al.*, 2003; Slyper, 2004). In terms of food quality, these diets should contain adequate amounts of wholemeal and wholegrain complex carbohydrates (Liu *et al.,* 2003), with strong emphasis placed on the generous provision of fruit and vegetables (Rolls *et al.,* 2004). Meat intakes (particularly red meat intake) should be moderate to low (Wang *et al.,* 2003; Schulz *et al.,* 2002), and calcium intakes from dairy produce should be adequate (Zemel & Miller, 2004).

Alcohol should be restricted in the overall amount, and should be consumed in small quantities evenly distributed over the course of the week (Breslow & Smothers, 2005; Tolstrup *et al.,* 2005). Absolute amounts of food consumed should be carefully controlled in terms of portion size (Young & Nestle, 2002; Levitsky & Youn, 2004), particularly regarding energy dense, high fat or high refined sugar foods (Rolls, 2003).

Fortunately, the food and nutrient intake objectives outlined above for the avoidance of obesity, largely coincide with those recommended for the avoidance of cardiovascular disease and its attendant risk factors, and for the avoidance of cancer and osteoporosis. For example, high fruit and vegetable intakes have been shown to significantly reduce the risk of cardiovascular disease (Dauchet *et al.*, 2006; He *et al.*, 2007). Several explanations have been proposed for this protective effect including an increased potassium intake (Demigne *et al.,* 2004), an increased antioxidant intake (John *et al.,* 2002), increased folate intake (Hatzis *et al.*, 2006), increased phytochemical consumption (Heber, 2004), increased dietary fibre intake (Feeney, 2004) and the displacement of more energy-dense, obesogenic foods from the diet.

Epidemiological studies have suggested a similarly significant protective effect of high fruit and vegetable intake against cancer. While the proposed protective effects of fruit and vegetables apply particularly to cancers of the gut including those of the oesophagus, stomach and colon (Johnson, 2004), others have also been suggested including those of the lung, breast, bladder (Riboli & Norat, 2003) and gallbladder (Rai *et al.,* 2004). Although the mechanisms by which these foods reduce cancer risk remain to be fully elucidated (Genkinger *et al.,* 2004), some of their suggested protective components include folate (Giovannucci, 2004) and antioxidants such as ascorbic acid, Vitamin E, glutathione, various polyphenols (resveratrol, lycopene) and carotenoids, all of which are reported to have antimutagenic properties by scavenging genotoxic free radicals (Ferguson *et al.*, 2004). Selenium is also thought to contribute to this process by its co-factor role in antioxidant enzyme complexes like glutathione peroxidase. Some fruit and vegetables (e.g. onions, leeks, garlic, dark green leafy vegetables) also contain significant amounts of organo-sulphur compounds which are thought to have anti-mutagenic properties (Fukushima *et al.*, 1997). Further protection is thought to be conferred by the dilution of potential gut carcinogens through the faecal bulking effect of fruit and vegetables (Bingham *et al.*, 2003), the generation of protective phytochemicals including phytic acids, phenolic acids, lignins and flavonoids (Ferguson & Harris, 1999), the adsorption of heterocyclic amines in the colon (Harris *et al.*, 1996) and the prebiotic promotion of an enhanced colonic flora and increased biomass (Brady *et al.*, 2000).

Fruit and vegetables are also rich in many nutrients which are thought to be protective against osteoporosis including calcium (Nieves, 2005), potassium (Tucker *et al.*, 2001; Harrington & Cashman, 2003), magnesium (Tucker *et al.*, 1999), vitamin C (Leveille *et al.*, 1997; Hall & Greendale, 1998) and vitamin K (Booth *et al.*, 2003; Collins *et al.*, 2006).

Reduction in red meat and processed meat intake has also been proposed as an important intervention to reduce the risk of chronic disease. Serum LDL levels have been positively associated with the intake of saturated fat and cholesterol (Schaefer, 2002), particularly from red meats, while reducing the intake of these dietary fats has been associated with a significant reduction in serum LDL levels (Schaefer & Brousseau, 1998) and a consequent decline in cardiovascular risk (Kannel *et al.*, 1979).

High total red meat intakes have also been increasingly associated with increased risk of colo-rectal cancer (Riboli & Norat, 2001; Sandhu *et al.*, 2001; Chao *et al.*, 2005; Lunn *et al.*, 2007), and may also increase the risk of stomach cancer (Larsson *et al.*, 2006). Some evidence also implicates high red meat consumption in renal, prostate, breast and pancreatic cancers. While the saturated fat in red meat has been suggested as a principle effector of the increased risk of colorectal (Rao *et al.*, 2001; Levi *et al.*, 2002), breast (Boyd *et al.*, 2003; Cho *et al.*, 2003) and prostate (Giovannucci *et al.*, 1993) cancer, it is likely that the increased risk of colorectal cancer (and possibly others), is partially attributable to other issues associated with high meat consumption, such as the generation of heterocyclic amines (HCAs) in cooking (Sinha, 2002).

While red meat does provide a rich source of iron and several other important nutrients for young disadvantaged women, displacement of excessive red meat by fish intake is also associated with several health benefits for both these women and the wider population. While some of the benefits relate to fish's displacement effect on processed and red meat products, others relate to components of the fish itself, most notably the omega-3 fatty acid content of oily fish. High intakes of omega-3 fatty acids have been associated with several cardiovascular benefits including a dose-dependent reduction in serum triglyceride levels (Roche & Gibney, 2000; Djousse *et al.*, 2003; Pejic & Lee, 2006), an anti-hypertensive vasodilatory effect (Geleijnse *et al.*, 2002), an anti-platelet, anti-thrombotic effect (Simopoulos, 1991), an anti-arrhythmic effect (Breslow, 2006) and an anti-inflammatory effect (Calder, 2006).

Its anti-inflammatory properties may also mediate a proposed protective effect against certain cancers. It has been suggested that these omega-3 fatty acids may reduce the risk of breast (Bagga *et al.*, 2002; Goodstine *et al.*, 2003), colorectal (Roynette *et al.*,

2004) and prostate cancer (Augustsson *et al.*, 2003; Leitzmann *et al.*, 2004), although convincing epidemiological evidence to support this is currently only beginning to emerge. Likewise, the mechanisms by which such an effect might be mediated remain to be fully elucidated.

Consumption of adequate dairy produce has also been associated with reduced risk of chronic disease. The original DASH study which established the efficacy of dietary intervention in the control of blood pressure, cited a two-fold increase in the anti-hypertensive effects of this diet with the addition of ~3 servings of low fat dairy produce per day, which it attributed to the calcium content of these foods (Appel *et al.*, 1997). A further meta-analysis citing 23 observational studies and 42 randomised controlled trials found significant reduction in hypertension risk and blood pressure levels in populations consuming adequate calcium (McCarron & Reusser, 1999).

Adequate dairy and calcium intakes have also been associated with reduced cancer risk. Pooled data from 10 cohort studies have revealed a lower risk of colorectal cancer with high calcium and milk intake (Cho *et al.*, 2004). While much of the evidence in this area relates to colo-rectal cancer, others have identified a slight inverse association between calcium intake over a ten year period and prostatic cancer risk (Baron *et al.*, 2005), while a protective role for low fat dairy products, calcium and vitamin D against breast cancer in pre-menopausal women has also been suggested (Shin *et al.*, 2002).

Perhaps the most widely accepted role for dairy foods in long term health however, is their proposed protective effect against osteoporosis, an effect which is likely to relate primarily to the dual activities of their calcium and vitamin D content, both of which are known to increase bone mineral density at supplemental doses (Chapuy *et al.*, 2002).

High intake of refined non-milk extrinsic sugars (NMES) contained in sweet foods and drinks, has been implicated in weight gain, but also in other negative health sequelae. From the cardiovascular perspective, high sugar intakes are thought to elevate serum triglyceride levels (Parks & Hellerstein, 2000) and deplete serum HDL levels (Ford & Liu, 2001), both established risk factors for cardiovascular disease. Excessive sucrose intakes have also been associated with increases in certain inflammatory markers in obese subjects (Sorensen *et al.*, 2005), which may further compromise cardiovascular health. Additionally, large prospective trials have demonstrated an association between a high glycaemic index and high glycaemic load of the overall diet, and increased risk of developing type II diabetes mellitus (Willett *et al.*, 2002).

While the literature linking refined sugar intake with cancer is less extensive, high intakes have also been proposed to increase the risk of colorectal cancer (Higginbotham *et al.*, 2004; Michaud *et al.*, 2005). Other cancers where high dietary sugar/increased glycaemic load intake has been implicated include those of the pancreas (Michaud *et al.*, 2002), lung (De Stefani *et al.*, 1998) and breast (Favero *et al.*, 1998), although the overall evidence for these associations is weak.

Diets which are high in foods of low energy density including wholegrain cereals have been suggested to protect against the development of obesity (Ello-Martin *et al.*, 2005), as have those high in breakfast cereals (Bazzano *et al.*, 2005; Song *et al.*, 2005). Wholegrain cereals are naturally high in many B group vitamins, particularly folate which has been suggested to reduce cardiovascular risk though its lowering effect on homocysteine (Wald *et al.*, 2002), and also to moderate the risk of some cancers including those of the colon (Giovannucci, 2004), breast (Zhang, 2004) and oro-pharynx (Pelucchi *et al.*, 2003).

Like fruit and vegetables, these cereals are also rich in dietary fibre which has been inconsistently associated with a reduced risk of cardiovascular disease (Flight & Clifton, 2006), and consistently linked with a reduced risk of cancer, particularly gut cancers (Bingham, 2006). High fibre cereals have also been associated with a reduced risk of sex-steroid dependent cancers including those of the breast (Cade *et al.*, 2007) and prostate (Dalais *et al.*, 2004), where the protective mechanism may relate to phyto-oestrogen activity at the cellular level.

Because many ready to eat breakfast cereals (RTEBCs) are fortified with additional micronutrients, their regular consumption has been particularly associated with improved intake of many vitamins and minerals including thiamin, riboflavin, calcium, magnesium and iron (Williams, 2005). It has also been reported that these RTEBCs contribute significantly to intakes of carbohydrate (8.1%), starch (10.8%), dietary fibre (9.8%), non-starch polysaccharide (NSP) (10.8%), iron (18%), total folate (18%), riboflavin (17%), niacin (15%), thiamin (14%), vitamin B6 (13%), and vitamin D (10%) in the diet of Irish adults (Galvin *et al.*, 2003). This study revealed that increased intake of RTEBCs was not only associated with an improved overall micronutrient density in the diet, but was also associated with a significantly lower prevalence of dietary inadequacy of calcium, iron, riboflavin and folate, particularly among women. Additionally, these higher intakes of RTEBCs were associated with greater achievement of dietary recommendations for fat, carbohydrate and NSP.

A subsequent US study similarly found RTEBC consumption to be associated with higher intakes of dietary fibre, calcium, iron, total folate, vitamin C and zinc among their teenage female population, and with a decreased intake of fat and cholesterol

(Barton *et al.*, 2005). Furthermore, frequency of RTEBC consumption (days per week), was predictive of lower BMI among this young female population.

Apart from BMI, improvements in other functional indices with RTEBC consumption have been reported elsewhere. These include lower blood glucose, better performance on shuttle-run fitness tests (Kafatos *et al.*, 2005), improved vitamin and mineral (e.g. iron) status and lower serum cholesterol levels (Preziosi *et al.*, 1999). The consumption of these RTEBCs with milk further enhances their contribution to overall nutritional intake. Although morbidity and mortality data in relation to RTEBC consumption are currently lacking, it is reasonable to assume that the improved micronutrient intakes and status which are associated with regular consumption of these foods will yield meaningful long-term health benefits, particularly among those whose nutrient requirements are not being achieved from other sources.

Other elements of the diet which may mediate health effects include the consumption of processed foods, which apart from their frequently high sugar and high fat content, also contain other components thought to compromise health. For example, many of these foods are high in sodium which exerts a deleterious effect on blood pressure (He & MacGregor, 2004), increases urinary calcium loss (Teucher & Fairweather-Tait, 2003) and reduces bone mineral density (Mizushima *et al.*, 1999). High salt intake has also been associated with increased risk of certain cancers, most notably gastric cancer (Tsugane, 2005). These processed foods are often also high in *trans-* fats which are known to increase LDL-cholesterol and reduce HDL cholesterol (Willett *et al.*, 1993; de Roos *et al.*, 2001), and which may also mediate an inflammatory response (Han *et al.*, 2002).

Based on the preceding factors, the fundamental principles of the healthy diet may thus be summarised as follows:

- Maximise fruit and vegetable consumption to at least 5 servings per day.
- Include high fibre fortified breakfast cereals and wholegrain cereals in generous amounts according to overall energy requirement.
- Limit the intake of red meat, and especially processed red meats, to 2-3 moderately-sized portions per week at the main meal, in favour of poultry or fish.
- Encourage at least 2-3 fish servings (~140g each) per week, particularly oily varieties like salmon, trout, herring, mackerel, tuna and sardines. Ideally, this increased fish intake should replace excess red meat, and especially processed meat products, in the diet.
- Ensure adequate intake of calcium-rich low fat dairy products, ideally ~3 servings per day.
- Minimise refined non-milk extrinsic sugars, by strictly limiting the intake of sugar and sugar-sweetened foods and drinks.
- Minimise the intake of processed foods such as biscuits, crisps, savoury snack foods and fast foods, which often contain high amounts of salt and *trans-* fats, and which can also displace more nutrient dense foods from the diet.

Now that the dietary and nutrient intake patterns which are conducive to long term health have been identified, this chapter will aim to describe how closely the diets of the socially disadvantaged and advantaged women in the current study population come to meeting these objectives.

4.2. Methods

4.2.1. Sample Selection

295 women aged 18-35 years were recruited at 20 different sites across north, south, west and inner city Dublin between June 2006 and April 2007. This population group were selected not just because of their high risk of poverty and nutrient inadequacy, but also for the other reasons outlined in Chapter 2. The dearth of recent research describing the dietary and nutrient intakes of disadvantaged young women in Ireland, further increases the imperative to generate data in this regard.

Sites for the recruitment of disadvantaged subjects were selected from a sampling frame which ranked each of the 335 electoral districts (EDs) in Dublin based on a composite index of disadvantage. This sampling frame was formulated from census data regarding social class, socio-economic group, educational, employment, household structure and accommodation data from each of the EDs and is fully described in Chapter 2. The recruitment sites from which respondents were derived are detailed in Appendix VI. Overall, 221 "disadvantaged" subjects were derived from community groups, training schemes, crèches, health centres and other public agencies within the lowest ranked quintile of EDs. A reference population of 74 "advantaged" or "non-poor" women aged 18-35 years was recruited from various sites including commercial companies, colleges and social clubs. These subjects derived from areas within the highest 80% of EDs identified by the sampling frame. The advantaged cohort were recruited to represent the wider population of "non-poor" women in Dublin, with *post-hoc* analysis confirming that their socio-economic profile differed fundamentally from that of the disadvantaged group.

4.2.2. Data Collection Instruments

Four separate questionnaires were administered to all respondents in a group setting. The first of these was divided into six distinct sections which explored demographic characteristics, local environment, attitudes and beliefs (general, health and dietary attitudes), health behaviours (alcohol, smoking, dietary supplement use, breast feeding, physical activity), socio-economic factors (occupational social class, socio-economic group (SEG), education, income, deprivation, consistent poverty, welfare and medical card entitlement and household structure) and health status (anthropometry, primiparous age, parity). This "Lifestyle Questionnaire" is shown in Appendix I.

The second questionnaire gathered information regarding the habitual diet, in the form of a weekly diet history, where respondents were asked to provide details regarding the type, amount and frequency of all foods and drinks typically consumed. The third questionnaire was a 24 hour dietary recall, which asked subjects to describe their exact intake for the previous day in as much detail as possible, including portion sizes and types and brands of foods and drinks taken. The fourth questionnaire was an FFQ adapted from that used by the LipGene project, which presented a list of commonly consumed foods. In each case, respondents were asked to indicate the frequency with which they would consume that food, the portion size typically taken and the type or brand of food consumed. Where respondents had difficulty estimating food portion sizes, 3 field workers (1 dietician, 2 undergraduate nutrition and dietetics students) offered assistance in expressing these amounts in terms of typical household measures. The seven day diet history, FFQ and 24 hour diet recall are shown in Appendix II-IV respectively.

Subjects' weight, height and waist circumference measurements were also taken by one of the three fieldworkers during the interview session. Weight was measured to the nearest 0.2kg using a Seca Compact Digital Floor Scale IIII, model 888. Height was measured to the nearest 0.5cm using a collapsible "Leicester Height Measure" stadiometer (CMS Weighing Equipment, Camden, London NW1 OJH, UK). Waist circumference was measured around the umbilicus at the midpoint between the lowest rib margin and the supra-iliac crest on the left mid-axillary line. Measurements were taken to the nearest 0.5cm with a Seca Circumference Measuring Tape, model 200 held snugly against the skin according to the protocol described by McCarthy *et al.*, (2001).

The data collection sessions described above lasted 45-70 minutes depending on the literacy and comprehension of the respondents, as well as the size of the group, which ranged from 3 to 18 individuals.

4.2.3. Data Entry and Data Management

The socio-demographic and attitudinal data from questionnaire one was entered into a Microsoft Excel® database. Dietary data from each of the three dietary assessment methods was entered into 3 separate Excel® spreadsheets for each of 72 respondents (55 disadvantaged, 17 advantaged) selected at random from the first 150 respondents.

These data were then entered into a nutrient analysis software package (WISP V3.0, © Tinuviel Software Ltd., 2005), the output of which was uploaded to an Excel® spreadsheet. This dataset was then merged with the dataset from questionnaire one to create a relational database including socio-demographic, socio-economic, attitudinal, health and food and nutrient intake data for each of the 72 respondents.

The database was exported to a statistical software package (SPSS v. 14.0, © SPSS Inc. 2006), and the "validity" of the dietary data from each of the three dietary assessment methods was then compared. A full description of the validation and comparability studies between the three dietary assessment methods is provided in Chapter 3.

Upon selection of the diet history protocol as the dietary assessment method of choice, diet history data from each of the remaining 223 respondents was entered into 223 separate Excel® spreadsheets, the final data from which was exported to the nutrient analysis package (WISP v 3.0, Tinuviel Software Ltd., 2005). The food group and nutrient intake data generated by the nutrient analysis package from these dietary data was then appended to the existing relational database to create a final dataset containing socio-demographic, socio-economic, attitudinal, health and food and nutrient intake data for all of the 295 respondents, of whom 216 (153 disadvantaged, 63 advantaged) were deemed to be valid reporters according to the procedures laid out in Chapter 3.

This dataset was subsequently manipulated to derive several variables (e.g. consistent poverty) which would facilitate the socio-economic, attitudinal and behavioral interrogation of the database, as described in Chapter 2.

The derivation of the eleven variables used to characterise socio-economic disadvantage is fully described in Chapter 2 and Table 2.2. While some of these parameters are specifically indicative of material disadvantage (e.g. relative income poverty, deprivation, consistent poverty), others relate more to the social aspects of disadvantage (e.g. low education, low social class, single adult family structure).

The variables describing respondents' general, health and dietary attitudes, as well as their perceptions of their local environment, local facilities, and their own physical and psychological health were also manipulated. Where dichotomous categorical variables to describe these parameters did not already exist in the raw data, they were created by aggregating existing categories within these variables. For example, many attitudinal data were originally described on a Likert scale ranging from strongly agree, tend to agree, tend to disagree and strongly disagree. Here, the "strongly agree" and "tend to agree" categories were collapsed into one "agree" category, while the "strongly disagree" and "tend to disagree" categories were similarly combined. Those selecting the "Don't know" option in each case were excluded from subsequent related analyses.

This procedure was also used to assess health locus of control according to three definitions (health mainly controlled by chance, by external forces outside the control of self, or by self). For future salience (Wardle & Steptoe, 2003), respondents were asked to select how often they considered their life in ten years time from a list of four options, which were subsequently dichotomised into "rarely" or "often". Stage of dietary change was selected from one of six possibilities (pre-contemplation, contemplation, decision, action, maintenance or relapse) (Prochaska & DiClemente, 1983). The action and maintenance stages were subsequently combined to define "active" stages of change, with the pre-contemplation, contemplation and decision stages aggregated to define "passive" stages.

With regard to manipulation of the dietary data, the food data entered into the nutrient analysis software package (WISP v 3.0, Tinuviel Software Ltd., 2005) were automatically categorised into one of 17 different food groups as shown in Table 4.1.

WISP Food Group	Food Group Description	Royal Society of Chemistry/Food Standards Agency Food Group Code
1	Breads	AF, AG
2	Breakfast cereals	AI
3	Rice, pasta and other cereals	All A codes except AF, AG, AI, AM, AN, AO, AP, AS & SN except SNA
4	Meats and meat products	All M codes
5	Fish	All J codes
6	Milk and cream	WCD, all B codes except BL, BT, BP, BR
7	Cheese	BL
8	Eggs	All C codes
9	Potatoes	DA, SNA
10	Other vegetables	All D codes except DA
11	Fruit and fruit juices	PE, all F codes
12	Biscuits, cakes and puddings	BP, BR
13	Fats and oils	All O codes
14	Sugar and confectionery	All S codes except SN, SNA
15	Alcoholic drinks	All Q codes
16	Other drinks	All P codes except PE
17	Other foods	All G codes, H codes & I codes, all W codes except WCD, X

Table 4.1 WISP Food Group Codes from Royal Society of Chemistry (RSC)/Food Standards Agency (FSA) Food Categories

These 17 food groups are themselves derived from the aggregation of hierarchical food groups defined by the Royal Society of Chemistry (RSC) and the Food Standards Agency (FSA) as those used in the Composition of Foods (Sixth Edition) and its supplements (FSA, 2002). These RSC/FSA food group codes are described in Table 4.1 above and in Table 4.2 on page 193.

Food Group	RSC/FSA Food Groups	"WISP" Food Groups	Description
Fruit & Fruit Juices	FA, FC, PE	11	Bananas, citrus fruits, fruit juices, other fruits, tinned fruit.
Vegetables	DB, DF, DG, DI, DR	10	Vegetable and pulse dishes, peas, beans, lentils, green vegetables, carrots, salad vegetables, other vegetables, tinned and jarred vegetables.
Combined Fruit and Vegetables	DB, DF, DG, DI, DR, FA, FC, PE	10 and 11	Bananas, citrus fruits, fruit juices, other fruits, tinned fruit, vegetable and pulse dishes, peas, beans, lentils, green vegetables, carrots, salad vegetables, other vegetables, tinned and jarred vegetables.
Breakfast Cereals	AI	2	Ready to eat breakfast cereals (RTEBCs), other cereals.
Sweet Foods & Confectionery	AM, AN, AO, AP, AS, BP, BR, SC, SE	12 and 14	Biscuits, cakes, buns, pastries, ice cream, puddings, milk puddings, chocolate confectionery, non-chocolate confectionery, sugar and preserves.
Meat and Meat Products	MA, MC, ME, MG, MI, MR	4	Bacon, ham, beef, veal, beef and veal dishes, burgers, beef, pork, chicken, turkey, game, lamb, lamb, pork, and bacon dishes, meat pies, other meat products, offal dishes, other pork dishes, poultry and game dishes, sausages.
Fish and Fish Products	JA, JC, JK, JM, JR	5	Fresh fish, fish dishes, other fish products.
Dairy Products	BA, BC, BF, BH, BJ, BL, BN, BV, WCD	6 and 7	Whole milk, low fat milk, skimmed milk, fortified milk, cream, yoghurt, other milks, cheese, dairy sauces.
Starchy Carbohydrates	AA, AC, AD, AF, AG, AK, AT, SNB, SNC	1 and 3	White bread and rolls, wholemeal bread, other breads, savouries (pizza etc.), cereal based savoury snacks, non-potato based savoury snacks, rice, pasta and other cereals
Potatoes	DA, SNA	9	Boiled, mashed and baked potatoes, processed and home made potato products, chipped, fried and roasted potatoes, potato based savoury snacks.

Table 4.2 Composition of Food Groups for Analysis

For simplicity, several of the WISP food categories shown previously were aggregated to produce 10 novel food categories of specific interest to the current study. For example, the milk and cream group and the cheese group were amalgamated to create a dairy foods group. The composition of the 10 novel food categories derived for further analyses is illustrated in Table 4.2 above.

In order to describe the effect of high and low relative intakes of these food groups on nutrient intakes, the food group intakes were dichotomised around the median. This yielded roughly equal sample sizes in each group to enhance the power of subsequent statistical comparisons, with those above this median classified as relatively "high consumers", and those below this median classified as relatively "low consumers".

The assessment of dietary fibre, macronutrient, vitamin and mineral compliance required the creation of categorical variables which were dichotomised around the nutrient intake guideline. For example, those whose individual vitamin and mineral intakes were above the estimated average requirement (EAR) for that nutrient were termed "compliers", with those falling below this threshold designated "non-compliers".

With regard to nutrient intake data, energy and macronutrient intakes were assessed with the contribution of alcohol both included and excluded. Similarly, vitamin and mineral intakes were assessed with the estimated contribution from dietary supplements both included and excluded according to the procedures outlined in Chapter 5. Apart from the comparative assessment of *absolute nutrient intakes* between the disadvantaged and advantaged populations, vitamin and mineral intakes per MJ of energy consumed were also derived, to facilitate comparison of the *nutrient densities* of these groups' dietary intakes.

As well as assessing compliance with nutrient intake guidelines at the individual level, thresholds for *population* compliance with dietary fibre and macronutrient guidelines were also calculated (Wearne & Day, 1999). This technique involves the *post-hoc* identification of the population group whose mean nutrient intake falls as close as possible to the guideline threshold without crossing this threshold.

For instance, the proportion of the population who are compliant with the population guideline of <33% total energy from fat would be determined by the sequential addition of members of that population from the lowest fat consumer upwards. The intake of the last person to be added before mean fat intake for the group exceeds the 33% guideline will define the threshold for fat intake compliance *at the population level*. The percentage of the population who lie below this fat intake threshold will represent the proportion of that population who are "compliers" *at the population level*. The same procedure is followed to ascertain compliance with dietary fibre guidelines at the population level, except that in this instance, cases are added from the highest intake in the distribution until the group mean falls below the 25g/d population intake guideline.

4.2.4. Statistical Analyses

The initial descriptive analyses to confirm that the "disadvantaged" and "advantaged" populations were of the anticipated socio-economic profile are illustrated in Table 2.2. The distribution of each food group intake was next assessed for normality by reference to the kurtosis and skewness of the distribution, Kolmogorov-Smirnoff statistics and a visual inspection of the distribution histogram. Differences in the intake of these food groups between the "disadvantaged" and "advantaged" populations based on their site of recruitment were then analysed, using independent t-tests for those food groups whose intakes were normally distributed (meat and meat products, starchy carbohydrates), and non-parametric Mann-Whitney U tests for those whose intakes were non-normally distributed (the remaining eight food groups). These analyses were performed only for the respondents who had been classified as valid reporters (n=216) according to the methods described at the end of Chapter 3.

The food group intakes were then dichotomised into high and low intake categories around the median as described earlier. Intakes of energy, dietary fibre, and selected macronutrients, vitamins and minerals were next compared between high and low consumers of each food group, to ascertain whether these variant food intake patterns predicted significant nutrient intake differences in this population. Again, independent t-tests were employed to compare differences in the intake of normally distributed nutrients between high and low food group consumers, while non-parametric Mann-Whitney U tests were used to compare intakes of non-normally distributed nutrients. As a prelude to subsequent nutrient intake analyses between the disadvantaged and advantaged cohorts, differences in the food groups contributing to energy, dietary fibre, macronutrient and micronutrient intakes in these populations were also described (see Appendices XII-XIV).

Following the food group analyses described above, intake distributions for energy, dietary fibre, macronutrient, vitamin and mineral intakes were assessed for normality of data distribution. Differences in the intake of these nutrients between the disadvantaged and advantaged groups were then examined. For the comparison of continuous variables such as absolute nutrient intakes and nutrient densities, independent t-tests were employed for normally distributed data, while non-parametric Mann-Whitney U tests were used for non-normally distributed data. For comparison of categorical variables such as compliance with macronutrient, vitamin or mineral guidelines between the disadvantaged and advantaged groups, crosstabulation with Chisquare analyses were performed, with Yates' Continuity Correction being reported for the 2 x 2 analyses between dichotomous variables.

In the case of the macronutrients, percentage food energy guidelines (Department of Health (UK) 1991; WHO/FAO, 2003) were employed to define compliance thresholds, while for vitamins and minerals, compliance was designated by achievement of the EAR (Food Safety of Ireland, 1999) as described previously. Micronutrient analyses were performed with dietary supplements included and excluded, to assess the adequacy of both total and dietary intakes of these nutrients according to disadvantage.

To investigate the specific dimensions of disadvantage which correlate with adverse food group and nutrient intakes, each of the 11 socio-economic indicators described previously was dichotomised into high and low status. Food group intakes were then compared between these high and low status cohorts using independent t-tests for normally distributed data, and non-parametric Mann-Whitney U tests for those which were non-normally distributed. The objective of these analyses was to establish which (if any) of these material and social indicators of disadvantage, were predictive of the less favorable food consumption patterns thought to predict less favourable energy, dietary fibre, macronutrient and micronutrient intakes.

Food group intakes were then compared according to respondent responses to various attitudinal questions to ascertain whether any of these attitudinal traits were associated with less favourable food intake patterns. Finally, food group intakes were compared according to other health behaviours including smoking, high alcohol consumption and physical inactivity, to provisionally assess whether these negative health behaviours co-segregated with less favourable food intake patterns. In instances where data were incomplete (e.g. only 214 of the 216 “valid” dietary reporters are classified for educational status), these missing subjects were excluded with the final numbers included in the statistical analyses detailed in column 2 of the relevant table.

4.3. Results

The remainder of this section details the results of all analyses performed to describe the differences in food group, energy, dietary fibre, macronutrient and micronutrient intakes across the socio-economic spectrum. Differences in food group consumption between the disadvantaged and advantaged groups are first described, followed by food group versus nutrient intake analyses to describe the likely impact of these dietary differences on the nutritional intake of the disadvantaged population.

The energy, dietary fibre, macronutrient, vitamin and mineral intakes of the disadvantaged and advantaged populations are then compared in terms of their absolute intake levels, their compliance with recommended intake guidelines and in the case of the vitamins and minerals, the micronutrient density of the diet. Finally, food group intakes are compared across a panel of socio-economic, attitudinal and health behavioural parameters, to assess which of these characteristics are predictive of deleterious dietary patterns. The overall purpose is to illuminate differences in food intake patterns according to socio-economic, attitudinal and behavioural characteristics, and to describe the impact of these variant food intake patterns on nutrient intakes among young women of low SES.

4.3.1. Food Groups

Food Group	Median Intake (g/day (IQR))		p value
	†Disadvantaged (n=153)	Advantaged (n=63)	
Fruit & Fruit Juices	74 (196)	200 (219)	<0.001
Vegetables	72 (74.5)	194 (116)	<0.001
Combined Fruit and Vegetables	172 (225.5)	405 (340)	<0.001
Breakfast Cereals	4 (17.5)	29 (44)	<0.001
Sweet Foods & Confectionery	67 (91.5)	64 (52)	0.498
Fish and Fish Products	0 (21)	26 (36)	<0.001
Dairy Products	166 (164.5)	228 (150)	0.001
Potatoes & Potato Products	165 (111.5)	77 (71)	<0.001
Meat & Meat Products*	184 (72)	143 (63)	<0.001
Starchy Carbohydrates*	180 (82)	170.0 (58)	0.368

†"Disadvantaged" defined as respondents recruited from the most disadvantaged quintile of electoral districts in the sampling frame described in Chapter 2. "Advantaged" defined as respondents recruited from the top 4 quintiles in this sampling frame.

* Mean (SD) rather than median (IQR) reported for Meat and Meat Products and Starchy Carbohydrates whose population intakes are normally distributed.

Table 4.3 Differences in Consumption of Food Groups according to Socio-economic Status among Valid Reporters (n=216)

Table 4.3 clearly illustrates profound differences in several of the basic food groups examined according to socio-economic status. The disadvantaged cohort have a significantly lower intake of nutrient dense food groups including fruit ($p<0.001$), vegetables ($p<0.001$), breakfast cereals ($p<0.001$), dairy foods ($p=0.001$) and fish ($p<0.001$), while their intake of meat and meat products ($p<0.001$) and potatoes and potato products ($p<0.001$) significantly exceeds that of their more advantaged peers. Intakes of sweet foods and confectionery (buns, cakes, pastries, biscuits, sugar, and confectionery) and starchy foods do not differ between the two groups, while a significant proportion of both cohorts (particularly the disadvantaged respondents) have fruit and vegetable intakes which fall far short of the recommended 400g/day.

Food Groups	Disadvantaged (n=153)	Advantaged (n=63)	p value
	% Consumers (*n*)	% Consumers (*n*)	
Fruit & Fruit Juices	68.6 (105)	93.7 (59)	<0.001
Vegetables	94.8 (145)	98.4 (62)	0.399
Fruit & Vegetables	96.7 (148)	100.0 (63)	0.340
Breakfast Cereals	58.2 (89)	85.7 (54)	<0.001
Sweet Foods & Confectionery	94.8 (145)	100.0 (63)	0.146
Meat and Meat Products	99.3 (152)	98.4 (62)	1.000
Fish and Fish Products	47.1 (72)	76.2 (48)	<0.001
Dairy	98.7 (151)	100.0 (63)	0.896
Starchy Carbohydrates	100.0 (153)	100.0 (63)	1.000
Potatoes & Potato Products	99.3 (152)	96.8 (61)	0.424

Yates' Continuity Correction quoted in all instances for 2 by 2 dichotomous tables.

Table 4.4 Differences in Percentage of Valid Reporters (n=216) Consuming Food Groups according to Socio-economic Status

Table 4.4 above begins to elucidate the nature of these socio-economic differences in food group intake. For several of the food groups for which significantly lower intakes have been described among the disadvantaged population, the *prevalence of consumption* is significantly lower among the disadvantaged cohort. For example, fruit and fruit juices are consumed by only 69% of the disadvantaged population versus 94% of the advantaged group ($p<0.001$). Similarly, a significantly lower proportion of the disadvantaged population consume breakfast cereals ($p<0.001$) and fish ($p<0.001$), in comparison to their more affluent peer group.

These differences highlight the impact which low prevalence of consumption can exert on overall population intakes of certain food groups. However, subsequent analyses reveal that even among consumers only, median intakes of fruit and fruit juices ($p=0.006$), breakfast cereals ($p<0.001$) and fish ($p<0.001$) remain significantly lower among the disadvantaged group (data not shown).

This persisting disparity is likely to relate to less frequent consumption of these food groups by the disadvantaged respondents, rather than any appreciable difference in typical portion sizes consumed.

4.3.2. Food Group Contributors to Nutrient Intake

Further descriptive analyses exploring the differences in the food groups contributing to energy, dietary fibre, macronutrient, vitamin and mineral intakes between the disadvantaged and advantaged cohorts are illustrated in Appendix XII-XIV and provide additional evidence of substantial differentials in food group intake between the two groups. These investigations also suggest that these food group differences may have a considerable impact upon nutrient intake differences between the disadvantaged and advantaged populations.

For example, in terms of overall energy intake, there appears to be a greater reliance on energy-dense food groups like meat and meat products and potatoes and potato products, as well as energy-dense, micronutrient-dilute food groups such as sweet foods and confectionery, fats and oils, alcoholic beverages and other beverages, among the disadvantaged group. At the same time, the proportion of energy derived from more energy-dilute, micronutrient dense food groups like fruit and fruit juices, vegetables and breakfast cereals, is considerably lower among these disadvantaged women.

Similarly, examination of food group contributors to macronutrient intakes demonstrates a greater reliance on nutrient-dense food groups among the disadvantaged cohort.

For example, potatoes and potato products, sweet foods and confectionery, and especially (sugary) beverages are greater contributors to carbohydrate intake among this group, while fruit and fruit juices, vegetables, dairy foods and rice, pasta and cereals contribute less carbohydrate in comparison to the more affluent women. Less favourable energy-dense food contribution patterns for fat, saturated fat, protein and dietary fibre are also observed among the disadvantaged women.

With regard to food group contributions to vitamin and mineral intake, appreciable disparities are again observed between the disadvantaged and advantaged groups. Again there is an over-reliance on energy-dense food groups such as breads, potatoes and potato products and meat and meat products, and energy-dense, *nutrient-dilute* foods including sweet foods and confectionery, fats and oils and alcoholic beverages among the disadvantaged women. These trends are coupled with a lower vitamin and mineral intake from energy-dilute, nutrient-dense food sources such as fruit and fruit juices, vegetables, breakfast cereals and dairy foods among these less affluent women.

The food group contributors to energy, dietary fibre and macronutrient intakes among disadvantaged and advantaged women are illustrated in Appendix XII. The food groups contributing to the intake of selected vitamins among the advantaged and disadvantaged respondents are depicted in Appendix XIII, while those showing the variant contributions of these food groups to selected mineral intakes in both cohorts are provided in Appendix XIV.

4.3.3. Impact of Food Group Intake Differences on Nutrient Intakes

While the analyses just described have elucidated substantial differences in food group intakes between the disadvantaged and advantaged women in this study population, the impact of these dietary variations on energy, dietary fibre, macronutrient and micronutrient intakes is less clear. The examination of differences in food group contributors to nutritional intake show that the disadvantaged and advantaged populations derive their energy, dietary fibre, macronutrient and micronutrients from different dietary sources. However, these investigations do not explicitly reveal whether these variations in food group intake are likely to yield significant differences in energy, dietary fibre, macronutrient, vitamin or mineral intakes between the two cohorts.

This section examines the association between food group consumption and energy, dietary fibre, macronutrient, vitamin and mineral intakes in the current population. In doing so, it highlights some of the nutrient intake deficits which are likely to arise from the socio-economic differences in food group consumption already described.

4.3.3.1. Energy, Dietary Fibre & Macronutrients

Food Group	Status	Mean Energy		Median Dietary Fibre (Southgate, 1969, Prosky 1992)		Mean Total Fat		Mean Saturated Fat		Median Non-Milk Extrinsic Sugar (NMES)	
		kcals/day (SD)	p value	g/day (IQR)	p value	% Total Energy /day (SD)	p value	% Total Energy /day (SD)	p value	% Total Energy /day (IQR)	p value
Fruit & Fruit Juices	High (n=108)	2265 (580)	0.289	11.8 (5.8)	<0.001	34.0 (5.9)	0.020	13.4 (3.4)	0.446	10.1 (8.2)	0.684
	Low (n=108)	2188 (47)		9.2 (4.4)		35.9 (6.1)		13.8 (3.4)		10.8 (10.0)	
Vegetables	High (n=108)	2159 (472)	0.065	11.8 (5.4)	<0.001	33.5 (5.8)	<0.001	12.6 (3.1)	<0.001	8.8 (8.2)	<0.001
	Low (n=108)	2294 (592)		8.8 (4.3)		36.4 (6.1)		14.6 (3.4)		12.1 (9.5)	
Fruit & Vegetables	High (n=108)	2256 (580)	0.423	12.5 (5.5)	<0.001	33.7 (5.7)	0.001	13.0 (3.2)	0.015	9.5 (9.2)	0.140
	Low (n=108)	2197 (495)		8.9 (3.6)		36.3 (6.1)		14.2 (3.5)		11.0 (9.7)	
Breakfast Cereals	High (n=108)	2203 (534)	0.522	11.8 (5.6)	<0.001	33.6 (6.0)	<0.001	13.0 (3.2)	0.012	9.3 (6.9)	0.018
	Low (n=108)	2250 (545)		9.0 (4.6)		36.4 (5.9)		14.2 (3.5)		11.8 (10.7)	
Sugar & Sweet Foods	High (n=117)	2398 (559)	<0.001	10.2 (5.0)	0.619	35.9 (5.6)	0.018	14.5 (3.1)	<0.001	11.1 (9.5)	<0.001
	Low (n=99)	2024 (436)		10.2 (5.9)		33.9 (6.4)		12.5 (3.4)		8.6 (9.9)	
Meat & Meat Products	High (n=107)	2423 (588)	<0.001	10.1 (5.2)	0.844	35.6 (5.7)	0.115	13.8 (3.2)	0.279	10.5 (9.0)	0.495
	Low (n=109)	2034 (403)		10.3 (6.0)		34.3 (6.3)		13.3 (3.6)		10.2 (8.0)	
Fish	High (n=114)	2186 (483)	0.248	11.0 (6.6)	<0.001	34.1 (6.2)	0.032	13.2 (3.3)	0.076	12.0 (7.2)	0.008
	Low (n=102)	2271 (594)		9.7 (5.3)		35.9 (5.8)		14.0 (3.4)		11.5 (10.1)	
Dairy Foods	High (n=112)	2275 (543)	0.173	11.1 (6.9)	0.003	35.0 (6.4)	0.999	14.0 (3.6)	0.090	9.4 (7.2)	0.054
	Low (n=104)	2175 (532)		9.7 (4.5)		35.0 (5.7)		13.2 (3.1)		11.7 (9.8)	
Starchy Carbohydrate	High (n=115)	2368 (550)	<0.001	11.7 (5.7)	<0.001	34.9 (5.6)	0.922	13.6 (3.3)	0.884	9.3 (9.2)	0.020
	Low (n=101)	2065 (479)		9.0 (4.7)		35.0 (6.6)		13.6 (3.5)		11.4 (8.0)	
Potatoes & Potato Products	High (n=112)	2422 (562)	<0.001	10.1 (4.9)	0.403	36.8 (5.3)	<0.001	14.4 (3.0)	<0.001	11.7 (9.6)	0.005
	Low (n=104)	2016 (423)		10.6 (6.6)		33.0 (6.2)		12.7 (3.6)		9.4 (7.8)	

Food Groups dichotomised into high and low consumers: Low fruit & fruit juice consumers <113g/day, low vegetable consumers <95g/day, low fruit & vegetable consumers <224g/day, low breakfast cereal consumers <11g/day, low sweet foods, sugar & confectionery consumers <57g/day, low meat & meat product consumers <170g/day, low fish consumers <7g/day, low dairy food consumers <179g/day, low starchy carbohydrate consumers <165g/day, low potato & potato product consumers <124g/day.

Energy, total fat and saturated fat intakes are normally distributed, and differences are assessed by parametric methods (independent t-tests). Dietary fibre and NMES intakes are non-normally distributed and differences are assessed by non-parametric methods (Mann-Whitney U tests).

Table 4.5 Association of Food Group Consumption with Energy, Fibre and Macronutrient Intakes among Valid Reporters (n=216)

Table 4.5 indicates that overall energy intake among the 216 valid reporters is strongly associated with intake of energy dense staples like starchy carbohydrates ($p<0.001$), meat and meat products ($p<0.001$) and potatoes and potato products ($p<0.001$), the latter two of which are consumed in greater amounts by the disadvantaged group. Intake of sugary foods also associates significantly with energy intake ($p<0.001$), while the association between high vegetable intake and lower energy consumption just fails to reach statistical significance ($p=0.065$), perhaps suggesting a displacement effect of vegetables on more energy dense foods.

Unsurprisingly, dietary fibre intake associates most strongly with intake of the high fibre food groups such as fruit ($p<0.001$), vegetables ($p<0.001$), breakfast cereals ($p<0.001$) and starchy carbohydrates ($p<0.001$). The nature of the association between high dairy food consumption and higher fibre intakes is less obvious, but may relate to the simultaneous consumption of milk with high fibre breakfast cereals.

Examination of total fat intake in relation to food group consumption demonstrates an association with high consumption of foods which are typically high in fat such as sugary and sweet foods ($p=0.018$) and potatoes and potato products ($p<0.001$). However, stronger associations are observed between high fat intake and low consumption of foods which are thought to displace high fat foods from the diet such as fruit and fruit juices ($p=0.020$), vegetables ($p<0.001$), breakfast cereals ($p<0.001$), and fish ($p=0.032$).

In examining food group associations with saturated fat intake, similar patterns emerge.

Here, high consumption of some of the food groups known to be high in saturated fat such as sugary and sweet foods ($p<0.001$) and potatoes and potato products ($p<0.001$), predict higher saturated fat intakes. However, high intake of food groups which are more obviously rich in saturated fat, such as dairy foods ($p=0.090$) and meat and meat products ($p=0.279$) are not significantly predictive of higher saturated fat intakes. Conversely, low intake of food groups such as vegetables ($p<0.001$) and breakfast cereals ($p=0.012$) which are thought to displace high saturated fat foods from the diet, do predict lower saturated fat intakes.

As expected, high non-milk extrinsic sugar (NMES) intakes are strongly associated with high consumption of sugary and sweet foods and confectionery ($p<0.001$), as well as potatoes and potato products ($p=0.005$). However, high NMES intakes are also predicted by low vegetable ($p<0.001$), low breakfast cereal ($p=0.018$) and low starchy carbohydrate ($p=0.020$) consumption, while the association with low dairy food intake just fails to reach statistical significance ($p=0.054$). Again, these findings are suggestive of the important displacement effect of the latter food groups on NMES rich foods.

4.3.3.2. Vitamins

Tables 4.6(a) and 4.6(b) illustrate the associations between high and low intakes of the ten different food groups and intakes of selected vitamins. For the B group vitamins shown in Table 4.6(a), it is immediately clear that high fruit and fruit juice, high vegetable, high breakfast cereal and high dairy food intakes are strongly predictive of greater vitamin B1, vitamin B2, vitamin B3 and folate intakes among these young women. It is equally clear that high intakes of energy dense foodstuffs such as meat and meat products, potatoes and potato products and sweet foods and confectionery are not associated with higher intakes of these nutrients, while increased intakes of starchy carbohydrates predict only higher vitamin B1 ($p=0.037$) and folate ($p=0.009$) intakes.

For vitamins A, C, D and E shown in Table 4.6(b), several strong associations are also observed. High fruit and fruit juice and high vegetable consumption are significantly predictive of higher vitamin C, D and E intakes, although in the case of vitamin D, this association is unlikely to relate to the fruit and vegetables themselves. High breakfast cereal consumption is also significantly associated with greater vitamin C ($p<0.001$), vitamin D ($p<0.001$) and vitamin E ($p<0.001$) intakes, as is high fish consumption ($p<0.001$, $p=0.019$ and $p=0.045$ respectively). High dairy food intake is significantly associated with higher vitamin A ($p=0.004$), vitamin C ($p=0.001$), vitamin D ($p=0.022$) and vitamin E ($p=0.002$) intakes. Again, high intakes of energy dense food groups including meat and meat products, potatoes and potato products, starchy carbohydrates and sweet foods and confectionery do not predict higher intakes of vitamins A, C, D or E, with the exception of higher vitamin C intakes among high potato ($p=0.003$) and high starchy carbohydrate ($p=0.049$) consumers.

Food Group	Status	Median Vitamin B1		Median Vitamin B2		Median Vitamin B3		Median Folate	
		mg/day (IQR)	p value	mg/day (IQR)	p value	mg/day (IQR)	p value	µg/day (IQR)	p value
Fruit & Fruit Juices	High (n=108)	1.65 (0.92)	<0.001	1.95 (1.23)	<0.001	25.2 (15.5)	<0.001	306 (172)	<0.001
	Low (n=108)	1.32 (0.87)		1.53 (1.01)		20.7 (12.7)		252 (146)	
Vegetables	High (n=108)	1.65 (1.12)	<0.001	1.88 (1.21)	0.016	25.6 (16.1)	<0.001	320 (178)	<0.001
	Low (n=108)	1.32 (0.83)		1.69 (0.91)		20.4 (12.3)		244 (121)	
Fruit & Vegetables	High (n=108)	1.68 (1.20)	<0.001	1.97 (1.37)	<0.001	25.8 (16.2)	<0.001	321 (174)	<0.001
	Low (n=108)	1.29 (0.75)		1.56 (0.91)		20.2 (11.8)		240 (123)	
Breakfast Cereals	High (n=108)	1.78 (1.19)	<0.001	2.06 (1.33)	<0.001	25.5 (15.0)	<0.001	329 (179)	<0.001
	Low (n=108)	1.24 (0.70)		1.45 (0.79)		19.1 (13.7)		227 (114)	
Sugar & Sweet Foods	High (n=117)	1.59 (0.88)	0.132	1.87 (1.07)	0.001	22.2 (13.7)	0.987	280 (163)	0.507
	Low (n=99)	1.42 (0.82)		1.54 (1.08)		23.0 (14.3)		275 (162)	
Meat & Meat Products	High (n=107)	1.59 (0.75)	0.168	1.75 (0.95)	0.881	23.7 (10.6)	0.052	277 (146)	0.614
	Low (n=109)	1.46 (1.06)		1.77 (1.29)		21.2 (18.9)		282 (194)	
Fish	High (n=114)	1.59 (0.87)	0.081	1.81 (0.98)	0.213	24.4 (15.5)	0.024	296 (176)	0.023
	Low (n=102)	1.38 (0.82)		1.66 (1.13)		21.6 (11.7)		261 (151)	
Dairy Foods	High (n=112)	1.65 (1.01)	0.001	2.07 (1.18)	<0.001	23.8 (13.1)	0.018	299 (168)	<0.001
	Low (n=104)	1.35 (0.78)		1.41 (0.74)		20.7 (12.9)		242 (149)	
Starchy Carbohydrates	High (n=115)	1.60 (0.75)	0.037	1.75 (0.97)	0.636	23 (12.1)	0.126	295 (145)	0.009
	Low (n=101)	1.32 (1.02)		1.76 (1.28)		21.2 (17.6)		258 (178)	
Potatoes & Potato Products	High (n=112)	1.57 (0.74)	0.747	1.65 (0.86)	0.061	22.1 (10.5)	0.182	267 (132)	0.323
	Low (n=104)	1.47 (1.20)		1.84 (1.15)		23.3 (16.0)		285 (187)	

Food Groups dichotomised into high and low consumers: Low fruit & fruit juice consumers <113g/day, low vegetable consumers <95g/day, low fruit & vegetable consumers <224g/day, low breakfast cereal consumers <11g/day, low sweet foods, sugar & confectionery consumers <57g/day, low meat & meat product consumers <170g/day, low fish consumers <7g/day, low dairy food consumers <179g/day, low starchy carbohydrate consumers <165g/day, low potato & potato product consumers <124g/day.

Thiamin, Riboflavin, Niacin and Folate intakes against food group intakes are non-normally distributed and differences are assessed by non-parametric methods (Mann-Whitney U tests).

Table 4.6(a) Association of Food Group Consumption with Vitamin Intakes among Valid Reporters (n=216) (Dietary Supplements Included)

Food Group	Status	Median Vitamin A		Median Vitamin C		Median Vitamin D		Median Vitamin E	
		µg/day (IQR)	p value	mg/day (IQR)	p value	µg/day (IQR)	p value	mg/day (IQR)	p value
Fruit & Fruit Juices	High (n=108)	379 (380)	0.298	140 (102)	<0.001	2.30 (3.42)	0.042	8.93 (7.68)	0.001
	Low (n=108)	343 (386)		49 (42)		1.76 (2.13)		6.59 (6.54)	
Vegetables	High (n=108)	355 (749)	0.401	120 (111)	<0.001	2.50 (4.47)	<0.001	8.87 (9.46)	0.001
	Low (n=108)	380 (251)		53 (56)		1.73 (1.64)		6.97 (6.19)	
Fruit & Vegetables	High (n=108)	382 (669)	0.084	143 (102)	<0.001	2.54 (4.35)	0.004	9.21 (8.50)	<0.001
	Low (n=108)	343 (279)		49 (37)		1.74 (1.52)		6.27 (6.34)	
Breakfast Cereals	High (n=108)	379 (758)	0.127	115 (109)	<0.001	2.61 (4.48)	<0.001	9.87 (8.71)	<0.001
	Low (n=108)	355 (278)		58 (66)		1.66 (1.34)		6.37 (4.68)	
Sugar & Sweet Foods	High (n=117)	384 (356)	0.125	81 (101)	0.937	2.14 (2.50)	0.242	7.97 (7.22)	0.192
	Low (n=99)	342 (415)		82 (114)		1.89 (4.38)		7.18 (9.06)	
Meat & Meat Products	High (n=107)	378 (261)	0.943	85 (82)	0.862	1.94 (1.78)	0.769	7.77 (5.41)	0.745
	Low (n=109)	352 (709)		80 (118)		2.21 (4.80)		7.51 (9.96)	
Fish	High (n=114)	368 (555)	0.245	106 (117)	<0.001	2.21 (4.54)	0.019	8.48 (7.98)	0.045
	Low (n=102)	355 (264)		72 (68)		1.79 (1.71)		7.23 (6.91)	
Dairy Foods	High (n=112)	391 (573)	0.004	100 (104)	0.001	2.34 (3.88)	0.022	9.01 (8.01)	0.002
	Low (n=104)	328 (290)		66 (83)		1.73 (2.10)		7.11 (5.75)	
Starchy Carbohydrate	High (n=115)	379 (332)	0.122	89 (109)	0.049	2.00 (2.30)	0.654	8.28 (7.26)	0.054
	Low (n=101)	338 (642)		76 (97)		1.90 (4.44)		6.69 (7.23)	
Potatoes & Potato Products	High (n=112)	357 (255)	0.889	73 (80)	0.003	1.80 (1.53)	0.256	7.48 (6.20)	0.347
	Low (n=104)	375 (700)		95 (118)		2.46 (4.67)		7.82 (9.27)	

Food Groups dichotomised into high and low consumers: Low fruit & fruit juice consumers <113g/day, low vegetable consumers <95g/day, low fruit & vegetable consumers <224g/day, low breakfast cereal consumers <11g/day, low sweet foods, sugar & confectionery consumers <57g/day, low meat & meat product consumers <170g/day, low fish consumers <7g/day, low dairy food consumers <179g/day, low starchy carbohydrate consumers <165g/day, low potato & potato product consumers <124g/day.

Vitamin A, vitamin C, vitamin D and vitamin E intakes against food group intakes are non-normally distributed and differences are assessed by non-parametric methods (Mann-Whitney U tests).

Table 4.6(b) Association of Food Group Consumption with Vitamin Intakes among Valid Reporters (n=216) (Dietary Supplements Included)

Upon exclusion of the vitamin contribution from dietary supplements, these trends between food groups and vitamin intakes are largely maintained (data not shown). The main difference which arises is that high starchy carbohydrate consumption becomes significantly associated with higher thiamin ($p=0.001$), niacin ($p=0.001$), folate ($p<0.001$), vitamin A ($p=0.001$), and vitamin E ($p=0.001$) intakes. High meat and meat product consumption becomes predictive for higher thiamin ($p=0.001$), niacin ($p=0.001$) and vitamin A ($p=0.007$). The persistence, and in many cases the strengthening, of the associations described previously, indicates that these vitamin intake differences are mediated primarily by differences in food group intakes.

4.3.3.3. Minerals

Table 4.7 illustrates the associations between high and low intake of the ten different food groups and mineral intakes among valid dietary reporters. Here, high fruit and fruit juice consumption predicts higher intakes of iron ($p<0.001$), calcium ($p<0.001$), magnesium ($p<0.001$) and selenium ($p<0.001$), with similar trends in intake of these minerals observed for high starchy carbohydrate consumers ($p=0.007$, $p<0.001$, $p<0.001$ and $p<0.001$ respectively). Iron ($p=0.001$), magnesium ($p=0.001$) and selenium ($p=0.010$) intakes are also significantly higher among high vegetable consumers. Those with high intake of breakfast cereals and dairy foods demonstrate higher intakes of iron, calcium and magnesium, than low consumers of these food groups, with similarly favourable trends also observed for high consumers of sweet foods and confectionery.

Sodium intake is significantly greater among high consumers of meat and meat products ($p<0.001$), potatoes and potato products ($p<0.001$) and starchy carbohydrates ($p<0.001$), suggesting a preponderance of highly processed varieties of these foods among the current study population. Although high intake of meat and meat products is significantly predictive of greater magnesium ($p=0.010$) and selenium intakes ($p=0.025$), it is remarkably not associated with higher iron intakes ($p=0.210$), again suggesting a preference towards low grade, processed meats in this population.

Food Group	Status	Median Sodium		Median Iron		Median Calcium		Median Magnesium		Median Selenium	
		mg/day (IQR)	p value	mg/day (IQR)	p value	mg/day (IQR)	p value	mg/day (IQR)	p value	µg/day (IQR)	p value
Fruit & Fruit Juices	High (n=108)	2965 (1029)	0.425	12.3 (7.7)	<0.001	891 (320)	<0.001	277 (78)	<0.001	49 (27)	<0.001
	Low (n=108)	2852 (1231)		10.2 (6.2)		693 (322)		230 (74)		41 (21)	
Vegetables	High (n=108)	2855 (967)	0.499	12.3 (11.8)	0.001	824 (322)	0.282	267 (80)	0.001	48 (28)	0.010
	Low (n=108)	2918 (1268)		10.2 (5.6)		793 (366)		238 (86)		43 (21)	
Fruit & Vegetables	High (n=108)	3052 (1045)	0.286	12.5 (11.3)	<0.001	882 (321)	<0.001	277 (79)	<0.001	48 (29)	0.002
	Low (n=108)	2822 (1152)		10.2 (5.3)		707 (342)		229 (75)		43 (19)	
Breakfast Cereals	High (n=108)	2962 (988)	0.800	12.6 (13.1)	<0.001	876 (331)	<0.001	269 (74)	<0.001	48 (23)	0.072
	Low (n=108)	2878 (1275)		9.6 (5.2)		711 (352)		231 (83)		42 (27)	
Sugar & Sweet Foods	High (n=117)	3087 (1250)	0.023	11.9 (6.3)	0.035	881 (333)	<0.001	264 (75)	0.003	45 (25)	0.368
	Low (n=99)	2712 (975)		10.4 (10.6)		715 (349)		239 (89)		43 (26)	
Meat & Meat Products	High (n=107)	3268 (1270)	<0.001	11.4 (5.1)	0.210	854 (347)	0.118	269 (84)	0.010	48 (24)	0.025
	Low (n=109)	2560 (947)		10.7 (12.0)		782 (359)		238 (82)		42 (25)	
Fish	High (n=114)	2918 (1058)	0.741	11.7 (6.4)	0.226	851 (332)	0.359	261 (88)	0.026	51 (28)	<0.001
	Low (n=102)	2908 (1277)		10.8 (9.8)		787 (388)		245 (79)		39 (19)	
Dairy Foods	High (n=112)	2984 (1082)	0.270	11.9 (8.6)	0.008	942 (332)	<0.001	270 (70)	<0.001	48 (25)	0.127
	Low (n=104)	2754 (1140)		10.3 (6.5)		653 (235)		228 (82)		43 (19)	
Starchy Carbohydrates	High (n=115)	3264 (1298)	<0.001	12.0 (5.0)	0.007	875 (328)	<0.001	268 (79)	<0.001	51 (24)	<0.001
	Low (n=101)	2591 (919)		10.2 (12.5)		706 (379)		235 (80)		38 (17)	
Potatoes & Potato Products	High (n=112)	3240 (1295)	<0.001	11.1 (5.6)	0.513	829 (383)	0.578	266 (88)	0.044	45 (21)	0.999
	Low (n=104)	2628 (945)		11.2 (12.2)		803 (352)		246 (79)		46 (27)	

Food Groups dichotomised into high and low consumers: Low fruit & fruit juice consumers <113g/day, low vegetable consumers <95g/day, low fruit & vegetable consumers <224g/day, low breakfast cereal consumers <11g/day, low sweet foods, sugar & confectionery consumers <57g/day, low meat & meat product consumers <170g/day, low fish consumers <7g/day, low dairy food consumers <179g/day, low starchy carbohydrate consumers <165g/day, low potato & potato product consumers <124g/day.

Sodium, Iron, Calcium, Magnesium and Selenium intakes against food group intakes are non-normally distributed and differences are assessed by non-parametric methods (Mann-Whitney U tests).

Table 4.7 Association of Food Group Consumption with Mineral Intakes among Valid Reporters (n=216) (Dietary Supplements Included)

While virtually all of the associations described above are maintained after the mineral contribution from supplements is excluded, the association between high meat and meat product ($p=0.009$) and fish ($p=0.003$) consumption and higher iron intake now reaches statistical significance. Again, these findings suggest that differences in mineral intake among the current population are primarily mediated by differences in food group intakes.

The food group and nutrient analyses described above demonstrate that differences in food group intake are likely to have a significant impact upon overall nutrient intake among this population of young women. Furthermore, they strongly suggest that the diets of the disadvantaged cohort, which have been previously characterised by lower fruit, vegetable, breakfast cereal, fish and dairy food intakes, and higher consumption of meat and meat products and potatoes and potato products, are likely to yield considerably less favourable energy, dietary fibre, macronutrients, vitamins and mineral intakes among this group. The following sections will explicitly describe the nutritional differences mediated by these socio-economic disparities in food group intake.

4.3.4. Energy, Dietary Fibre & Macronutrient Intakes

This section investigates the differences which exist in energy, dietary fibre and macronutrient intakes between the disadvantaged and advantaged groups in the current study population.

4.3.4.1. Contributors to Energy

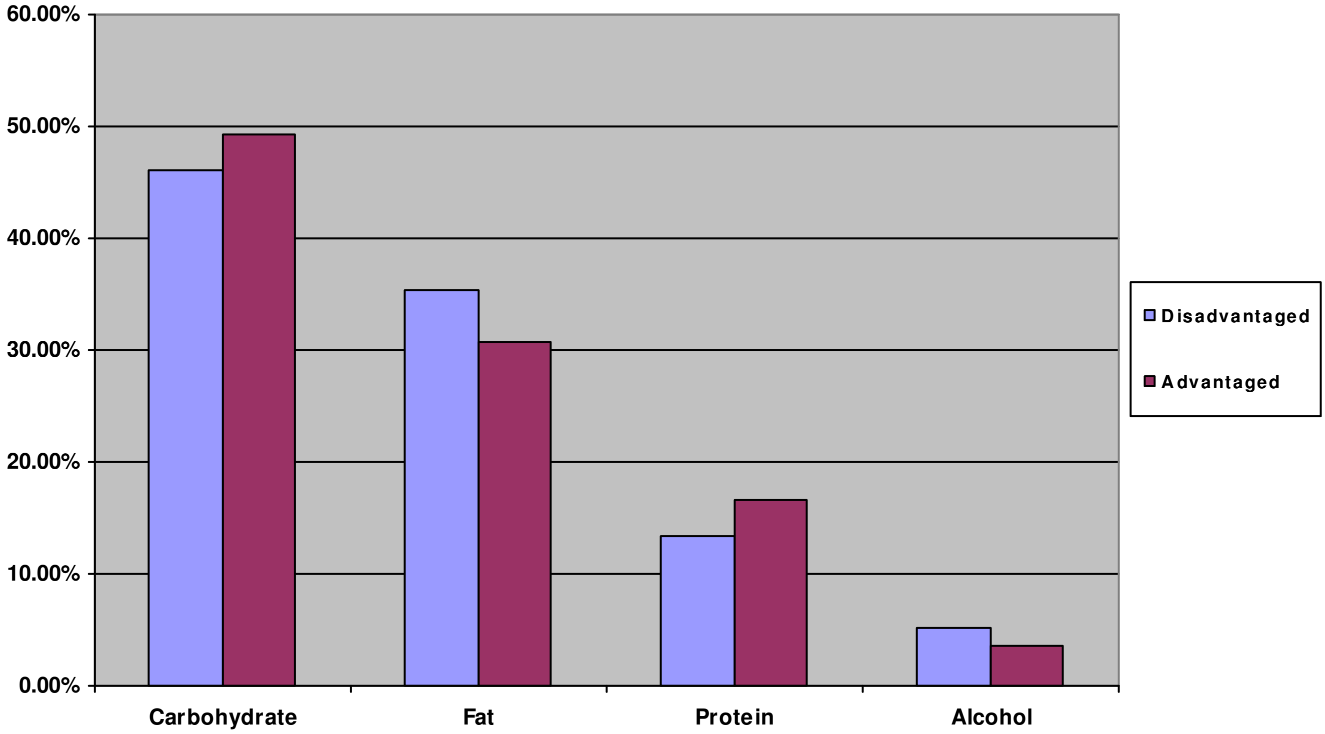

Figure 4.2 Percentage of Total Energy Derived from Macronutrients among Disadvantaged (n=153) and Advantaged (n=63) Valid Reporters

Figure 4.2 above depicts the pronounced differences in macronutrient profile which exist between the disadvantaged and advantaged groups.

The disadvantaged respondents derive a lower proportion of their total energy intake from carbohydrate and protein, and a considerably higher proportion from fat and alcohol. Apart from these main macronutrients, the relative intakes of their constituents such as saturated fat and NMES are also important indicators of overall dietary quality.

4.3.4.2. Socio-economic Differences in Energy, Dietary Fibre and Macronutrient Intakes

The comparative intakes of energy, dietary fibre and a comprehensive range of macronutrients between the disadvantaged and advantaged populations are described in Table 4.8(a) and Table 4.8(b).

Macronutrients	Including Energy from Alcohol						Excluding Energy from Alcohol					
	Recommended Daily Intake	Disadvantaged		Advantaged		p value	Recommended Daily Intake	Disadvantaged		Advantaged		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)			Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Energy (kcals)	~2000kcals/day	2329 (560)	2268 (841)	1978 (385)	1870 (482)	<0.001	~2000kcals/day	2208 (560)	2130 (823)	1906 (374)	1792 (514)	<0.001
Energy (MJ)	~8.4MJ/day	9.79 (2.35)	9.53 (3.51)	8.33 (1.62)	7.88 (2.04)	<0.001	~8.4MJ/day	9.28 (2.35)	8.97 (3.43)	8.03 (1.57)	7.56 (2.17)	<0.001
Carbohydrate (% Energy)	>50% Food Energy (UK DH, 1991)	46.1 (5.9)	45.4 (8.1)	49.2 (6.0)	49.2 (7.5)	<0.001	>50% Food Energy (UK DH, 1991)	48.7 (5.9)	48.6 (7.6)	51.0 (6.1)	51.6 (8.0)	0.007
Total Fat (% Energy)	<33% Total Energy (UK DH, 1991)	35.3 (5.8)	35.6 (8.2)	30.7 (5.1)	30.5 (7.2)	<0.001	<35% Food Energy (UK DH, 1991)	37.2 (5.4)	37.7 (7.2)	31.8 (5.4)	31.8 (7.0)	<0.001
Saturated Fat (% Energy)	<10% Total Energy (UK DH, 1991)	13.9 (3.3)	14.0 (4.7)	11.6 (2.6)	11.6 (3.6)	<0.001	<11% Food Energy (UK DH, 1991)	14.6 (3.3)	14.9 (4.8)	12.0 (2.8)	12.0 (3.7)	<0.001
Monounsaturated Fat (% Energy)		11.6 (2.3)	11.9 (3.4)	9.8 (2.1)	9.7 (3.3)	<0.001		12.2 (2.4)	12.4 (3.3)	10.2 (2.2)	10.1 (3.4)	<0.001
Polyunsaturated Fat (% Energy)		5.6 (1.9)	5.7 (2.6)	5.7 (1.9)	5.7 (2.6)	0.762		6.0 (2.0)	5.9 (2.7)	5.9 (1.9)	5.7 (2.7)	0.892
Protein (% Energy)		13.4 (2.8)	12.9 (3.4)	16.6 (2.8)	16.1 (2.5)	<0.001		14.1 (3.0)	13.8 (3.6)	17.1 (2.8)	16.7 (2.8)	<0.001

UK DH – United Kingdom Department of Health.

Energy, Carbohydrate, Total Fat, Saturated Fat, Monounsaturated Fat, Polyunsaturated Fat and Protein intakes are normally distributed and socio-economic differences in intake between the disadvantaged and advantaged groups are assessed by parametric methods (Independent samples t-tests).

Table 4.8(a) Socio-economic Differences in Energy and Macronutrient Intakes among Valid Dietary Reporters (n=216)

Macronutrients	Including Energy from Alcohol						Excluding Energy from Alcohol					
	Recommended Daily Intake	Disadvantaged		Advantaged		p value	Recommended Daily Intake	Disadvantaged		Advantaged		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)			Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Dietary Fibre (Southgate, 1969, Prosky 1992) (g/day)	>25g/day (WHO/FAO, 2003)	10.1 (3.9)	9.8 (4.9)	12.6 (4.5)	12.5 (5.8)	<0.001	>25g/day (WHO/FAO, 2003)					
Non-Starch Polysaccharide (Englyst, 1988) (NSP) (g/day)	>18 g/day (UK DH, 1991)	11.7 (3.8)	11.4 (4.7)	15.0 (5.0)	14.5 (7.2)	<0.001	>18g/day (UK DH, 1991)					
Non-milk Extrinsic Sugars (NMES) (% Energy)	<10% Total Energy (UK DH, 1991)	12.8 (8.2)	10.8 (9.6)	9.0 (5.7)	8.4 (6.1)	<0.001	<11% Food Energy (UK DH, 1991)	13.7 (8.6)	11.6 (10.2)	9.4 (6.0)	8.8 6.4)	<0.001
Total *trans*- Fatty Acids (% Energy)	<2% Food Energy (UK DH, 1991)	0.58 (0.32)	0.53 (0.33)	0.53 (0.26)	0.50 (0.34)	0.273	<2% Food Energy (UK DH, 1991)	0.61 (0.31)	0.57 (0.34)	0.55 (0.26)	0.52 (0.35)	0.273
Cholesterol (mg/day)	<300 mg/day	289 (153)	253 (155)	218 (68)	217 (102)	<0.001	<300 mg/day					
Alcohol (% Energy)	<14 units (140mls ethanol) per week (DoHC, Ireland)	5.2 (5.2)	3.9 (5.9)	3.5 (2.4)	3.3 (3.1)	0.163	<14 units (140mls ethanol) per week (DoHC, Ireland)					

NSP – Non-starch Polysaccharide, NMES – Non-milk Extrinsic Sugar, WHO – World Health Organisation, FAO – Food and Agriculture Organisation, UK DH – UK Department of Health, DoHC – Department of Health & Children (Ireland).

Dietary Fibre, NSP, NMES, Total –trans Fatty Acid, Cholesterol and Alcohol intakes are non-normally distributed and socio-economic differences in intake between the disadvantaged and advantaged groups are assessed by non-parametric methods (Mann-Whitney U tests).

Table 4.8(b) Socio-economic Differences in Dietary Fibre and Macronutrient Intakes among Valid Dietary Reporters (n=216)

While overall energy intakes among the advantaged group are largely in keeping with the guidelines described in the preceding tables, those for the disadvantaged group exceed these guidelines by 10-15%, and are significantly higher than those for the advantaged women, with energy from alcohol both included ($p<0.001$) and excluded ($p<0.001$).

Regarding macronutrient intakes, percentage of total and food energy from carbohydrate is significantly lower among disadvantaged respondents ($p<0.001$ for total energy, and $p=0.007$ for food energy). Crucially, the disadvantaged population have mean and median intakes which fall some way short of the recommended population average of 50% of food energy, while the mean and median intakes of the advantaged group exceeds this guideline figure. Similarly, percentage of total energy and food energy from fat is significantly higher among disadvantaged respondents ($p<0.001$ in both instances). Again, those in the disadvantaged group have mean and median intakes which exceed the recommended 33% of total energy and 35% of food energy from fat, while the mean and median intakes of those in the advantaged group are within this guideline.

While both groups have mean intakes of saturated fat which exceed the reference limits of 10% of total energy and 11% of food energy, those in the disadvantaged group have significantly greater intakes than their more affluent contemporaries ($p<0.001$ in both instances). While monounsaturated fat (MUFA) intakes are significantly higher among the disadvantaged group ($p<0.001$ for both total energy and food energy), these differences are likely to arise more as a function of their higher overall fat intakes, than due to any qualitative shift towards proportionately greater MUFA intake in the diet.

Polyunsaturated fat intake does not differ between the two groups (p=0.762 and p=0.892 for total energy and food energy respectively). The proportion of both total energy and food energy derived from protein, although adequate for both groups, is significantly lower among the disadvantaged group than the advantaged group (p<0.001 in both cases).

Although dietary fibre (Southgate (1969), Prosky *et al.,* (1992) (AOAC)) and non-starch polysaccharide NSP (Englyst & Cummings, 1988) intakes are significantly lower among disadvantaged respondents (p<0.001 in both cases), both the advantaged and disadvantaged groups have mean and median dietary fibre intakes which are half or less of the 25g/day currently recommended. Even though NSP intakes come closer to the recommended levels, they remain considerably less than these guidelines, particularly among the disadvantaged group (p<0.001). Similarly, those in the disadvantaged group have significantly greater mean and median intakes of NMES (p<0.001), figures which exceed the recommended 11% of food energy, while the mean and median intake of their advantaged peers falls within this guideline.

The mean dietary cholesterol intake of both groups falls within the population guideline of 300mg/day, but again both mean and median intakes are significantly higher for the disadvantaged cohort (p<0.001). *Trans-* fatty acid intakes are well within the recommended 2% of dietary energy for both groups, and although mean intakes are roughly 10% higher for the disadvantaged cohort, these differences do not reach statistical significance (p=0.273). Although mean energy derived from alcohol is considerably greater among the disadvantaged population, there is evidence that this population mean is elevated by the very high intakes of a small number of consumers.

Median intakes between the disadvantaged and advantaged groups are similar in terms of the proportion of energy derived from alcohol, indicating little significant difference between the two groups in this regard (p=0.163).

4.3.4.3. Socio-economic Differences in Compliance with Dietary Fibre and Macronutrient Guidelines

The findings above reveal pronounced differences in the absolute proportions of energy derived from the different macronutrients. However, they are also strongly suggestive of a lower overall compliance with guidelines for energy, dietary fibre and at least some of these macronutrients among the disadvantaged group. To investigate this issue of socio-economic variation in dietary fibre and macronutrient compliance, further analyses were carried out to determine the respective proportions of the disadvantaged and advantaged groups falling within the recommended guidelines. The outcome of these analyses is described in Table 4.9.

	Population Guideline	Percentage (*n*) of *Individuals* Falling within Population Guideline			Threshold for Compliance with Population Guideline*	Percentage (*n*) of *Population* in Compliance with Population Guideline		
		Disadvantaged (n=153)	**Advantaged (n=63)**	**p value**		**Disadvantaged (n=153)**	**Advantaged (n=63)**	**p value**
Dietary Fibre (Southgate) (g/day)	% population >25g/day (WHO/FAO, 2003)	0.7 (1)	1.6% (1)	1.000	21.5g/day	0.7 (1)	3.2 (2)	0.424
% Food Energy from Carbohydrate	% population >50% Food Energy (UK DH, 1991)	51.0 (78)	69.8 (44)	0.017	>32.8% Food Energy	100.0 (153)	100.0 (63)	1.000
% Food Energy from Non-Milk Extrinsic Sugars (NMES)	% population <11% Food Energy (UK DH, 1991)	40.5 (62)	69.8 (44)	<0.001	<24.5% Food Energy	88.2 (135)	96.8 (61)	0.085
% Food Energy from Fat	% population <35% Food Energy (UK DH, 1991)	26.1 (40)	65.1 (41)	<0.001	<42.8% Food Energy	77.8 (119)	95.2 (60)	0.004
% Food Energy from Saturated Fat	% population <11% Food Energy (UK DH, 1991)	11.1 (17)	34.9 (22)	<0.001	<13.2% Food Energy	30.1 (46)	66.7 (42)	<0.001
% Food Energy from trans- Fatty Acids	% population <2% Food Energy (UK DH, 1991)	99.3 (152)	100.0 (63)	1.000	<2.3% Food Energy	100.0 (153)	100.0 (63)	1.000
Cholesterol (mg/day)	% population <300 mg/day	62.1 (95)	87.3 (55)	<0.001	<1368mg/day	100.0 (153)	100.0 (63)	1.000
Alcohol (units per week)	% population <14 units (140mls ethanol)/week (DoHC, Ireland)	62.3 (94)	74.6 (47)	0.114	<69 units/week	100.0 (153)	100.0 (63)	1.000

NMES – Non-milk Extrinsic Sugar, WHO – World Health Organisation, FAO – Food and Agriculture Organisation, UK DH – UK Department of Health, DoHC – Department of Health & Children (Ireland).

* These nutrient intake thresholds equate to the intake of the last individual who can be added to the group before their group mean exceeds (fat, saturated fat, NMES, cholesterol, alcohol) or falls below (dietary fibre, carbohydrate) the recommended guideline.

Yates' Continuity Correction quoted in all instances for 2 by 2 dichotomous analyses.

Table 4.9 Socio-economic Differences in Compliance with Dietary Fibre & Macronutrient Guidelines at Individual & Population Level among Valid Reporters (n=216)

The analyses of compliance with dietary fibre and macronutrient guidelines were performed as previously described on page 194-195 of the methods section. Method 1 compares individual intakes with the population guideline, to estimate the number of respondents falling within these recommended intake levels. Method 2 estimates the proportion of the population who may be classified as "compliers" with the nutrient guideline, by establishing whether they fall within the population whose mean intake is equal to the recommended guideline. In order to calculate this proportion of "compliers", the threshold at which the addition of one more subject causes the group mean to exceed the recommended guideline (or to fall below this guideline in the case of dietary fibre) must be established. The nutrient intake of the final individual defining the compliant population is then designated the threshold for compliance *at the population level*. The thresholds for fibre and each of the macronutrients are shown in column 6 of Table 4.9.

At both the individual and population level there is no difference in compliance with dietary fibre (Southgate, 1969 (AOAC)) guidelines (p=1.000), with just 2 individuals, one disadvantaged and one advantaged, exceeding the recommended 25g/day, and just three respondents overall exceeding the threshold intake which denotes compliance with this population guideline. For percentage energy from carbohydrate, a significantly lower proportion of the disadvantaged population comply with the 50% food energy target at the individual level (p=0.017), although the mean intake for the full population lies above 50% indicating 100% compliance at the population level. There is significantly lower compliance with the NMES target of 11% dietary energy at the individual level (p<0.001) among the disadvantaged cohort, with just 41% having intakes below this 11% threshold, versus 70% of the advantaged group.

Similarly, there is significantly lower compliance with guidelines for total fat intake among the disadvantaged cohort at the individual ($p<0.001$) and population levels ($p=0.004$). Compliance with saturated fat intake guidelines is significantly lower among the disadvantaged cohort by both analytical techniques ($p<0.001$ in both cases), while compliance with cholesterol guidelines is also significantly lower among this group at the individual level ($p<0.001$).

Finally, although the difference in compliance with alcohol guidelines does not reach statistical significance at the individual level ($p=0.114$), only 62% of disadvantaged respondents versus 75% of the advantaged respondents fall below the recommended 14 units per week. These analyses suggest that a significant minority of both groups consume alcohol at levels which exceed the current guidelines, and this issue will be further examined in Chapter 5.

4.3.5. Vitamin Intakes

This section examines the impact of socio-economic variation in diet upon the vitamin intakes of disadvantaged and advantaged women in the current study. Previous analyses have suggested that the less favourable food group intake patterns in the disadvantaged groups may have significant implications for vitamin intakes among these women.

The achievement of vitamin intake guidelines (estimated average requirements) between the disadvantaged and the advantaged populations, with dietary supplements both included and excluded, was first described. Vitamin intake differences between the disadvantaged and advantaged populations, both including and excluding the contribution from dietary supplements, were next examined. The nutrient density of these vitamins in the diet was then compared between the disadvantaged and advantaged populations, again with the contribution from dietary supplements both included and excluded.

4.3.5.1. Socio-economic Differences in Vitamin Compliance

Although socio-economic differences in the absolute intakes of the various vitamins, and the dietary density of these vitamins are of interest, SES differences in the proportion of subjects meeting recommended guidelines for these nutrients are of much greater importance in the public health context. These investigations, shown in Table 4.10, are important to adjust for the confounding effect of a minority of individuals with very high vitamin intake, who can disproportionately raise the group mean thereby potentially masking a high prevalence of inadequacy for the nutrient in question.

Vitamins	Estimated Average Requirement (EAR) FSAI (1999)	% Population <EAR Including Supplements			% Population <EAR Excluding Supplements		
		Disadvantaged (n=153)	Advantaged (n=63)	p value	Disadvantaged (n=153)	Advantaged (n=63)	p value
Vitamin B1 (mg/day)	% population < 0.6mg/day	1.3	0.0	0.896	1.3	0.0	0.896
Vitamin B2 (mg/day)	% population < 1.1mg/day	15.7	7.9	0.194	18.3	11.1	0.271
Vitamin B3 (mg/day)	% population <1.3mg/MJ/day	6.5	0.0	0.085	6.5	0.0	0.085
Vitamin B6 (µg/g protein/day)	% population <13µg/g protein/day	0.7	0.0	1.000	0.7	0.0	1.000
Vitamin B12 (µg/day)	% population <1.0µg/day	0.0	0.0	1.000	0.0	0.0	1.000
Folate (µg/day)	% population <230µg/day	35.3	20.6	0.050	40.5	30.2	0.202
Vitamin C (mg/day)	% population <46mg/day	30.7	6.3	<0.001	35.9	6.3	<0.001
Vitamin A (µg/day)	% population <400µg/day	54.2	65.1	0.190	68.6	90.5	0.001
Vitamin D† (µg/day)	% population <5µg/day	80.4	66.7	0.047	97.4	92.1	0.160
Omega-3 PUFA (mg/day)	% population <0.2% dietary energy	85.0	76.2	0.179	85.0	76.2	0.179

EAR – Estimated Average Requirement, RDA – Recommended Dietary Allowance, FSAI – Food Safety Authority of Ireland, n-3 PUFA – Omega-3 Polyunsaturated Fatty Acids.

† EAR for Vitamin D assumed at 5 µg/day (i.e. half the maximum of the current RDA).

Yates' Continuity Correction quoted in all instances for 2 by 2 dichotomous tables.

Table 4.10 Percentage of Disadvantaged and Advantaged Valid Reporters (n=216) Failing to Achieve Recommended Vitamin Intakes with Dietary Supplement Contributions Included and Excluded

Table 4.10 describes the difference in percentage of respondents achieving adequate vitamin intakes as defined by the Estimated Average Requirement (EAR), among both the disadvantaged and advantaged populations. The proportions of each population achieving the recommended guidelines are estimated with supplements both included and excluded, and the Yates' Continuity Correction reported for each of these 2 x 2 analyses.

With supplements included, there is generally good compliance with vitamin B1, vitamin B6 and vitamin B12 guidelines among both the disadvantaged and advantaged populations. For vitamin B3 however, 6.5% of the disadvantaged group have intakes below the EAR, versus none of the advantaged population, although this trend does not reach statistical significance ($p=0.085$) and any shortfall in niacin is likely to be met by dietary tryptophan.

For most of the other vitamins examined, there are very significant differences in the proportion of the disadvantaged and advantaged populations failing to meet the EAR. For example, five times as many of the disadvantaged respondents fail to meet the vitamin C guideline ($p<0.001$), while 36% of the disadvantaged respondents fall short of the EAR for folate, compared with 21% of the advantaged women ($p=0.050$). Additionally, twice as many disadvantaged respondents fail to meet the EAR for vitamin B2, although this difference does not reach statistical significance ($p=0.194$). For several of the vitamins, including vitamin A, and especially vitamin D and n-3 fatty acids, a very large proportion of both populations fail to meet the EAR. However, the percentage of non-compliers is higher among the disadvantaged group in all instances, reaching statistical significance in the case of vitamin D ($p=0.047$).

When dietary supplements are excluded, non-compliance rates for some vitamins (e.g. riboflavin) increase among both groups. For folate, the socio-economic difference in the percentage of compliers is abolished (p=0.202), with 30% of the advantaged population and 41% of the disadvantaged population now failing to meet the EAR. Excessive total folate intake does not appear to be a significant issue among this population of young women, with a maximum intake of 892µg/day recorded among the valid reporters, and a mean intake for those in the highest folate quartile of 498µg/day (median 466µg/day).

Unlike folate, the socio-economic difference in vitamin C non-compliance between the two groups persists after the exclusion of dietary supplements (36% of disadvantaged women vs. 6% of the advantaged group, (p<0.001)), while a significant difference in vitamin A compliance between the two groups emerges, with those in the *advantaged* group less likely to meet the EAR (p=0.001). An even greater majority of the population than before, particularly those in the disadvantaged group (97%), fail to meet the recommended intakes for vitamin D and n-3 fatty acids (85%), pointing to an endemic insufficiency in these nutrients, which is generally more pronounced among the socially disadvantaged group.

4.3.5.2. Socio-economic Differences in Vitamin Intakes

The socio-economic differences in absolute vitamin intake which arise from differences in food group consumption (and dietary supplementation practices) are important effectors of the socio-economic health inequalities attributable to poor nutritional intake. Table 4.11 describes differences in vitamin intake between the disadvantaged and advantaged groups in the current study.

Vitamins	Estimated Average Requirement (EAR) (FSAI, 1999)	Daily Intake Including Supplements					Daily Intake Excluding Supplements				
		Disadvantaged (n=153)		Advantaged (n=63)		p value	Disadvantaged (n=153)		Advantaged (n=63)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Vitamin B1 (mg/day)	0.6mg/day (72µg/MJ/day)	1.6 (0. 7)	1.5 (0.8)	1.8 (0.8)	1.6 (1.5)	0.170	1.4 (0.4)	1.4 (0.6)	1.4 (0.4)	1.4 (0.5)	0.863
Vitamin B2 (mg/day)	1.1mg/day	1.9 (0.8)	1.7 (1.0)	2.1 (0.8)	1.9 (1.4)	0.021	1.6 (0.6)	1.5 (0.7)	1.7 (0.4)	1.7 (0.6)	0.531
Vitamin B3 (mg/day)	~11 mg/day (1.3mg/MJ/day)	23.0 (9.5)	20.8 (12.1)	29.0 (10.2)	26.7 (17.4)	<0.001	20.3 (7.5)	19.4 (8.3)	23.9 (6.2)	23.8 (7.9)	0.001
Vitamin B5 (mg/day)	None defined	5.8 (2.6)	5.1 (2.6)	6.8 (2.9)	5.5 (5.5)	0.028	4.9 (1.6)	4.9 (2.0)	5.1 (1.0)	4.9 (1.3)	0.479
Vitamin B6 (mg/day)	1.1 mg/day (13µg/g protein/day)	2.5 (1.2)	2.2 (1.3)	3.2 (2.2)	2.8 (2.2)	0.007	2.1 (0.6)	2.0 (0.8)	2.2 (0.5)	2.2 (0.7)	0.415
Vitamin B12 (µg/day)	1.0µg/day	4.7 (2.0)	4.3 (2.5)	4.8 (1.7)	4.6 (2.1)	0.383	4.6 (2.0)	4.2 (2.3)	4.6 (1.6)	4.1 (2.0)	0.827*
Folate (µg/day)	230µg/day	286 (115)	258 (141)	365 (162)	324 (224)	0.001	252 (77)	244 (97)	273 (70)	269 (102)	0.060
Vitamin C (mg/day)	46mg/day	89 (73)	71 (77)	184 (210)	149 (118)	<0.001	78 (59)	59 (66)	128 (71)	112 (102)	<0.001*
Vitamin A (µg/day)	400µg/day	517 (416)	379 (355)	549 (501)	316 (801)	0.336	350 (187)	330 (212)	276 (119)	264 (151)	0.004
Carotene (µg/day)	None defined	3035 (2288)	2528 (2665)	5139 (2943)	4482 (3806)	<0.001	3035 (2288)	2528 (2665)	5139 (2943)	4482 (3806)	<0.001*
Vitamin D† (µg/day)	0-10µg/day	3.1 (3.2)	1.8 (2.1)	4.5 (4.9)	2.8 (4.8)	0.030	1.9 (1.2)	1.7 (1.2)	2.3 (1.6)	1.8 (1.9)	0.221*
Vitamin E†† (mg/day)	8mg/day (RDA)	8.7 (4.9)	7.4 (6.1)	11.9 (7.5)	8.4 (11.5)	0.008	7.0 (3.0)	6.6 (4.5)	7.7 (2.9)	7.3 (3.9)	0.108
n-3 PUFA (mg/day)	0.2% dietary energy	0.31 (0.22)	0.25 (0.28)	0.29 (0.22)	0.21 (0.36)	0.466	0.31 (0.22)	0.25 (0.28)	0.29 (0.22)	0.21 (0.36)	0.466*

EAR – Estimated Average Requirement, RDA – Recommended Dietary Allowance, FSAI – Food Safety Authority of Ireland, n-3 PUFA – Omega-3 Polyunsaturated Fatty Acids, SD – Standard Deviation, IQR – Inter-quartile Range.

† EAR for Vitamin D assumed at 5 µg/day (i.e. half the maximum of the current RDA), ††† RDA for vitamin E previously set at 8mg/day for women aged 18-64 years (Irish RDAs, 1983), no current Irish EAR.

With supplements included, all of the vitamins examined are non-normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by non-parametric methods (Mann-Whitney U tests). Upon exclusion of supplements, these vitamins become normally distributed and the differences between the two groups are assessed by parametric methods (Independent samples t-tests), except for those designated with an asterisk (*).

Table 4.11 Vitamin Intakes with Supplement Contributions Included & Excluded among Disadvantaged & Advantaged Valid Reporters (n=216)

Significant differences are seen for many of the vitamins when contribution from dietary supplements is included in the analysis. In most cases, both the mean and median population intakes for both the disadvantaged and advantaged cohorts are well above the Estimated Average Requirement (EAR). For *dietary* folate, however, the population mean and median for the disadvantaged group in particular, barely exceed the recommended population guideline (EAR) of 230µg/day, while with dietary supplements included, overall intakes fall far short of the 230µg/day plus 400µg/day of folic acid from supplements recommended for young women of child-bearing age. For vitamin D, the population mean and median intakes actually fall below the US guideline threshold (5µg/day for those aged <50 years) in both the disadvantaged and advantaged groups, while median intakes of vitamin A are also less than the EAR in both groups. In terms of comparing absolute intakes between the two groups, intakes of vitamin B2 ($p=0.021$), vitamin B3 ($p<0.001$), vitamin B5 ($p=0.028$), vitamin B6 ($p=0.007$) and folate ($p=0.001$) are all significantly lower among the disadvantaged group. Vitamin C ($p<0.001$) and carotene ($p<0.001$) intakes are also significantly lower among these disadvantaged subjects, as are vitamin D ($p=0.030$) and vitamin E ($p=0.008$) intakes.

When the dietary data from both groups are analysed with dietary supplements excluded, to ascertain the differences in vitamin intake from food alone, two major issues are noted. Firstly, and most obviously, the mean and median intakes for several of the vitamins drop in both population groups. Secondly, the socio-economic differences which previously existed for several of the vitamins are either attenuated or abolished altogether, highlighting the greater contribution made to these vitamin intakes by dietary supplements among the advantaged group.

For example, the significant differences which existed for vitamin B2, vitamin B5 and vitamin B6 disappear altogether ($p=0.531$, $p=0.479$ and $p=0.415$ respectively), while those for vitamin B3 and folate are considerably diminished ($p=0.001$ and $p=0.060$ respectively). Similarly, the previous socio-economic differences in vitamin D ($p=0.221$) and vitamin E ($p=0.108$) intakes also recede, and are no longer statistically significant. The significantly lower intakes of vitamin C ($p<0.001$), and carotene ($p<0.001$) which prevailed when dietary supplements were included, persist even after removal of these supplements, indicating significant variations in *dietary intake* of these vitamins. Additionally, upon removal of dietary supplement contributions, a significant difference in mean vitamin A intakes between the disadvantaged and advantaged populations emerges, with those in the higher group displaying poorer intakes ($p=0.004$), although mean intake for both groups falls well below the EAR.

The appearance of this difference in vitamin A intake also highlights the issue of dietary supplements' contribution to absolute vitamin intakes. Both the disadvantaged and advantaged groups show mean and median vitamin A intakes which are well under the EAR of 400μg/day when supplements are excluded. With supplements excluded, vitamin D also shows mean and median intakes less than the US recommendation of 5μg/day for both the disadvantaged and advantaged populations, while mean and median vitamin E intakes for the disadvantaged women fall under the previous RDA of 8mg/day when supplemental intakes are discounted. Additionally, mean and particularly median folate intakes among the disadvantaged group become very marginal when the contribution from dietary supplements is not considered.

4.3.5.3. Socio-economic Differences in Vitamin Density

Often, absolute vitamin intakes rise as a function of overall increases in food intake. For some B group vitamins which are involved in energy and protein metabolism, requirements are largely dependent on the amount of energy or protein consumed. For other vitamins, however, assessment of intake per MJ of energy consumed adjusts for the influence of total energy intake, and is a useful indicator of the overall quality of the diet.

Table 4.12 describes the socio-economic differences in vitamin "concentration" or density of the diet, per MJ of total energy consumed. Due to its primary role in amino acid metabolism, vitamin B6 requirement is expressed in terms of µg/g protein consumed daily. The analyses have been performed with dietary supplements both included and excluded. With supplements included, all of the vitamins examined, with the exception of vitamin A ($p=0.467$), vitamin B6 ($p=0.114$) and the n-3 fatty acids ($p=0.623$), are consumed at significantly lower concentrations in the diets of the disadvantaged group. Upon the removal of dietary supplements, with the exception of vitamin B6 these significant differences remain for vitamin B1 ($p<0.001$), vitamin B2 ($p<0.001$), vitamin B3 ($p<0.001$), vitamin B5 ($p<0.001$), vitamin B12 ($p=0.001$), folate ($p<0.001$), vitamin C ($p<0.001$), carotene ($p<0.001$), vitamin D ($p=0.004$) and vitamin E ($p<0.001$), with the dietary concentrations of vitamin B3, folate, vitamin C and carotene showing particularly large differences between the disadvantaged and advantaged populations.

Vitamins	Estimated Avg. Requirement (EAR) (FSAI, 1999)	Daily Intake per MJ Including Supplements					Daily Intake per MJ Excluding Supplements				
		Disadvantaged (n=153)		Advantaged (n=63)		p value	Disadvantaged (n=153)		Advantaged (n=63)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Vitamin B1 (µg/MJ/day)	72µg/MJ/day	170 (80)	140 (70)	220 (90)	200 (130)	<0.001	150 (40)	140 (50)	170 (40)	170 (70)	<0.001
Vitamin B2 (mg/MJ/day)	1.1mg/day	0.20 (0.09)	0.17 (0.09)	0.26 (0.10)	0.23 (0.15)	<0.001	0.17 (0.05)	0.16 (0.07)	0.20 (0.05)	0.20 (0.08)	<0.001
Vitamin B3 (mg/MJ/day)	1.3mg/MJ/day	2.4 (1.1)	2.0 (1.3)	3.5 (1.2)	3.3 (2.0)	<0.001	2.12 (0.78)	1.97 (0.87)	2.93 (0.85)	2.84 (0.96)	<0.001*
Vitamin B5 (mg/MJ/day)	None defined	0.61 (0.31)	0.50 (0.22)	0.82 (0.34)	0.70 (0.45)	<0.001	0.51 (0.14)	0.49 (0.16)	0.62 (0.12)	0.62 (0.18)	<0.001*
Vitamin B6 (µg/g prot /day)	13µg/g protein/day	32.3 (15.0)	28.0 (10.7)	39.5 (28.1)	30.9 (23.9)	0.114	27.3 (6.8)	26.7 (6.8)	26.5 (5.6)	26.5 (9.4)	0.414
Vitamin B12 (µg/MJ/day)	None defined	0.49 (0.20)	0.44 (0.22)	0.59 (0.18)	0.56 (0.21)	<0.001	0.47 (0.19)	0.43 (0.20)	0.55 (0.18)	0.52 (0.20)	0.001*
Folate (µg/MJ/day)	None defined	30.2 (13.1)	26.9 (13.5)	44.4 (19.4)	39.0 (27.1)	<0.001	26.3 (7.7)	25.6 (11.6)	33.2 (8.1)	33.1 (12.4)	<0.001
Vitamin C (mg/MJ/day)	None defined	9.4 (7.5)	7.1 (7.5)	20.8 (18.7)	17.5 (14.2)	<0.001	8.2 (6.2)	6.3 (5.8)	15.3 (7.5)	12.8 (13.7)	<0.001*
Vitamin A (µg/MJ/day)	None defined	54.7 (46.9)	35.1 (28.6)	64.0 (55.5)	37.7 (73.4)	0.467	35.4 (16.7)	32.5 (18.3)	33.0 (12.4)	32.1 (14.5)	0.484*
Carotene (µg/MJ/day)	None defined	319 (245)	248 (294)	623 (364)	581 (458)	<0.001	319 (245)	248 (294)	623 (364)	581 (458)	<0.001*
Vitamin D (µg/MJ/day)	None defined	0.33 (0.36)	0.18 (0.16)	0.54 (0.64)	0.33 (0.58)	0.001	0.19 (0.14)	0.16 (0.11)	0.27 (0.18)	0.20 (0.23)	0.004*
Vitamin E (mg/MJ/day)	None defined	0.92 (0.58)	0.74 (0.50)	1.39 (0.76)	1.14 (1.35)	<0.001	0.71 (0.26)	0.69 (0.34)	0.91 (0.27)	0.89 (0.41)	<0.001
n-3 PUFA (mg/MJ/day)	0.2% dietary energy	0.031 (0.021)	0.027 (0.030)	0.036 (0.028)	0.024 (0.030)	0.623	0.031 (0.021)	0.027 (0.030)	0.036 (0.028)	0.024 (0.030)	0.623*

EAR – Estimated Average Requirement, RDA – Recommended Dietary Allowance, FSAI – Food Safety Authority of Ireland, n-3 PUFA – Omega-3 Polyunsaturated Fatty Acids, SD – Standard Deviation, IQR – Inter-quartile Range.

With supplements included, nutrient densities of all the vitamins examined are non-normally distributed and the differences between the disadvantaged and advantaged cohorts are assessed by non-parametric methods (Mann-Whitney U tests). Upon exclusion of supplements, these vitamin densities become normally distributed and the differences between the two groups are assessed by parametric methods (independent samples t-tests), except for those designated with an asterisk (*).

Table 4.12 Vitamin Density per MJ Energy Consumed with Dietary Supplement Contributions Included and Excluded among Disadvantaged and Advantaged Valid Reporters (n=216)

4.3.5.4. Contribution of Dietary Supplements to Overall Vitamin Intakes

Vitamin	% Contribution among Disadvantaged Respondents	% Contribution among Advantaged Respondents
Vitamin B1	7	14
Vitamin B2	8	14
Vitamin B3	8	12
Vitamin B6	8	17
Folate	7	15
Vitamin C	7	13
Vitamin A	13	20
Vitamin D	13	22
Vitamin E	10	17

Table 4.13 Estimated Contribution of Supplements to Selected Vitamin Intakes among Disadvantaged & Advantaged Valid Reporters (n=216)

Table 4.13 above shows the estimated contribution made by dietary supplements to each of the vitamins examined. A strong social gradient in the percentage of vitamins derived from supplements is clearly evident, with those in the advantaged group receiving roughly twice the proportion of most of these vitamins from supplements compared with their less advantaged peers. These differences are most likely to arise from variations in the prevalence of vitamin supplementation across the social spectrum, rather than any compositional differences in the supplements consumed. These issues will be examined more comprehensively in Chapter 5.

There are certain issues relating to dietary supplementation and its contribution to vitamin intake which do warrant specific mention in the present context however. Supplements contribute just 7% to overall folate intake among the disadvantaged group, versus 15% in the advantaged group.

Also of considerable interest are the significant contributions to overall vitamin D and vitamin A intakes made by supplements in both groups. In the case of vitamin A, this increased contribution from supplements among the advantaged group considerably attenuates their lower mean intake and EAR compliance levels in comparison to their disadvantaged peers. In the case of vitamin D, the higher supplemental contributions observed among the advantaged group appear to be a primary driver of their higher median intakes and greater compliance with recommended intake guidelines. Both of these nutrients illustrate the profound effect which differing supplementation practices may yield on overall intake disparities between the different social categories.

4.3.6. Mineral Intakes

This section examines the impact of socio-economic variations in diet upon the mineral intakes of disadvantaged and advantaged women in the current study. As for vitamin intakes, the food group analyses detailed previously suggest that the sub-optimal dietary patterns observed in the disadvantaged groups may have a significant deleterious impact on mineral intake levels among these women.

Initially, differences in the achievement of mineral intake guidelines (estimated average requirements) between the disadvantaged and advantaged cohorts, with dietary supplements both included and excluded, were explored. Differences in overall mineral intakes between the disadvantaged and advantaged populations (again with the contribution from dietary supplements both included and excluded), were next established. Finally, differences in the mineral density of the diet between the disadvantaged and advantaged groups were examined, again with the contribution from dietary supplements both included and excluded.

4.3.6.1. Socio-economic Differences in Mineral Intake Compliance

The percentage of respondents failing to meet target mineral guidelines among the disadvantaged and advantaged populations is illustrated in Table 4.14. While sodium intakes are higher among the disadvantaged women, a significant majority of both the disadvantaged (79%) and the advantaged (68%) populations consume more than the recommended 2400mg per day.

Likewise, a high proportion of both the advantaged group (38%), and particularly the disadvantaged group (50%), fail to achieve the recommended iron intake, and these percentages increases substantially to 49% and 60% respectively when supplemental intakes are not considered. The differences described in compliance with iron guidelines between the two groups do not reach statistical significance however (p=0.161 with supplements included and p=0.186 with supplements excluded).

Approximately one third of both populations fail to achieve adequate selenium and iodine intakes. With regard to calcium intake, a significantly greater proportion of the disadvantaged cohort (25%) than the advantaged cohort (10%) fall short of the recommended intake (EAR) of 615mg/day (p=0.019), with these differences largely maintained when supplements are excluded (p=0.031). A significantly greater proportion of the disadvantaged population achieve the recommended copper intake however (p=0.032), with 19% of advantaged respondents failing to achieve this target compared with 8% of the disadvantaged group. These findings highlight endemic mineral intake inadequacies among young urbanised women of all social strata, but deficits which are particularly pronounced for iron and calcium among the lower social groupings.

Minerals	Recommended Daily Intake (EAR) (FSAI, 1999)	% Population <EAR Including Supplements			% Population < EAR Excluding Supplements		
		Disadvantaged (n=153)	Advantaged (n=63)	p value	Disadvantaged (n=153)	Advantaged (n=63)	p value
Sodium † **(mg/day)**	% population >2400mg/day	79.1	68.3	0.129	79.1	68.3	0.129
Iron (mg/day)	% population <10.8 mg/day	49.7	38.1	0.161	60.1	49.2	0.186
Calcium (mg/day)	% population <615 mg/day	24.8	9.5	0.019	27.5	12.7	0.031
Zinc (mg/day)	% population <5.5 mg/day	8.5	3.2	0.270	8.5	3.2	0.270
Copper (mg/day)	% population <0.8 mg/day	7.8	19.0	0.032	7.8	19.0	0.032
Phosphorous (mg/day)	% population <400 mg/day	0.0	0.0	1.000	0.0	0.0	1.000
Selenium (µg/day)	% population <40 µg/day	38.6	34.9	0.728	38.6	34.9	0.728
Iodine (µg/day)	% population <100 µg/day	34.0	31.7	0.874	34.0	31.7	0.874

EAR – Estimated Average Requirement, RDA – Recommended Dietary Allowance, FSAI – Food Safety Authority of Ireland.

† Target maximum recommended intake set at 2400mg per day by FSAI (2005).

Yates' Continuity Correction quoted in all instances for 2 by 2 dichotomous tables.

Table 4.14 Percentage of Disadvantaged and Advantaged Valid Reporters (n=216) Failing to Achieve Recommended Mineral Intakes with Dietary Supplement Contributions Included and Excluded

4.3.6.2. Socio-economic Differences in Mineral Intake

Table 4.15 describes the differences which exist in absolute mineral intakes between the disadvantaged and advantaged cohorts, with dietary supplements both included and excluded. Mean and median sodium intakes are significantly higher among the disadvantaged group in both cases ($p<0.001$), although potassium intakes are similar ($p=0.687$ with supplements and $p=0.694$ without supplements). For most other minerals except magnesium and iron, mean and median intakes appear quite similar between the two groups, both with supplements included and excluded. In the case of magnesium however, the less affluent respondents report lower mean and significantly lower median intakes when the contribution from supplements is included ($p=0.013$) and excluded ($p=0.035$).

Although mean iron intake is higher among the disadvantaged group with supplements included, *median* intake levels are considerably lower among this group, with this trend just failing to reach statistical significance ($p=0.073$). When supplements are excluded from the analyses, iron intake among the population becomes normally distributed. The disadvantaged respondents' mean intake becomes significantly less than that of their more affluent peers ($p=0.011$), while their median intake also remains lower. These findings indicate that a small number of respondents with very high iron intakes as a result of dietary supplementation have skewed the population upwards among the disadvantaged group. Given the overall lower prevalence of dietary supplementation observed among the disadvantaged group (32% vs. 52% of the advantaged group, $p=0.004$), it is possible that their higher prevalence of iron supplementation (2.3% vs. 1.4% of the advantaged group) arises as a result of prescribed iron supplement use.

Given the significant iron contribution from dietary supplements, non-parametric comparison of median intakes is more appropriate when these preparations are included. When supplements are excluded however, the previously large standard deviations in iron intake decrease considerably as population intakes become normally distributed, with parametric comparison of mean intakes now providing a more representative illustration of differences in intake between the two populations.

Among both populations, mean and median intakes for most of the minerals examined are well above the recommended EAR. With regard to iron however, both the advantaged group, and especially the disadvantaged group, have median intakes which are marginal or fall below this threshold irrespective of whether supplementary contributions are considered, and this is reflected in the high prevalence of insufficiency in both groups described previously. In addition, despite being significantly higher among the disadvantaged women, mean and median intakes of sodium for both groups are well above the recommended 2400mg/day, again reflected by the high prevalence of non-compliance with this guideline among both populations.

Minerals	Estimated Avg. Requirement (EAR) (FSAI, 1999)	Daily Intake Including Supplements					Daily Intake Excluding Supplements				
		Disadvantaged (n=153)		Advantaged (n=63)		p value	Disadvantaged (n=153)		Advantaged (n=63)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Sodium † (mg/day)	2400mg/day	3178 (923)	3056 (1275)	2716 (615)	2641 (983)	<0.001*	3178 (923)	3056 (1275)	2716 (615)	2641 (983)	<0.001*
Potassium (mg/day)	None defined	2969 (823)	2858 (1035)	3010 (714)	2885 (1081)	0.687	2965 (825)	2856 (1036)	3001 (713)	2885 (1095)	0.694
Iron (mg/day)	10.8 mg/day	18.5 (24.0)	10.9 (6.1)	15.2 (7.5)	11.9 (12.7)	0.073	10.2 (3.0)	10.1 (4.3)	11.4 (3.1)	10.8 (3.8)	0.011*
Calcium (mg/day)	615 mg/day	840 (320)	799 (369)	874 (250)	830 (326)	0.219	833 (316)	799 (381)	857 (238)	815 (326)	0.300
Magnesium (mg/day)	None defined	252 (69)	250 (85)	270 (80)	261 (89)	0.013	252 (70)	250 (85)	275 (68)	259 (82)	0.035
Zinc (mg/day)	5.5 mg/day	8.9 (2.5)	8.8 (3.2)	8.8 (1.7)	8.7 (2.0)	0.915*	8.9 (2.5)	8.8 (3.2)	8.8 (1.7)	8.7 (2.0)	0.915*
Copper (mg/day)	0.8 mg/day	1.4 (0.5)	1.3 (0.8)	1.3 (0.5)	1.2 (0.8)	0.134	1.4 (0.5)	1.3 (0.8)	1.3 (0.5)	1.2 (0.8)	0.134
Phosphorous (mg/day)	400 mg/day	1351 (367)	1328 (441)	1376 (247)	1347 (317)	0.621*	1351 (367)	1328 (441)	1376 (247)	1347 (317)	0.621*
Selenium (µg/day)	40 µg/day	48 (20)	45 (21)	53 (25)	46 (32)	0.433	48 (20)	45 (21)	53 (25)	46 (32)	0.433
Iodine (µg/day)	100 µg/day	131 (56)	122 (71)	123 (46)	119 (63)	0.407	131 (56)	122 (71)	123 (46)	119 (63)	0.407

EAR – Estimated Average Requirement, FSAI – Food Safety Authority of Ireland, SD – Standard Deviation, IQR – Inter-quartile Range.

† Target maximum recommended intake set at 2400mg per day by FSAI (2005).

With supplements included, nutrient intakes of all the minerals examined, except those designated with an asterisk, are non-normally distributed and the differences between the disadvantaged and advantaged cohorts are assessed by non-parametric methods (Mann-Whitney U tests). Upon exclusion of supplements, the mineral intakes which show a normal distribution again have their differences between the two groups assessed by parametric methods (independent t-tests), and these are again designated with an asterisk (*).

Table 4.15 Mineral Intakes with Dietary Supplement Contributions Included and Excluded among Disadvantaged and Advantaged Valid Reporters (n=216)

4.3.6.3. Socio-economic Differences in Mineral Density

It is with reference to the mineral density of the diet that major differences emerge between the disadvantaged and advantaged groups. Table 4.16 shows that when dietary supplemental intakes are included, median potassium ($p<0.001$), iron ($p<0.001$), calcium ($p<0.001$), magnesium ($p<0.001$), selenium ($p<0.001$) and iodine ($p=0.019$) intakes per MJ of energy consumed are significantly lower among the disadvantaged group, as are mean intakes per MJ of zinc ($p<0.001$) and phosphorous ($p<0.001$). When supplemental intakes are excluded from the analyses, these considerable differences remain. These findings point to a lower overall mineral density of the diet among the disadvantaged women.

Minerals	Estimated Avg. Requirement (EAR) (FSAI, 1999)	Daily Intake per MJ Including Supplements					Daily Intake per MJ Excluding Supplements				
		Disadvantaged (n=153)		Advantaged (n=63)		p value	Disadvantaged (n=153)		Advantaged (n=63)		p value
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Sodium † **(mg/MJ/day)**	<2400mg/day	326 (65)	323 (73)	331 (71)	328 (86)	0.646	326 (65)	323 (73)	331 (71)	328 (86)	0.646
Potassium (mg/MJ/day)	None defined	307 (65)	305 (70)	364 (66)	359 (95)	<0.001	307 (65)	305 (71)	363 (66)	357 (93)	<0.001
Iron (mg/MJ/day)	10.8 mg/day	2.0 (2.6)	1.1 (0.5)	1.8 (0.8)	1.5 (1.2)	<0.001	1.1 (0.3)	1.0 (0.3)	1.4 (0.3)	1.3 (0.4)	<0.001
Calcium (mg/MJ/day)	615 mg/day	86 (27)	82 (31)	106 (27)	101 (32)	<0.001	85 (27)	81 (30)	104 (25)	100 (33)	<0.001
Magnesium (mg/MJ/day)	None defined	26 (6)	25 (7)	34 (8)	32 (9)	<0.001	26 (6)	25 (7)	33 (6)	32 (8)	<0.001
Zinc (mg/MJ/day)	5.5 mg/day	0.9 (0.2)	0.9 (0.3)	1.1 (0.2)	1.1 (0.2)	<0.001*	0.9 (0.2)	0.9 (0.3)	1.1 (0.2)	1.1 (0.2)	<0.001*
Copper (mg/MJ/day)	0.8 mg/day	0.15 (0.05)	0.13 (0.08)	0.16 (0.06)	0.13 (0.10)	0.224	0.15 (0.05)	0.13 (0.08)	0.16 (0.06)	0.13 (0.10)	0.224
Phosphorous (mg/MJ/day)	400 mg/day	139 (27)	136 (32)	168 (29)	167 (39)	<0.001*	139 (27)	136 (32)	168 (29)	167 (39)	<0.001*
Selenium (µg/MJ/day)	40 µg/day	5.0 (1.9)	4.6 (2.3)	6.4 (2.8)	5.8 (3.4)	<0.001	5.0 (1.9)	4.6 (2.3)	6.4 (2.8)	5.8 (3.4)	<0.001
Iodine (µg/MJ/day)	100 µg/day	13.5 (5.6)	12.5 (6.2)	14.9 (4.9)	14.1 (5.4)	0.019	13.5 (5.6)	12.5 (6.2)	14.9 (4.9)	14.1 (5.4)	0.019

EAR – Estimated Average Requirement, FSAI – Food Safety Authority of Ireland, SD – Standard Deviation, IQR – Inter-quartile Range.

† Target maximum recommended intake set at 2400mg per day by FSAI (2005).

With supplements included, nutrient densities of all the minerals examined, except those designated with an asterisk, are non-normally distributed and the differences between the disadvantaged and advantaged cohorts are assessed by non-parametric methods (Mann-Whitney U tests). Upon exclusion of supplements, the mineral densities which show a normal distribution have their differences between the two groups assessed by parametric methods (independent samples t-tests), and these are again designated with an asterisk (*).

Table 4.16 Mineral Density per MJ Energy Consumed with Dietary Supplement Contributions Included and Excluded among Disadvantaged and Advantaged Valid Reporters (n=216)

4.3.6.4. Contribution of Dietary Supplements to Overall Mineral Intakes

Mineral	% Contribution among Disadvantaged Respondents	% Contribution among Advantaged Respondents
Sodium	0	0
Iron	12	13
Calcium	1	2
Magnesium	0	1
Zinc	0	0
Selenium	0	0

Table 4.17 Estimated Contribution of Supplements to Selected Mineral Intakes among Disadvantaged & Advantaged Valid Reporters (n=216)

The contribution of dietary supplements to overall mineral intakes in both the disadvantaged and advantaged populations is shown in Table 4.17 above. It is immediately apparent that these supplements make a generally more modest contribution to mineral intake for both groups, than was the case for vitamins. These preparations make a considerable contribution to mean population iron intakes for both groups however, although comparison of median iron intakes reveal that this benefit is confined to a small percentage of each group. Supplements also make a small contribution to calcium intake, and in the advantaged group, to magnesium intake.

4.3.7. Socio-economic, Attitudinal & Behavioural Predictors of Diet

The previous sections have described pronounced differences in dietary patterns between the disadvantaged and advantaged young women in the current study population. Intakes of fruit, vegetables, breakfast cereals, fish and dairy foods are significantly lower among the disadvantaged women, while their intakes of meat and meat products and potatoes and potato products are significantly higher than those of their more affluent peers. These dietary variations are reflected in significantly less favourable energy, dietary fibre, macronutrient, vitamin and mineral intakes among the disadvantaged respondents, as well as lower compliance with macronutrient and micronutrient intake guidelines in this group.

This section will explore some of the socio-economic, attitudinal and health behavioural factors which associate with unhealthy dietary patterns, in order to ascertain whether these might be predictors of poorer intake patterns among the disadvantaged women.

4.3.7.1. Socio-economic Factors

In order to understand the specific dimensions of poverty and disadvantage which mediate socio-economic differences in dietary patterns, the intakes of the ten food groups were compared across eleven key indicators of socio-economic status. Low status for all eleven of these indicators is significantly associated with lower fruit, vegetable and breakfast cereal intakes. However, higher sweet food and confectionery intake is predicted only by relative income poverty (p=0.047) and consistent poverty (p=0.008), indicating that such behaviour may be more associated with *material* disadvantage.

High meat and meat product intakes are significantly associated with only four of the indicators, and these include markers of both social (e.g. social class ($p<0.001$)) and material (e.g. medical card entitlement ($p=0.008$)) disadvantage. These high meat intakes do not coincide significantly with any of the specific markers of material disadvantage (relative income poverty ($p=0.163$), deprivation ($p=0.749$) and consistent poverty ($p=0.430$)) however, perhaps indicating a greater association with the social indicators.

Like fruit, vegetables and breakfast cereals, low fish intake is significantly predicted by all eleven of the indicators, with the exception of single adult family structure ($p=0.432$), precluding meaningful differential assessment of its material and social correlates.

With regard to dairy foods, low intake is significantly predicted by virtually all of the markers of social disadvantage, while remaining conspicuously unrelated to the specific indicators of material deprivation (e.g. relative income poverty ($p=0.878$), deprivation ($p=0.931$) and consistent poverty ($p=0.678$)).

High intake of potatoes and potato products demonstrates a similar pattern, showing strong associations with the social proxies of disadvantage, but, with the exception of relative income poverty ($p<0.001$), displaying much weaker association with the material indicators (e.g. deprivation ($p=0.168$) and consistent poverty ($p=0.133$)).

While these measures are relatively crude estimates of complex sociological processes, they do suggest that high intake of sweet foods, sugar & confectionery associates more with material disadvantage, while high intake of meat and meat products and potatoes and potato products, and low intakes of dairy foods may relate more to social disadvantage.

SE Indicator	Status	Fruit and Fruit Juices		Vegetables		Combined Fruit & Vegetables		Breakfast Cereals		Sweet foods and Confectionery	
		Median g/day (IQR)	**p value**	**Median g/day (IQR)**	**p value**	**Median g/day (IQR)**	**p value**	**Median g/day (IQR)**	**p value**	**Median g/day (IQR)**	**p value**
Disadvantage	No (n=63)	200 (219)	<0.001	194 (116)	<0.001	405 (340)	<0.001	29 (44)	<0.001	64 (52)	0.498
	Yes (n=153)	74 (196)		72 (74.5)		172 (225.5)		4 (17.5)		67 (91.5)	
Social Class	High (n=113)	157 (212)	<0.001	141 (141)	<0.001	299 (323)	<0.001	20 (40)	<0.001	64 (66)	0.460
	Low (n=103)	50 (191)		69 (90)		161 (228)		4 (17)		67 (98)	
Socio-economic Group (SEG)	High (n=144)	143 (229)	0.003	117 (127)	<0.001	276 (300)	<0.001	17 (30)	0.002	64 (68)	0.094
	Low (n=72)	69 (191)		66 (76)		164 (229)		4 (17)		67 (102)	
Education	High (n=132)	155 (212)	<0.001	129 (143)	<0.001	292 (327)	<0.001	20 (30)	<0.001	64 (64)	0.203
	Low (n=82)	36 (191)		67 (76)		159 (231)		4 (16)		73 (107)	
Early School Leaving	No (n=145)	145 (215)	<0.001	113 (129)	<0.001	264 (321)	<0.001	17 (30)	<0.001	65 (65)	0.467
	Yes (n=71)	29 (190)		72 (102)		166 (236)		0 (14)		67 (111)	
Relative Income Poverty	No (n=138)	143 (232)	<0.001	140 (141)	0.001	286 (321)	0.001	16 (30)	<0.001	58 (64)	0.047
	Yes (n=78)	69 (182)		64 (62)		142 (230)		4 (18)		78 (99)	
Deprivation	No (n=155)	148 (229)	<0.001	113 (121)	0.005	271 (306)	<0.001	17 (29)	<0.001	64 (65)	0.066
	Yes (n=61)	57 (145)		76 (70)		164 (225)		0 (14)		68 (104)	
Consistent Poverty	No (n=180)	129 (217)	0.001	110 (114)	0.001	245 (298)	<0.001	13 (29)	0.005	63 (66)	0.008
	Yes (n=36)	29 (145)		62 (58)		112 (185)		0 (17)		88 (124)	
Benefit Entitlement	No (n=115)	146 (214)	0.010	114 (127)	0.001	289 (319)	0.002	18 (29)	<0.001	66 (63)	0.849
	Yes (n=100)	73 (204)		79 (107)		188 (241)		4 (17)		65 (91)	
Medical Card	No (n=112)	157 (227)	0.001	141 (125)	<0.001	298 (338)	<0.001	21 (36)	<0.001	60 (63)	0.149
	Yes (n=104)	66 (196)		67 (81)		172 (228)		2 (17)		71 (97)	
Single Adult Family Unit	No (n=146)	145 (225)	0.012	110 (127)	0.031	259 (314)	0.005	17 (30)	<0.001	66 (72)	0.955
	Yes (n=70)	71 (192)		86 (93)		185 (228)		0 (17)		62 (89)	

Population intakes of Fruit and Fruit Juices, Vegetables, Fruit & Vegetables Combined, Breakfast Cereals and Sweet Foods & Confectionery are non-normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by non-parametric methods (Mann-Whitney U tests), with medians and interquartile ranges (IQR) reported.

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme. Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 4.18(a) Differences in Food Group Intakes among Valid Reporters (n=216) according to Selected Socio-economic Indicators

SE Indicator	Status	Meat & Meat Products		Fish		Dairy Products		Starchy Carbohydrates		Potatoes & Potato Products	
		Mean g/day (SD)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Mean g/day (SD)	p value	Median g/day (IQR)	p value
Disadvantage	No (n=63)	143 (63)	<0.001	26 (36)	<0.001	228 (150)	0.001	170 (58)	0.368	77 (71)	<0.001
	Yes (n=153)	184 (72)		0 (21)		166 (164.5)		180 (82)		165 (112)	
Social Class	High (n=113)	155 (66)	<0.001	21 (35)	<0.001	215 (155)	<0.001	174 (68)	0.473	100 (90)	<0.001
	Low (n=103)	191 (73)		0 (21)		144 (158)		181 (84)		180 (114)	
Socio-economic Group (SEG)	High (n=144)	166 (69)	0.061	18 (33)	<0.001	205 (161)	<0.001	176 (67)	0.641	110 (113)	<0.001
	Low (n=72)	185 (74)		0 (17)		138 (157)		181 (91)		179 (123)	
Education	High (n=132)	170 (70)	0.634	21 (34)	<0.001	200 (171)	0.006	176 (64)	0.734	108 (111)	<0.001
	Low (n=82)	175 (72)		0 (17)		159 (160)		180 (92)		180 (120)	
Early School Leaving	No (n=145)	174 (72)	0.627	17 (33)	0.002	201 (170)	0.001	179 (70)	0.688	115 (113)	<0.001
	Yes (n=71)	169 (70)		0 (21)		143 (159)		174 (87)		179 (111)	
Relative Income Poverty	No (n=138)	167 (72)	0.163	20 (34)	<0.001	188 (172)	0.878	178 (71)	0.828	108 (104)	<0.001
	Yes (n=78)	181 (70)		0 (17)		179 (177)		176 (84)		179 (100)	
Deprivation	No (n=155)	171 (71)	0.749	15 (33)	0.036	185 (175)	0.931	176 (66)	0.599	125 (122)	0.168
	Yes (n=61)	174 (74)		6 (21)		183 (184)		182 (97)		141 (125)	
Consistent Poverty	No (n=180)	174 (72)	0.430	14 (31)	0.008	184 (170)	0.678	179 (71)	0.426	124 (123)	0.133
	Yes (n=36)	164 (69)		0 (21)		195 (186)		168 (93)		171 (103)	
Benefit Entitlement	No (n=115)	162 (65)	0.035	17 (34)	0.014	203 (174)	0.095	176 (70)	0.835	107 (104)	<0.001
	Yes (n=100)	183 (78)		5 (21)		167 (166)		179 (82)		174 (115)	
Medical Card	No (n=112)	160 (69)	0.008	21 (35)	0.001	197 (172)	0.159	181 (68)	0.483	99 (84)	<0.001
	Yes (n=104)	185 (73)		0 (21)		166 (169)		173 (84)		181 (112)	
Single Adult Family Unit	No (n=146)	166 (68)	0.090	13 (30)	0.432	200 (176)	0.022	177 (71)	0.958	117 (110)	0.002
	Yes (n=70)	184 (77)		9 (26)		151 (150)		177 (85)		178 (114)	

Population intakes of Meat and Meat Products and Starchy Carbohydrates are normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by parametric methods (Independent t-tests), with means and standard deviations (SD) reported. Population intakes of Fish, Dairy Foods and Potatoes and Potato Products are non-normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by non-parametric methods (Mann-Whitney U tests), with medians and interquartile ranges (IQR) reported.

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme. Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 4.18(b) Differences in Food Group Intakes among Valid Reporters (n=216) according to Selected Socio-economic Indicators

4.3.7.2. Attitudinal Factors

The attitudinal factors which associate with differences in food group intakes are shown in Tables 4.19(a) and (b). Those which are significantly predictive of high fruit and fruit juice intake are high stage of dietary change score (action or maintenance vs. passive stages) ($p=0.006$), action or maintenance stage of dietary change (vs. all others) ($p=0.009$), active pursuit of a healthy diet ($p<0.001$) and use of the mass media for health information ($p<0.001$). Those which predict low fruit and fruit juice intake include chance locus of health control ($p=0.032$), pre-contemplation stage of dietary change ($p=0.029$) and citing taste ($p=0.015$) or knowledge ($p=0.032$) as a barrier to healthy eating. These attitudinal profiles are largely replicated when examining predictors of vegetable intake, although further significant predictors of intake are observed. For example, external locus of health control ($p=0.011$), and poor self-perceived health ($p=0.002$) predict lower intakes, while satisfaction with current bodyweight ($p=0.001$) and conscious efforts to limit fat in the diet ($p<0.001$) associate with higher intakes. Poor self-perceived dietary knowledge just fails to reach statistical significance as a predictor of low vegetable intake ($p=0.056$). For fruit and vegetable intake combined, the patterns described above are essentially very similar, although identification of price as a barrier to healthy eating just fails to predict lower intakes ($p=0.079$).

With reference to breakfast cereal intakes, chance locus of health control is significantly associated with lower intakes ($p=0.012$), while pre-contemplation stage of dietary change just fails to reach significance as a predictor of low intake ($p=0.060$), possibly due to the low number of respondents classified in this category ($n=23$).

Identification of taste as a barrier to healthy eating coincides with lower intakes ($p=0.004$), while poor perceived dietary knowledge as a predictor of low intake just fails to reach significance ($p=0.082$). Active stage of change score ($p<0.001$) and action or maintenance stage of change ($p<0.001$) are again prominent predictors of higher intake, as are active pursuit of a healthy diet ($p<0.001$) and conscious efforts to limit fat in the diet ($p=0.004$). These findings suggest that breakfast cereals are preferentially sought out by those making a conscious effort to improve their health and diet. Satisfaction with current diet ($p=0.004$) and with current bodyweight ($p=0.001$) also associate significantly with higher breakfast cereal intakes.

The attitudinal predictors of lower sweet food, sugar and confectionery intake are few, but include active stage of dietary change ($p=0.002$), action or maintenance stages of change ($p=0.003$) and conscious efforts to limit dietary fat ($p=0.006$).

The factors associated with lower meat and meat product consumption again include action or maintenance stage of dietary change ($p=0.025$) and active pursuit of a healthy diet ($p=0.017$), as well as use of the mass media for health information ($p=0.036$). Satisfaction with current bodyweight is also strongly predictive of lower meat intakes ($p=0.001$).

There are many attitudinal traits associated with variant fish consumption. Action or maintenance stages of dietary change ($p<0.001$), the active pursuit of a healthy diet ($p<0.001$), conscious efforts to limit dietary fat ($p=0.002$) and the use of mass media for health information ($p=0.003$) all predict higher intakes, identifying this as a key food group targeted by those making conscious efforts to improve their health and diet.

This is supported by the low intakes observed among those with a chance locus of control ($p<0.001$). As was the case for fruit and fruit juices, taste ($p=0.009$) and poor perceived dietary knowledge ($p=0.015$) also appear to be important barriers to fish intake.

Although this occurs to a less obvious extent than with breakfast cereals or fish, dairy foods also appear to be preferentially favoured by those pursuing a healthy lifestyle. Intakes are higher for those in the action or maintenance stage of change ($p=0.019$), those who report pursuing a healthy diet ($p=0.001$), and non-significantly for those attempting to limit dietary fat ($p=0.064$). However, poor dietary knowledge again appears to present a barrier to intake ($p=0.021$).

Potatoes and potato products are consumed in lower amounts by those in the action or maintenance stage of change ($p<0.001$), those actively pursuing a healthy diet ($p<0.001$), those attempting to restrict their dietary fat intake ($p=0.005$) and those who refer to the mass media for health information ($p=0.001$). This highlights this food group as one which is frequently avoided or limited by those with an active interest in healthy eating. Those who cite taste as a barrier to healthy diet however, consume these foods in greater quantities than their peers ($p=0.029$).

Overall, these findings indicate that motivation to improve diet is probably the main determinant of healthy eating behaviour in this group of young women, with most of those stating that they are making conscious efforts in this regard demonstrating more favourable dietary profiles across a wide range of food groups.

General attitudes to health also appear to have a bearing, with those with “chance” or “external” locus of control displaying generally less healthy dietary habits. Of the potential barriers to healthy eating, taste (fruit, vegetables, breakfast cereals and fish) and knowledge (fruit, fruit and vegetables, fish and dairy) are most prominent, with price being conspicuously absent, apart from a possible weak association with lower combined fruit and vegetable intake (p=0.079). Finally, use of the mass media (radio, television, magazines and the internet) as a source of health information is associated with generally better dietary patterns.

Attitudinal Variable	Status	Fruit & Fruit Juices		Vegetables		Combined Fruit & Vegetables		Breakfast Cereals		Sweet foods and Confectionery	
		Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value
Chance Health Locus	Yes (n=34)	36 (163)	0.032	67 (51)	<0.001	139 (252)	0.003	7 (16)	0.012	67 (104)	0.309
	No (n=177)	117 (228)		110 (125)		240 (301)		14 (29)		64 (67)	
External Health Locus	Yes (n=24)	114 (213)	0.244	70 (59)	0.011	187 (228)	0.097	9 (20)	0.121	79 (117)	0.331
	No (n=180)	115 (226)		108 (119)		234 (313)		16 (29)		65 (69)	
Internal Health Locus	Yes (n=209)	114 (225)	0.578	96 (114)	0.326	224 (297)	0.402	11 (27)	0.273	65 (71)	0.981
	No (n=6)	57 (273)		65 (163)		173 (358)		33 (55)		54 (122)	
Dietary Stage of Change Score	High (n=78)	159 (249)	0.006	160 (139)	<0.001	313 (352)	<0.001	21 (36)	<0.001	51 (52)	0.002
	Low (n=111)	86 (193)		74 (69)		172 (231)		9 (20)		77 (84)	
Pre-contemplation Stage of Change	Yes (n=23)	21 (189)	0.029	68 (66)	0.023	137 (202)	0.011	9 (17)	0.060	59 (78)	0.865
	No (n=192)	115 (229)		99 (115)		231 (288)		13 (29)		66 (73)	
Action/Maintenance Stage of Change	Yes (n=78)	159 (249)	0.009	160 (139)	<0.001	313 (352)	<0.001	21 (36)	<0.001	51 (52)	0.003
	No (n=137)	100 (200)		79 (75)		185 (255)		9 (20)		73 (84)	
10 year Future Salience	Yes (n=90)	100 (230)	0.177	91 (107)	0.049	213 (257)	0.066	9 (23)	0.163	73 (84)	0.032
	No (n=126)	114 (215)		110 (130)		227 (304)		13 (29)		57 (63)	
Conscious Effort to eat Healthily	Yes (n=127)	146 (240)	<0.001	133 (139)	<0.001	294 (325)	<0.001	18 (26)	<0.001	64 (63)	0.363
	No (n=85)	57 (184)		69 (89)		158 (209)		1 (14)		71 (89)	
"My Weight is OK for my Age"	Yes (n=111)	122 (247)	0.546	117 (129)	0.011	257 (342)	0.122	17 (30)	0.001	65 (62)	0.159
	No (n=90)	100 (228)		88 (99)		222 (269)		9 (20)		70 (96)	
My Diet is Already OK	Yes (n=79)	114 (227)	0.354	113 (139)	0.201	266 (347)	0.203	17 (25)	0.004	57 (65)	0.321
	No (n=130)	114 (229)		94 (101)		218 (267)		9 (23)		70 (84)	
Conscious Effort to Limit Dietary Fat	Yes (n=134)	115 (237)	0.362	113 (130)	0.001	271 (306)	0.016	17 (29)	0.004	59 (61)	0.006
	No (n=68)	106 (203)		76 (105)		190 (248)		4 (21)		80 (102)	
Taste Barrier to Healthy Eating	Yes (n=66)	62 (195)	0.015	74 (126)	0.001	188 (243)	0.003	4 (21)	0.004	75 (89)	0.289
	No (n=150)	115 (221)		108 (113)		243 (296)		14 (29)		59 (66)	
Price Barrier to Healthy Eating	Yes (n=52)	139 (197)	0.216	108 (142)	0.205	274 (266)	0.079	14 (29)	0.998	66 (85)	0.607
	No (n=163)	100 (229)		95 (114)		216 (290)		11 (26)		65 (70)	
Knowledge Barrier to Healthy Eating	Yes (n=28)	36 (188)	0.032	69 (56)	0.056	137 (222)	0.020	4 (15)	0.082	73 (114)	0.569
	No (n=188)	115 (229)		99 (123)		234 (286)		13 (29)		65 (71)	
Mass Media used for Health Information	Yes (n=118)	159 (215)	<0.001	114 (149)	<0.001	293 (323)	<0.001	17 (26)	<0.001	66 (69)	0.839
	No (n=98)	58 (189)		77 (107)		169 (234)		4 (17)		59 (78)	
Self-perceived Health	Good (n=167)	117 (229)	0.123	110 (127)	0.002	257 (268)	0.008	16 (29)	0.003	64 (72)	0.406
	Poor (n=49)	57 (207)		72 (71)		158 (233)		4 (14)		71 (77)	

"Chance Health Locus" describes those who report their health to be determined by chance, "External Health Locus" describes those who report their health to be determined by external factors over which they have no control, "Internal Health Locus" describes those who report their health to be under their own control. "Dietary Stage of Change Score" describes whether respondents fall into the passive or "low" stages (pre-contemplation, contemplation, decision), or into the active or "high" stages (action, maintenance). "10 Year Future Salience" describes whether respondents think about their lives in ten years time "fairly often" or "very often" ("yes") or "rarely" or "not very often" ("no"). "Conscious Effort to Eat Healthily" describes whether respondents report pursuing a healthy diet "Always", "Most of the Time" or "Quite Often" ("Yes"), or "Now and Again" or "Hardly Ever" ("No"). "My Weight is OK for My Age" describes whether respondents "Strongly Agree" or "Tend to Agree"("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "My weight is fine for my age". "My Diet is Already OK" describes whether respondents "Strongly Agree" or "Tend to Agree"("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "I don't need to make changes to my diet as it is healthy enough". "Conscious Effort to Limit Fat" describes whether respondents "Strongly Agree" or "Tend to Agree"("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "I try to keep the amount of fat that I eat to a healthy amount"." Taste Barrier to Healthy Eating", " Price Barrier to Healthy Eating", and "Knowledge Barrier to Healthy Eating" describes whether or not respondents cite these factors as impediments to healthy eating. "Mass Media used for Health Information" describes whether respondents select "Magazines", "Television", "Radio" or "Internet" among their top 3 sources of health information from a list of 10 possible options. "Self-perceived Health" describes whether respondents report their health to be "Good" (Excellent, Very Good or Good) or "Poor" (Fair or Poor).

Table 4.19(a) Intake of Food Groups according to Selected Attitudinal Traits among Valid Reporters (n=216)

Attitudinal Variable	Status	Meat and Meat Products		Fish		Dairy Products		Starchy Carbohydrates		Potatoes & Potato Products	
		Mean g/day (SD)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Mean g/day (SD)	p value	Median g/day (IQR)	p value
Chance Health Locus	Yes (n=34)	188 (72)	0.155	0 (2)	<0.001	146 (156)	0.093	199 (100)	0.064	180 (112)	0.016
	No (n=177)	169 (72)		17 (31)		195 (181)		173 (70)		121 (114)	
External Health Locus	Yes (n=24)	162 (64)	0.499	0 (19)	0.066	142 (82)	0.055	202 (97)	0.128	170 (96)	0.152
	No (n=180)	173 (74)		14 (31)		199 (175)		177 (71)		121 (122)	
Internal Health Locus	Yes (n=209)	172 (72)	0.969	11 (26)	0.862	184 (175)	0.336	176 (74)	0.154	126 (124)	0.682
	No (n=6)	173 (53)		11 (32)		252 (176)		221 (136)		110 (68)	
Dietary Stage of Change Score	High (n=78)	158 (67)	0.019	23 (38)	<0.001	216 (189)	0.033	174 (67)	0.667	101 (81)	<0.001
	Low (n=111)	182 (71)		0 (21)		176 (153)		179 (81)		160 (135)	
Pre-contemplation Stage of Change	Yes (n=23)	177 (76)	0.743	0 (22)	0.207	176 (164)	0.542	167 (84)	0.505	192 (132)	0.006
	No (n=192)	171 (71)		13 (26)		188 (176)		179 (75)		125 (120)	
Action/Maintenance Stage of Change	Yes (n=78)	158 (67)	0.025	23 (38)	<0.001	216 (189)	0.019	174 (67)	0.634	101 (81)	<0.001
	No (n=137)	180 (73)		0 (21)		176 (164)		179 (81)		163 (118)	
10 year Future Salience	Yes (n=90)	163 (69)	0.102	8 (25)	0.378	185 (185)	0.615	187 (89)	0.129	126 (109)	0.666
	No (n=126)	179 (73)		13 (31)		186 (163)		171 (64)		126 (135)	
Conscious Effort to eat Healthily	Yes (n=127)	161 (70)	0.017	21 (34)	<0.001	215 (171)	0.001	177 (72)	0.811	107 (87)	<0.001
	No (n=85)	185 (69)		0 (17)		153 (150)		179 (82)		179 (122)	
"My Weight is OK for my Age"	Yes (n=111)	158 (69)	0.001	17 (32)	0.614	198 (171)	0.107	178 (73)	0.752	121 (124)	0.174
	No (n=90)	191 (74)		10 (26)		174 (176)		181 (80)		138 (107)	
My Diet is Already OK	Yes (n=79)	171 (75)	0.571	14 (34)	0.231	198 (159)	0.165	182 (74)	0.612	122 (135)	0.166
	No (n=130)	177 (70)		8 (25)		178 (173)		176 (77)		133 (117)	
Conscious Effort to Limit Dietary Fat	Yes (n=134)	169 (69)	0.160	18 (34)	0.002	197 (181)	0.064	183 (76)	0.206	117 (119)	0.005
	No (n=68)	184 (78)		0 (21)		167 (152)		169 (74)		160 (130)	
Taste Barrier to Healthy Eating	Yes (n=66)	185 (70)	0.087	0 (21)	0.009	162 (153)	0.053	171 (79)	0.441	150 (132)	0.029
	No (n=150)	167 (72)		17 (32)		192 (175)		180 (75)		123 (113)	
Price Barrier to Healthy Eating	Yes (n=52)	158 (78)	0.107	15 (31)	0.519	194 (175)	0.911	186 (79)	0.349	135 (149)	0.758
	No (n=163)	177 (69)		11 (26)		182 (174)		175 (75)		125 (109)	
Knowledge Barrier to Healthy Eating	Yes (n=28)	157 (75)	0.242	0 (20)	0.015	113 (189)	0.021	135 (68)	0.002	151 (80)	0.431
	No (n=188)	174 (71)		14 (29)		190 (165)		184 (75)		125 (131)	
Mass Media used for Health Information	Yes (n=118)	162 (67)	0.036	17 (34)	0.003	205 (157)	0.167	182 (69)	0.345	112 (114)	0.001
	No (n=98)	183 (76)		0 (21)		155 (186)		172 (84)		158 (114)	
Self perceived Health	Good (n=167)	170 (70)	0.382	13 (28)	0.305	189 (175)	0.900	176 (70)	0.694	121 (122)	0.038
	Poor (n=49)	180 (77)		4 (22)		176 (179)		181 (92)		165 (145)	

"Chance Health Locus" describes those who report their health to be determined by chance, "External Health Locus" describes those who report their health to be determined by external factors over which they have no control, "Internal Health Locus" describes those who report their health to be under their own control. "Dietary Stage of Change Score" describes whether respondents fall into the passive or "low" stages (pre-contemplation, contemplation, decision), or into the active or "high" stages (action, maintenance). "10 Year Future Salience" describes whether respondents think about their lives in ten years time "fairly often" or "very often" ("yes") or "rarely" or "not very often" ("no"). "Conscious Effort to Eat Healthily" describes whether respondents report pursuing a healthy diet "Always", "Most of the Time" or "Quite Often" ("Yes"), or "Now and Again" or "Hardly Ever" ("No"). "My Weight is OK for My Age" describes whether respondents "Strongly Agree" or "Tend to Agree"("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "My weight is fine for my age". "My Diet is Already OK" describes whether respondents "Strongly Agree" or "Tend to Agree"("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "I don't need to make changes to my diet as it is healthy enough". "Conscious Effort to Limit Fat" describes whether respondents "Strongly Agree" or "Tend to Agree" ("Yes") or "Tend to Disagree" or "Strongly Disagree"("No") with the statement "I try to keep the amount of fat that I eat to a healthy amount"." Taste Barrier to Healthy Eating", " Price Barrier to Healthy Eating" and "Knowledge Barrier to Healthy Eating" describes whether or not respondents cite these factors as impediments to healthy eating. "Mass Media used for Health Information" describes whether respondents select "Magazines", "Television", "Radio" or "Internet" among their top 3 sources of health information from a list of 10 possible options. "Self-perceived Health" describes whether respondents report their health to be "Good" (Excellent, Very Good or Good) or "Poor" (Fair or Poor).

Table 4.19(b) Intake of Food Groups according to Selected Attitudinal Traits among Valid Reporters (n=216)

4.3.7.3. Health Behavioural and Anthropometric Factors

The health behavioural and anthropometric factors which associate with variations in food group intakes are depicted in Tables 4.20(a) and (b). There is clear co-prevalence of low fruit intake with other unhealthy behaviours among this population. Fruit and fruit juice intakes are lower among those who do not participate in vigorous exercise ($p=0.030$) and especially among those who smoke ($p=0.003$), while those not taking dietary supplements also have lower intakes ($p=0.030$). Associations are also evident between these deleterious health behaviours and low vegetable consumption and low breakfast cereal consumption. In the case of breakfast cereals, high waist circumference is also associated with low intakes ($p=0.004$). While none of these health behaviours associate significantly with high intake of sweet foods and confectionery, the relationship between increased waist circumference (>88cm) and high intake of these foods just fails to reach significance ($p=0.057$).

High alcohol intake (>14 units per week) associates significantly with higher intake of meat and meat products ($p=0.019$), and these higher meat intakes are also associated with a greater prevalence of overweight (BMI>25kg/m^2) ($p=0.010$) and central adiposity (waist circumference >88cm) ($p<0.001$).

Like fruit, vegetables and breakfast cereals, non-participation in vigorous activity ($p=0.011$), non-dietary supplement use ($p=0.023$) and smoking ($p<0.001$) are all associated with lower fish intakes, again highlighting these food groups as ones which are preferentially selected by those with an active interest in healthy eating and overall healthy lifestyles. These deleterious behaviours also associate with higher potato and potato product consumption, re-emphasing the association of these foods with poorer diet and lifestyle choices.

Smoking ($p=0.008$) and non-dietary supplement use ($p=0.047$) associate significantly with lower dairy food intakes, while these low dairy intakes also coincide with a greater prevalence of central adiposity ($p=0.016$). High intakes of starchy foods (bread, rice, pasta) and potatoes and potato products are significantly associated with increased prevalence of overweight ($p=0.001$ and $p=0.040$ respectively) and central adiposity ($p=0.002$ and $p=0.002$ respectively), although this finding may relate to greater overall energy intakes among high consumers of these foods, rather than any disproportionate over-consumption of these high carbohydrate staples.

Overall, these findings suggest the significant co-segregation of poor dietary choices with deleterious health behaviours, most notably non-participation in vigorous activity, non-dietary supplement use and smoking. These issues will be further examined in Chapter 5, to ascertain whether these trends relate specifically to the *co-occurrence* of these negative behaviours in certain individuals.

The poorer food intake patterns described are also associated with significantly less favourable anthropometric status, particularly low intake of breakfast cereals and dairy foods, and high intake of meat and meat products, starchy foods and potatoes and potato products.

Health Behaviour	Status	Fruit & Fruit Juices		Vegetables		Combined Fruit & Vegetables		Breakfast Cereals		Sweet foods and Confectionery	
		Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value
Physical Activity Level	High (n=89)	115 (241)	0.665	95 (150)	0.545	261 (264)	0.417	13 (26)	0.998	73 (90)	0.168
	Low (n=127)	105 (208)		96 (105)		211 (315)		11 (27)		59 (62)	
Participation in Vigorous Activity	Yes (n=70)	168 (227)	0.030	139 (175)	0.007	296 (320)	0.006	18 (31)	0.015	70 (69)	0.775
	No (n=146)	100 (222)		90 (96)		192 (265)		9 (24)		63 (74)	
Weekly Alcohol Intake	High (n=73)	96 (200)	0.175	85 (117)	0.206	186 (283)	0.374	5 (22)	0.756	59 (67)	0.368
	Low (n=141)	114 (229)		101 (120)		241 (296)		17 (29)		67 (75)	
Dietary Supplement Use	Yes (n=76)	144 (228)	0.030	141 (146)	0.001	302 (290)	0.002	17 (46)	0.001	62 (75)	0.306
	No (n=137)	100 (203)		86 (101)		193 (255)		9 (21)		67 (70)	
Smoking	Yes (n=103)	69 (193)	0.003	79 (104)	<0.001	181 (226)	<0.001	2 (14)	<0.001	57 (88)	0.385
	No (n=111)	157 (242)		122 (125)		296 (357)		20 (23)		71 (68)	
Body Mass Index Status	High (n=85)	100 (234)	0.897	94 (92)	0.676	224 (272)	0.874	9 (21)	0.153	67 (82)	0.463
	Low (n=131)	114 (219)		98 (120)		229 (302)		15 (29)		64 (65)	
Waist Circumference Status	High (n=81)	100 (231)	0.425	90 (92)	0.186	211 (236)	0.293	9 (17)	0.004	71 (85)	0.057
	Low (n=135)	117 (229)		108 (125)		233 (347)		17 (29)		64 (61)	
Self-perceived Stress Level	High (n=83)	100 (200)	0.174	90 (115)	0.286	195 (256)	0.174	9 (23)	0.264	64 (93)	0.785
	Low (n=133)	115 (236)		98 (111)		235 (347)		13 (28)		66 (69)	

BMI – Body Mass Index, IQR – Inter-quartile Range

Population intakes of Fruit and Fruit Juices, Vegetables, Fruit & Vegetables Combined, Breakfast Cereals and Sweet Foods & Confectionery are non-normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by non-parametric methods (Mann-Whitney U tests), with medians and inter-quartile ranges (IQR) reported.

"Physical Activity Level" describes whether respondents have a "High" or "Low" activity level based on a combination of participation in vigorous activity (yes or no) and typical daily sitting time (duration). "Participation in Vigorous Activity" denotes whether respondents engage in any vigorous activity in a typical week. "Weekly Alcohol Intake" is dichotomised into "High" (greater than 14 units (140mls pure ethanol) per week), and "Low" (none or less than 14 units (140mls pure ethanol) per week). "Dietary Supplement Use" describes whether or not respondents currently use any dietary supplements (e.g. vitamin and mineral tablets). "Body Mass Index Status" describes whether respondents are categorised into the ideal or "Low" grouping ($<25kg/m^2$) or into the overweight/obese "High" grouping ($\geq 25kg/m^2$). "Waist Circumference Status" describes whether respondents are classified into the lower risk "Low" category (<88cm) or into the higher risk "High" category (≥88cm). "Self-perceived Stress Level" describes whether respondents have "High" stress levels (experience psychological stress at least once per day) or "Low" stress levels (experience psychological stress less than once per day).

Table 4.20(a) Intake of Food Groups according to Selected Health Behavioural and Anthropometric Characteristics among Valid Reporters (n=216)

Health Behaviour	Status	Meat and Meat Products		Fish		Dairy Products		Starchy Carbohydrates		Potatoes & Potato Products	
		Mean g/day (SD)	p value	Median g/day (IQR)	p value	Median g/day (IQR)	p value	Mean g/day (SD)	p value	Median g/day (IQR)	p value
Physical Activity Level	High (n=89)	170 (76)	0.726	13 (29)	0.328	188 (172)	0.906	184 (73)	0.245	127 (122)	0.786
	Low (n=127)	174 (69)		7 (26)		179 (187)		172 (78)		125 (127)	
Participation in Vigorous Activity	Yes (n=70)	169 (76)	0.623	19 (35)	0.011	191 (168)	0.333	179 (70)	0.819	110 (102)	0.007
	No (n=146)	174 (70)		0 (26)		178 (172)		176 (79)		142 (112)	
Weekly Alcohol Intake	High (n=73)	188 (73)	0.019	7 (23)	0.429	191 (163)	0.858	177 (70)	0.975	168 (130)	0.328
	Low (n=141)	164 (70)		13 (29)		184 (184)		177 (79)		121 (112)	
Dietary Supplement Use	Yes (n=76)	165 (76)	0.324	19 (41)	0.023	216 (178)	0.047	175 (69)	0.606	103 (87)	<0.001
	No (n=137)	176 (69)		9 (23)		177 (170)		180 (79)		152 (115)	
Smoking	Yes (n=103)	175 (71)	0.549	0 (19)	<0.001	157 (166)	0.008	168 (80)	0.076	163 (118)	<0.001
	No (n=111)	169 (72)		21 (34)		202 (164)		187 (71)		116 (112)	
Body Mass Index (BMI) Status	High (n=85)	188 (78)	0.010	13 (26)	0.516	164 (176)	0.089	199 (80)	0.001	150 (120)	0.040
	Low (n=131)	162 (66)		11 (26)		196 (172)		163 (70)		118 (123)	
Waist Circumference Status	High (n=81)	195 (76)	<0.001	6 (24)	0.243	166 (153)	0.016	198 (80)	0.002	161 (110)	0.002
	Low (n=135)	159 (66)		16 (31)		203 (173)		165 (71)		117 (112)	
Self-perceived Stress Level	High (n=83)	163 (65)	0.151	9 (26)	0.827	186 (163)	0.575	191 (82)	0.031	127 (146)	0.552
	Low (n=133)	178 (75)		13 (26)		184 (187)		168 (70)		124 (107)	

BMI – Body Mass Index, SD – Standard Deviation, IQR – Inter-quartile Range

Population intakes of Meat and Meat Products and Starchy Carbohydrates are normally distributed and the differences between the disadvantaged and advantaged groups assessed by parametric methods (Independent samples t-tests), with means and standard deviations (SD) reported. Population intakes of Fish, Dairy Foods and Potatoes and Potato Products are non-normally distributed and the differences between the disadvantaged and advantaged cohorts assessed by non-parametric methods (Mann-Whitney U tests), with medians and inter-quartile ranges (IQR) reported.

"Physical Activity Level" describes whether respondents have a "High" or "Low" activity level based on a combination of participation in vigorous activity (yes or no) and typical daily sitting time (duration). "Participation in Vigorous Activity" denotes whether respondents engage in any vigorous activity in a typical week. "Weekly Alcohol Intake" is dichotomised into "High" (greater than 14 units (140mls pure ethanol) per week), and "Low" (none or less than 14 units (140mls pure ethanol) per week). "Dietary Supplement Use" describes whether or not respondents currently use any dietary supplements (e.g. vitamin and mineral tablets). "Body Mass Index Status" describes whether respondents are categorised into the ideal or "Low" grouping ($<25kg/m^2$) or into the overweight/obese "High" grouping ($\geq25kg/m^2$). "Waist Circumference Status" describes whether respondents are classified into the lower risk "Low" category (<88cm) or into the higher risk "High" category (≥88cm). "Self-perceived Stress Level" describes whether respondents have "High" stress levels (experience psychological stress at least once per day) or "Low" stress levels (experience psychological stress less than once per day).

Table 4.20(b) Intake of Food Groups according to Selected Health Behavioural and Anthropometric Characteristics among Valid Reporters (n=216)

4.4. Discussion

Low socio-economic status has been consistently associated with adverse dietary and nutritional intake patterns. James *et al.* (1997) identified an excessive intake of higher fat meat and meat products, fats, sugars, preserves and refined cereals, coupled with a deficient intake of fruit and vegetables and wholegrain cereals among lower socio-economic groups. Such diets are often described as “energy dense” but “nutrient dilute” – they have excessive energy density due to their high fat, sugar and refined carbohydrate content, but are low in essential micronutrients including iron, calcium, magnesium, folate and vitamin C. The data described in the previous results section clearly demonstrate the existence of similarly adverse patterns among disadvantaged respondents in the current study.

4.4.1. Methodology

In any study which aims to elucidate the dietary and health behaviours of socially disadvantaged groups, the methodological procedures employed to derive this information are critical. This is because of the significant difficulties which arise in carrying out survey work with such groups including inaccessibility of prospective participants, poor literacy and poor comprehension (Parnell, 2007). In addition to these impediments, the complexity and detail of both the dietary information required and the sociological processes at hand, often make the investigation of diet and nutritional intake among these groups extremely difficult.

In the current study, measures have been taken to overcome these issues. The development of the sampling frame described in Chapter 2 was undertaken to ensure that the group surveyed were as representative as possible of their wider peer group in the Greater Dublin area. The recruitment of respondents in these geographical districts was, by necessity, conducted through local community development and training groups. Although such convenience sampling may capture respondents who do have some degree of social participation, attempts to recruit subjects by other means (e.g. door to door interview or by arranged individual appointments) proved impossible in the current context.

The data collection for both the disadvantaged and advantaged groups was conducted simultaneously over a period of almost eleven months, to minimise the effect of seasonal bias on food intake or health behaviours. In addition, subjects were incentivised to participate by providing vouchers for a local food and clothing retailer. From the pragmatic viewpoint, this measure enhanced overall participation rates very considerably. However, it also helped to reduce sampling bias, by ensuring that those who took part were not doing so out of a specific personal interest in diet or health which might coincide with behavioural patterns which were unrepresentative of their wider peer group.

With regard to dietary assessment, three instruments were used for this purpose, with preliminary internal comparability studies accompanied by detailed external reference techniques to compare the reliability of data generated by each, as described in Chapter 3. This was necessary because standard assessment methods which may be applicable to the wider population, are not always appropriate for use in discrete sub-groups within that population. For example, standard food frequency questionnaires (FFQs) may omit foods of specific relevance to these groups, while seven day weighed records (or estimated records as employed by the NSIFCS (Harrington *et al.*, 2001)) and multiple 24-hour diet recalls (as used by the Low Income Diet and Nutrition Survey (LIDNS) in the UK) may be contraindicated due to difficulties with respondent compliance or follow-up (only ~55% of all participants in the latter study completed all four 24 hour diet recalls). The inclusion of the diet history protocol in the current study, as well as the range of socio-demographic indicators sought, significantly increased the duration of the interview sessions, requiring the involvement of three fieldworkers to aid subjects with comprehension or literacy difficulties. However, the greater reliability of dietary data from the diet history method justified its inclusion and the subsequent use of its data in the food and nutrient analyses. The integrity of this dietary data was further enhanced by the exclusion of dietary misreporters (mainly under-reporters) according to the procedures described in Chapter 3 (Black, 2000). This again was a crucial measure, to prevent the inaccurate over-estimation of micronutrient inadequacy among both the disadvantaged and advantaged populations.

With regard to the demographic, environmental, socio-economic, attitudinal, health behavioural and health status data sought, this information was elicited primarily by the use of questions employed in other studies, as described in Chapter 2. Unlike many other studies, a full panel of socio-economic indicators were captured including occupational social class, socio-economic group, education, employment, income, deprivation, consistent poverty, benefit and medical card entitlement, household and family structure, literacy, numeracy and indebtedness. Collection of data for these parameters facilitated extensive investigation into the different structures and dimensions of poverty which are predictive of poorer diet and health behaviours among young, urbanised women.

With reference to both the socio-economic and attitudinal data from the quantitative study, these were dichotomised for comparison against food group consumption, nutrient intake and health behaviours. This was deemed the most appropriate method to highlight any behavioural differences arising between those of low and high status in a sample population of this size.

For attitudinal associations with behaviour however, it is recognised that quantitative assessment using dichotomous variables cannot capture the full nature and complexity of these interactions. For example, future salience was estimated by enquiring how often respondents thought about their future in ten years time, although other timeframes could equally have been selected for this assessment. Also, even where considerable differences between the dichotomous categories were observed, the sample size in one category may be insufficient to yield statistically significant findings, as would seem to be the case for the pre-contemplation stage of dietary change. For these reasons, the quantitative attitudinal data yielded by this part of the study were augmented by qualitative data providing more comprehensive insights in this regard. These qualitative investigations are described in Chapter 6.

4.4.2. Results

This study illuminates pronounced differences in the dietary intake of young, urbanised women of differing socio-economic status. The lower social groupings have significantly lower intakes of energy-dilute, nutrient rich foods including fruit, vegetables, breakfast cereals, fish and dairy foods. They simultaneously show significantly higher intakes of energy dense foods like meat and meat products and potatoes and potato products.

The socio-economic disparities in these food groups will now be explored in the context of existing literature in this area. Their established impact on energy, dietary fibre, macronutrient, vitamin and mineral intakes will then be discussed. Finally, the socio-economic, attitudinal and health behavioural factors associated with these adverse dietary patterns will be investigated, with a view to forwarding intervention models which might effectively address these disparate intake patterns.

4.4.2.1. Food Groups

4.4.2.1.2. Fruit and Vegetables

The disadvantaged group in the current study cohort demonstrate significantly lower mean and median intakes of fruit and fruit juices ($p<0.001$) and vegetables ($p<0.001$) than their advantaged peers. The consumption of vegetables by 94.8% and 98.4% of disadvantaged and advantaged respondents respectively, indicate that the socio-economic differences in mean intake are likely to arise from variations in either typical portion size, or, more likely, from differences in the frequency of consumption. Conversely, there is a significant difference in the *prevalence* of fruit and fruit juice consumption according to socio-economic status, with a considerably greater proportion of those in the higher social grouping (93.7%) consuming these foods, compared with their less affluent peers (68.6%). Hence, the differences in mean consumption levels which arise in this instance are likely to be attributable to differences in the *proportion of consumers* as well as differences in the *amounts taken by these consumers* between the two populations. The persistence of differences in fruit and fruit juice intake between disadvantaged and advantaged consumers only ($p=0.006$), confirms this to be the case.

The deleterious impact of lower fruit and vegetable consumption on energy, dietary fibre, macronutrient and micronutrient intakes in this population has also been suggested by preliminary univariate analyses. Low fruit and fruit juice intakes are significantly associated with lower intakes of dietary fibre ($p<0.001$), higher intakes of fat ($p=0.020$), lower intakes of vitamin B1 ($p<0.001$), vitamin B2 ($p<0.001$), vitamin B3 ($p<0.001$) and folate ($p<0.001$), lower intakes of vitamin C ($p<0.001$), vitamin D ($p=0.042$) and vitamin E ($p=0.001$), and lower intakes of iron ($p<0.001$), calcium ($p<0.001$), magnesium ($p<0.001$) and selenium ($p<0.001$). The association of low vegetable intakes with adverse nutrient intake profiles is even more profound. Here, low vegetable intakes were significantly associated with lower intakes of dietary fibre ($p<0.001$), and higher intakes of fat ($p<0.001$), saturated fat ($p<0.001$), and NMES ($p<0.001$). They are also predictive of lower vitamin B1 ($p<0.001$), vitamin B2 ($p=0.016$), vitamin B3 ($p<0.001$), folate ($p<0.001$), vitamin C ($p<0.001$), vitamin D ($p<0.001$), and vitamin E ($p<0.001$), intakes as well as lower iron ($p=0.001$), magnesium ($p=0.001$) and selenium ($p=0.010$) intakes.

Examination of the food group contributors to nutrient intake in this population clearly suggests that fruit and vegetables feature less prominently in the diets of the disadvantaged group in this regard. These low SES women receive just 3% of their overall dietary energy from fruit and fruit juices, and 2% from vegetables, compared with their more advantaged counterparts who receive 6% and 5% of their energy respectively from these two food groups. These differences contribute to a proportionately lower energy intake from carbohydrate (46% vs. 49%) ($p<0.001$), and a significantly greater percentage energy intake from fat (35% vs. 30%) ($p<0.001$), among the disadvantaged group, precipitating a considerably greater overall energy intake among these low SES women ($p<0.001$).

Additionally, fruit (17% vs. 8%) and vegetables (21% vs. 10%) contribute only half the proportion of dietary fibre to the diets of the disadvantaged group, precipitating a significantly lower overall dietary fibre intake than that of their more affluent peers ($p<0.001$). Their significantly higher NMES intake ($p<0.001$) may also be suggestive of a displacement effect of sweet foods and drinks on fruit and vegetables.

With regard to vitamin intake, the disadvantaged group derive a substantially lower percentage of their vitamin B1 (5% vs. 9%), vitamin B2 (2% vs. 4%), vitamin B6 (5% vs. 10%), folate (6% vs. 10%), vitamin C (29% vs. 38%) and vitamin E (4% vs. 10%) from the fruit and fruit juices group, and a much lower proportion of their vitamin B1 (7% vs. 16%), vitamin B3 (3% vs. 7%), vitamin B6 (4% vs. 13%), folate (10% vs. 21%), vitamin C (16% vs. 41%) and vitamin E (9% vs. 19%) from the vegetable group. In terms of absolute vitamin intakes, after discounting the contribution of supplements, these disadvantaged women have significantly lower intakes of vitamin B3 ($p=0.001$), vitamin C ($p<0.001$) and carotene ($p<0.001$), while there is also a tendency towards lower folate intakes ($p=0.060$). For many of the vitamins associated with fruit and vegetables including vitamin B1, vitamin B2, vitamin B3, folate, vitamin C, carotene and vitamin E, the dietary concentration per MJ of energy consumed is significantly lower among the disadvantaged group. They are also significantly less likely to achieve the recommended daily intake for two of these vitamins, folate ($p=0.050$) and vitamin C ($p<0.001$).

With regard to mineral intakes, the disadvantaged women derive a lower percentage of their iron (2% vs. 3%), calcium (2% vs. 3%), magnesium (5% vs. 9%), zinc (1% vs. 2%), and selenium (2% vs. 3%) from fruit and fruit juices.

They also derive a lower proportion of their iron (6% vs. 12%), calcium (3% vs. 5%), magnesium (4% vs. 9%), zinc (3% vs. 6%) and selenium (2% vs. 5%) from the vegetable group. They have significantly lower intakes of iron (p=0.011) and magnesium (p=0.035) when the contribution of supplements is discounted, and the iron, calcium, magnesium, zinc and selenium concentrations of the diet per MJ of energy consumed are also significantly lower in this group. Additionally, this group are significantly less likely to meet the recommended daily intake for calcium than the advantaged group (p=0.019).

The findings of the current study echo those of previous studies where low fruit and vegetable intakes have been consistently identified among those in the lower social strata. Irala-Estevez *et al.* (2000) demonstrated significantly lower intakes of fruit and vegetables for both men and women of lower socio-economic status across the then 15 EU member states. This association persisted whether educational status or occupational social class was used to define low SES. Further international research from other developed countries including Australia (Giskes *et al.*, 2002a; Giskes *et al.*, 2002b), New Zealand (Metcalf *et al.*, 2006), Norway (Wandel, 1995), the Netherlands (Hulshof *et al.*, 2003; Kamphuis *et al.*, 2007), Denmark (vegetables only) (Groth *et al.*, 2001) and the UK (Billson *et al.*, 1999; Shohaimi *et al.*, 2004), has consistently shown lower fruit and vegetable intakes among lower socio-economic groups defined by a range of indices including income, education, household structure, area of residence and occupational social class. Indeed, some studies have described a widening social gradient in fruit and vegetable consumption over recent years (Wrieden *et al.*, 2004).

The nutritional impact of low fruit and vegetable intakes has also been demonstrated in previous studies. Findings from the NSIFCS indicated that fruit and vegetables have a considerable positive impact on the nutritional quality of the Irish diet. For example, vegetables and vegetable dishes contribute significantly to mean daily intakes of dietary fibre (17%) and non-starch polysaccharide (NSP) (19%) (Galvin *et al.*, 2001), as well as significantly enhancing mean daily carotene (59.8%), vitamin A (30.7%), vitamin E (18.9%), folate (10.9% for men and 13.6% for women) and vitamin C (22.1%) intakes (O'Brien *et al.*, 2001). Fruit and nuts also contribute significantly to mean daily intakes of dietary fibre (8.1%) and non-starch polysaccharide (8.2%), as well as vitamin C (25.2%) and copper (12.1%) (Hannon *et al.*, 2001). Hence it is unsurprising that the existence of socio-economic gradients in intake of these foods would be likely to exert a considerable deleterious impact upon the nutritional intake of low SES women in Ireland, as demonstrated in the current study.

Investigation of the socio-economic factors associated with lower fruit and fruit juice intake and lower vegetable consumption in the current study reveals each of the 11 indices of disadvantage to be significantly associated with these lower intakes. While this precludes a meaningful comparison between the material and social constructs of poverty which may contribute to these trends, it does highlight the potential role of barriers such as affordability and cultural acceptability.

Friel *et al.,* (2005) have described similar socio-economic variation in overall fruit and vegetable intake patterns in the SLAN survey, concluding that "material and structural influences matter very much for females in respect to compliance with fruit and vegetable recommendations. For males, while these factors are important, they appear to be mediated through other more socially contextual type factors". Other researchers have also emphasised the principle importance of cost in determining low fruit and vegetable intakes among low SES groups (Drewnowski, 2004; Drewnowski & Specter, 2004; Kamphuis *et al.*, 2007).

The current study indicates differences in fruit and fruit juice and vegetable consumption according to a number of attitudinal variables. The attitudinal factors which associate significantly with high fruit and fruit juice intake are primarily those which are indicative of motivation towards healthy diet and lifestyles such as active stage of change score ($p=0.006$), action or maintenance stage of dietary change ($p=0.009$), active pursuit of a healthy diet ($p<0.001$) and use of the mass media for health information ($p<0.001$). Those which predict low intakes include chance locus of health control ($p=0.032$) and pre-contemplation stage of dietary change ($p=0.029$). These findings strongly suggest that *those who are motivated to improve their diet* recognise increased fruit and fruit juice intakes as an important means of achieving this aim (although the lower intakes among less motivated respondents may not necessarily be solely attributable to their lower motivation). The attitudinal traits associated with high fruit intake are very similar to those which discriminate between high and low vegetable intake, again highlighting the importance of motivation in eliciting more favourable intake patterns. With regard to the barriers to fruit and vegetable consumption, taste preferences ($p=0.015$) and poor self-perceived dietary knowledge ($p=0.032$) emerge as obstacles to fruit consumption, while taste preferences are even more strongly associated with low vegetable consumption ($p=0.001$). Poor self-perceived dietary knowledge just fails to reach statistical significance as a predictor of low vegetable intake ($p=0.056$).

These findings emphasise the continued importance of educating low SES groups about the benefit of fruit and vegetable consumption, and of exposing younger people of low SES to these foods early in life to prevent sensory rejection later on. For fruit and vegetable intake combined, the identification of price as a barrier to healthy eating just fails to predict lower intakes (p=0.079), perhaps suggesting that affordability may play some role in mediating low intakes among this population.

The findings above are in many cases reflective of those revealed by other studies in this area. Pollard *et al.* (2002) also found maintenance stage of dietary change to be a potent predictor of fruit and vegetable intake among their cohort of middle aged UK women. Van Duyn *et al.* (2001), in their nationally representative sample of US adults, also identified a significant association between the action and maintenance stages of dietary change and fruit and vegetable intake levels. In a nationally representative sample of UK adults (Wardle & Steptoe, 2003), lower health consciousness, stronger belief in the influence of chance on health, lower future salience (consideration of the future) and lower self-perceived life expectancy were identified among lower SES respondents. Crucially, these adverse attitudinal characteristics correlated with health subversive behaviours among these lower SES subjects, including lower fruit and vegetable consumption.

With regard to other potential impediments to fruit and vegetable intake, self-perceived dietary knowledge and taste emerge as the barriers of greatest importance among the current study population. Van Duyn *et al.* (2001) have reported a 22% greater intake of fruit and vegetables among those who were aware of the “5 or more a day” message.

Similarly very strong associations between nutritional knowledge and adherence to fruit and vegetable recommendations have been reported among UK adults, with those in the highest quintile for knowledge almost 25 times more likely to meet recommended guidelines than those in the lowest quintile (Wardle *et al.*, 2000). This group went further, to assert that nutritional knowledge was a potent "partial mediator" of the socio-demographic differences in fruit and vegetable intake, and highlighted the importance of including improved nutritional knowledge as a target of health education campaigns.

In addition to nutritional knowledge, Van Duyn *et al.,* (2001) also emphasised the role of taste as a critical predictor of fruit and vegetable intake. From the Irish perspective, Kearney *et al.*, (2000) revealed taste to be the second most frequently cited influence on food choice among a representative sample of Irish adults, with 43% of the population selecting this option as opposed to only 36% selecting the "healthy eating" option. Kearney & McElhone, (1999) also identified taste as a significant barrier to healthy eating among the Irish adult population, with many perceiving taste and palatability of the diet to be compromised by healthy eating.

The identification of taste as an obstacle to healthy eating, including fruit and vegetable consumption, is important in the socio-economic context. Food neophobia refers to a reluctance to try new or unfamiliar foods to which a person is unaccustomed, and is often the legacy of limited exposure to different tastes and textures in infancy and early childhood, conditions which are thought to prevail among children raised in socially deprived circumstances.

The exposure of these children to a smaller variety of foods (often energy dense, nutrient dilute varieties), may relate to food insecurity, where due to budgetary constraints, parents may favour foods which are sure to be accepted by children, irrespective of their nutritional content (Knol *et al.,* 2004). Hence, apart from the cultural barriers to the consumption of fruit and vegetables in later life, this may create a sensory barrier to the adoption of these foods by low SES children (Baxter & Schröder, 1997), increasing their propensity towards lower intakes in adulthood.

Examination of the health behaviours associated with low fruit and vegetable consumption is useful to identify potential population groups for targeted intervention programmes. In the current study, those who do not participate in vigorous exercise have significantly lower intakes of fruit and fruit juices ($p=0.030$), vegetables ($p=0.007$) and fruit and vegetables combined ($p=0.006$), while those who do not use dietary supplements show very similar patterns. Smokers demonstrate significantly lower intakes of fruit and fruit juices ($p=0.003$), vegetables ($p<0.001$) and fruit and vegetables combined ($p<0.001$). These findings suggest the co-segregation of low fruit and vegetable intakes with other health-subversive behaviours in this population, and suggest that these dietary patterns may be symptomatic of overall less healthy lifestyle. Such groups may thus represent useful targets for mixed health promotion interventions incorporating fruit and vegetable intake advice.

Taken together, the findings above reveal a strong association between social and material deprivation, and lower fruit and vegetable consumption. The association between low fruit and vegetable intakes and poorer health locus of control and stage of dietary change characteristics, highlights poor motivation as an important impediment to increased fruit and vegetable intakes among this population.

Taste preferences and poor dietary knowledge are further barriers which may compromise fruit and vegetable intake. While price surprisingly appears to be a less important perceived obstacle in this regard, this may relate to limited experience in budgeting for such items. The association of attitudinal traits with low fruit and vegetable intakes, raises the possibility that they may act as potential effectors of the socio-economic gradient in intake levels of these foods. This view is supported by the coincidence of low intakes with other adverse health behaviours which may also be mediated through these attitudinal traits.

4.4.2.1.2. Breakfast Cereals

Dietary data from the current study population indicate significantly lower breakfast cereal (including porridge) intakes among the disadvantaged group ($p<0.001$), when compared with their more affluent peers. Furthermore, breakfast cereal intakes for these disadvantaged subjects are substantially lower than those reported in Chapter 1 for the equivalent group in NSIFCS, where significant social class and educational gradients were not observed (see Chapter 1). There is evidence that the considerably lower breakfast cereal intakes which occur among the disadvantaged cohort in the current study population relate to significant differences in the prevalence of breakfast cereal consumption (85.7% of advantaged respondents vs. 58.2% of disadvantaged subjects) between the two groups. However, among consumers of breakfast cereals only, lower intakes persist in the low SES women ($p<0.001$), suggesting that lower frequency of consumption (and possibly lower portion size) are also contributory factors.

The potential negative impact of low breakfast cereal consumption on energy, dietary fibre and macronutrient intakes in the current study population has been alluded to previously.

Lower intakes are significantly associated with lower dietary fibre intake ($p<0.001$), and higher fat ($p<0.001$), saturated fat ($p=0.012$) and NMES ($p=0.018$) intakes. With regard to vitamin intakes, low breakfast cereal consumption associates with lower intakes of vitamin B1 ($p<0.001$), vitamin B2 ($p<0.001$), vitamin B3 ($p<0.001$) and folate ($p<0.001$), as well as lower intakes of vitamin C ($p<0.001$), vitamin D ($p<0.001$) and vitamin E ($p<0.001$), and iron ($p<0.001$), calcium ($p<0.001$) and magnesium ($p<0.001$).

As was the case for fruit and vegetables, investigation of the food group contributors to nutrient intake indicates that breakfast cereals feature much less prominently for the disadvantaged group in this regard. Breakfast cereals are found to provide considerably less energy to the diets of these women (2%), when compared with the advantaged group (4%). They also contribute only half the percentage of carbohydrate (3% vs. 6%), and a third of the percentage of NSP (3% vs. 9%) to the diets of these disadvantaged women in comparison with their more advantaged peers. The breakfast cereal group also makes a much less significant contribution to micronutrient intakes among the disadvantaged group. They derive a lower percentage of their vitamin B1 (8% vs. 14%), vitamin B2 (8% vs. 13%), vitamin B3 (8% vs. 11%), vitamin B6 (7% vs. 10%), folate (9% vs. 13%), vitamin C (2% vs. 4%), vitamin D (5% vs. 11%) and vitamin E (1% vs. 5%) from these foods than their more affluent reference group. They also receive a lower proportion of their iron (10% vs. 18%), calcium (1% vs. 4%) and zinc (2% vs. 5%) from this food group.

The findings outlined above suggest that the lower breakfast cereal intakes observed among the disadvantaged group will be likely to exert a substantial deleterious impact on the overall nutritional intake of these women, and evidence of just such an effect is provided by nutrient intake analyses. For example, the disadvantaged group derive a significantly lower proportion of their energy from carbohydrate ($p<0.001$) and a significantly higher proportion from fat ($p<0.001$), saturated fat ($p<0.001$) and NMES ($p<0.001$). They also have a significantly lower intake of dietary fibre ($p<0.001$) and NSP ($p<0.001$) than their more advantaged peers. Their compliance with recommended intake guidelines for carbohydrate ($p=0.017$), fat ($p<0.001$), saturated fat ($p<0.001$), NMES ($p<0.001$) and cholesterol ($p<0.001$) is also significantly lower than that of their advantaged counterparts.

Because many of these cereals are fortified with additional micronutrients, it is unsurprising that their lower intakes among the disadvantaged group coincide with lower intakes of several of these vitamins and minerals. Even after discounting the contribution from dietary supplements, significantly lower intakes of vitamin B3 persist among the disadvantaged group ($p=0.001$), with their lower intakes of folate, another vitamin added to these cereals, just failing to reach statistical significance ($p=0.060$). The disadvantaged women also demonstrate an almost universally lower intake of vitamins per MJ of energy consumed. Regarding mineral intake, the disadvantaged group display a lower iron ($p=0.011$) and magnesium ($p=0.035$) intake when the contribution of dietary supplements is excluded and a significantly lower mineral density per MJ of energy consumed for potassium ($p<0.001$), iron ($p<0.001$), calcium ($p<0.001$), magnesium ($p<0.001$), zinc ($p<0.001$) and selenium ($p<0.001$). They are also significantly less likely to meet their EAR for calcium ($p<0.019$), a nutrient provided in the milk which accompanies breakfast cereal consumption.

Many international studies have identified the important contribution made by ready to eat breakfast cereals (RTEBCs) to the overall nutritional quality of the diet.

For example, Williams, (2005) assessed diets in a nationally representative sample of 10,851 Australian adults aged 19 years or over. Those who did not consume any breakfast were much more likely to have inadequate intakes of several micronutrients, particularly vitamin B1, vitamin B2, calcium, magnesium and iron. Among young people in Europe, Kafatos *et al.*, (2005) showed significantly greater intakes of dietary fibre, magnesium, calcium, iron, folate, and vitamins A, B2 and B6 among RTEBC consumers in their cohort of 392 Greek adolescents, while a US study which surveyed 2379 girls aged 9-19 years found RTEBC consumption to be associated with higher intakes of fibre, calcium, iron, folic acid, vitamin C and zinc, and with decreased intakes of fat and cholesterol (Barton *et al.*, 2005). Further evidence of more favourable macronutrient profiles among RTEBC consumers is provided by Gibson & O'Sullivan, (1995). This study surveyed a cohort of 2705 10-11 and 14-15 year old UK schoolchildren, reporting not just a graded increase in vitamin and mineral intakes with increasing RTEBC consumption, but also a simultaneous reduction in percentage energy from fat, from 39-40% among non-consumers, to 36-37% in children consuming one or more portions of breakfast cereal per day.

Apart from their more favourable nutrient intake characteristics, those who consume breakfast cereals have also been reported to have better functional health indices including lower BMI (Cho *et al.*, 2003; Song *et al.*, 2005) lower blood glucose and better anaerobic fitness (Kafatos *et al*, 2005), and better self-rated health (Williams, 2005), often a sensitive indicator of actual health status (Balanda & Wilde, 2003).

In Ireland, McNulty *et al.*, (1996) identified the considerable contribution made by RTEBCs to the macronutrient and micronutrient intakes of Northern Irish schoolchildren.

They identified higher intakes of dietary fibre and most micronutrients, and macronutrient intakes more consistent with nutritional guidelines, among RTEBC consumers. They also described significant nutrient intake deficiencies for vitamin B1, vitamin B2, folate, vitamin B12 and iron among a high proportion of children not consuming RTEBCs.

Among adults, data from the NSIFCS (Burke *et al.*, 2005) demonstrated that wholegrain cereal foods in general, contribute significantly to mean daily intakes of energy (26%), protein (21%), carbohydrate (41%), dietary fibre (45%), iron (43%) and folate (27%) in the Irish diet. Galvin *et al.*, (2003) analysed the NSIFCS database to determine the contribution of *breakfast cereals specifically*, to the achievement of micronutrient and other dietary intake recommendations by Irish adults. This analysis revealed that only 73.1% of Irish adults consumed breakfast cereals including RTEBCs, precipitating a low daily mean intake for the overall population of 28.6g/day, a figure however, which is still considerably greater than the mean (12g/day) and median (4g/day) intakes reported for disadvantaged women in the current population. Despite the modest intake of these RTEBCs, it was revealed that they make an important contribution to the mean daily intake of carbohydrate (8.1%), starch (10.8%), dietary fibre (9.8%) and non-starch polysaccharide (NSP) (10.8%). These RTEBCs also contribute significantly to mean daily intakes of iron (18%), thiamin (14%), riboflavin (17%), niacin (15%), vitamin B6 (13%), folate (18%) and vitamin D (10%) in the diet of Irish adults. Increased intake of RTEBCs was not only associated with an increased overall micronutrient density in the diet, but also with a significantly lower prevalence of dietary inadequacy for calcium, iron, riboflavin and folate, particularly among women. Finally, higher intakes of RTEBCs among this NSIFCS cohort were associated with greater achievement of recommendations for fat, carbohydrate and NSP.

In the current study, low status for all eleven of the socio-economic indicators is significantly predictive of low breakfast cereal consumption, and significant socio-economic differences remain when the analyses are repeated among consumers only. The measures which are specifically indicative of material disadvantage (relative income poverty, deprivation, consistent poverty), do not appear to have any greater or lesser predictive value for lower median breakfast cereal consumption than those indicative of social deprivation (low social class, low education etc.), suggesting a role for both broad dimensions of poverty in reduced intake of this food group.

Several studies have identified a significantly lower intake of RTEBCs among lower SES groups as defined by a number of indices. An Australian study which surveyed 6680 adults aged 18-64 years (Mishra *et al.*, 2002), described the association between SES and food group intake patterns. RTEBC were consumed significantly more frequently among high SES men and high SES women, in comparison to their less advantaged peers. Siega-Riz *et al.*, (2000) also noted lower RTEBC consumption among low socio-economic groups in a representative sample of US adults, and correlated this lower intake with higher intakes of fat and lower dietary fibre and calcium density in the diet. High prevalence of breakfast skipping and lower RTEBC consumption has also recently been reported among low SES US adolescents, with this pattern particularly common among adolescent females (Sweeney & Horishita, 2005).

In Europe, low RTEBC intakes among lower SES groups have also been widely documented. Lang & Jebb, (2003) described lower intake of wholegrain cereal products, including wholegrain RTEBCs among lower socio-economic groups in the UK.

This group noted that these intake patterns often coincided with other negative health behaviours like physical inactivity and smoking. Using data from the 1986-1987 Dietary and Nutritional Survey of British Adults, Lang *et al.*, (2003) also described a lower prevalence of wholegrain cereal consumption, including RTEBCs, among lower SES groups as defined by occupation. Lower RTEBC consumption was also recorded among children of lower social class in Edinburgh (Ruxton *et al.*, 1996), indicating the important role which social conditioning in childhood may play in mediating low prevalence of consumption in later life.

The attitudinal correlates of low breakfast cereal consumption are similar to those observed for fruit and vegetables, suggesting the co-segregation of different unhealthy eating practices in this study population. The significant preponderance of low breakfast cereal intakes among those citing a chance locus of control ($p=0.012$) is suggestive of an association between increased fatalism (perceived inability to control one's own health) and poorer intake levels. The significantly higher cereal intakes among those residing in the action and maintenance stages of change ($p<0.001$), and the tendency towards lower intakes among those in the pre-contemplation stage ($p=0.060$), indicate that individuals who attempt to make improvements to their diet are correctly including increased breakfast cereal consumption as an element of this "healthier diet". This view would seem to gain credence from the significantly higher intakes among those who actively pursue a healthier diet ($p<0.001$), those consciously limiting the amount of fat in their diet ($p=0.004$), those who perceive their current diet to be sufficiently healthy ($p=0.004$) and those who actively seek out health information from the popular media ($p=0.003$).

All of these findings point to a generally accurate interpretation of the healthy diet by those subjects who actually attempt to improve their eating habits, a finding in line with those of Hearty *et al.*, (2007). As was the case for fruit and vegetable intake, taste emerges as a significant barrier to breakfast cereal consumption ($p=0.004$), while those who cite poor dietary knowledge as a barrier to healthy eating may also have a weak tendency towards lower intakes ($p=0.082$), perhaps indicating the importance of further education in this regard. Intake of breakfast cereals is not lower among those who identify price as a barrier to healthy eating ($p=0.998$), suggesting that any impact which cost and affordability have on consumption of these foods, is likely to be very modest.

Similar to the patterns observed for fruit and vegetable consumption, participation in vigorous activity ($p=0.015$) and dietary supplement use ($p=0.001$) are significantly predictive of higher breakfast cereal intakes, while smokers have significantly lower intakes ($p<0.001$), mirroring the findings of Lang & Jebb (2003). These results provide further evidence of the co-segregation of unhealthy behavioural patterns, including poor food group selection, among the current population. Finally, breakfast cereal intakes are also lower among those with abdominal obesity (waist circumference ≥88cm) ($p=0.004$), supporting the findings of previous studies among young women where similar trends have been observed (Barton *et al.,* 2005).

4.4.2.1.3. Sweet Foods, Sugar and Confectionery

Over-consumption of “refined sugars” or NMES has been associated with several nutritional and health problems including high energy density and micronutrient dilution of the diet, contributing to weight gain and micronutrient insufficiency respectively. There is also suggestion that high refined sugar intakes can contribute to elevations in systemic inflammatory markers (Osiecki, 2004), while the role of these sugars in increased risk of dental caries is well established.

With regard to the current study, the negative impact of high sweet food, sugar and confectionery intakes on nutrient intake profiles has previously been highlighted. High intake of these foods is significantly associated with higher energy intake ($p<0.001$), higher fat ($p=0.018$) and saturated fat intake ($p<0.001$), and, predictably, higher NMES intake ($p<0.001$) on univariate analysis. High intake of these foods, perhaps surprisingly, does not associate with lower micronutrient intakes however, although this could relate to greater absolute food intakes among these high consumers.

Regarding the socio-economic differences in consumption of these foods, although median intakes are similar ($p=0.498$) between the disadvantaged and the advantaged groups, mean intakes are roughly 20% greater among the disadvantaged group indicating the presence of a small number of high consumers among this cohort.

Crucially, the absence of any significant association between high consumption of sweet foods and micronutrient compromise may relate to methodological issues arising from the classification of foods and drinks for food group analysis.

The nutrient analysis software used categorises sugar-sweetened beverages with other non-alcoholic beverages, rather than with sweet foods, sugar and confectionery, for the purposes of food group analysis. Hence, output data describing socio-economic differences in the overall intake of these sweet foods and drinks *together* are not available, nor are data describing their combined association with variant nutrient intakes. However, their collective impact becomes clear when socio-economic differences in NMES intake, which derives from both sweet foods *and drinks*, is investigated. Here percentage of total and dietary energy from NMES is significantly higher ($p<0.001$), and compliance with NMES guidelines significantly lower ($p<0.001$), among those in the disadvantaged population.

While the percentage of energy derived from sweet foods, sugar and confectionery is only marginally higher among the disadvantaged group (14% vs. 13%), a substantial difference arises in the proportion of energy and carbohydrate derived from non-alcoholic beverages. Here, the advantaged population receives just 2% of their total energy, 4% of their carbohydrate and 18% of their NMES from non-alcoholic beverages. This compares with 6% of total energy, 13% of carbohydrate and 41% of NMES coming from non-alcoholic beverages among the disadvantaged group. The fact that the latter sugars are not derived from milk or milky drinks (these are classified under dairy produce), strongly suggests a substantially higher intake of non-diet soft drinks among the disadvantaged women. There is little doubt that the substantially higher intake of sweet foods, sugar, confectionery and sugary drinks combined among the disadvantaged group, is a significant contributor to their higher NMES intakes and lower compliance with NMES guidelines.

It is also a possible precipitant of the lower vitamin and mineral intakes, impaired vitamin and mineral density and poorer achievement of micronutrient guidelines which prevail in this group, by virtue of its displacement effect on more nutrient dense food groups.

There is now a wealth of evidence supporting the negative impact of these foods and drinks on overall quality of the diet. Several studies have implicated non-diet soft drink consumption in particular, as a contributory factor to high energy intake and weight gain among adolescent populations (Harnack *et al.*, 1999; Berkey *et al.*, 2004), while research has also identified a significant displacement effect of these sugar sweetened beverages on milk and fruit juice (Harnack *et al.*, 1999; Striegel-Moore *et al.*, 2006).

With regard to sweet foods, although they do not appear to contribute significantly to nutritional compromise among the current disadvantaged group, other research does suggest a deleterious impact of these foods on overall dietary quality. Frary *et al.*, (2004) investigated the adverse effect of sugary foods and sweets, as well as sugar-sweetened beverages on overall dietary quality among US children and adolescents. They found that the intake of these foods and drinks compromised overall nutrient intakes, with consumers less likely to achieve the recommended intakes for several important nutrients including calcium, folate and iron. Only children who were non-consumers of sugar-sweetened beverages had a mean calcium intake that met the adequate intake level, again highlighting the significant displacement effect of these beverages on milk intake.

In Europe, Alexy *et al.*, (2003) also examined the overall nutritional quality of the diet in the context of NMES intake (including non-diet soft drinks) among German children and adolescents. This group identified a significant nutrient-dilution effect of these foods and drinks, with the intakes of nutrient-dense food groups and several important nutrients themselves declining as NMES intake increased.

While much of the data implicating high consumption of sweet foods and drinks in poorer nutritional intake comes from studies in children and adolescents, it is reasonable to assume the existence of similar nutrient intake trends among adults consuming large amounts of these foods. In absolute terms, the current study population has an average NMES intake of 71g/day, with a mean of 80g/day in the disadvantaged group and 47g/day in the advantaged group. The median intakes are considerably lower than these figures among the disadvantaged and total populations however, again indicating a discrete group of high consumers among the disadvantaged respondents.

A cross-sectional study among a national sample of US children, adolescents and adults revealed an average daily intake of 82g/day of refined sugar for those aged 2 years and over. While the average contribution to total daily energy intake was 16% for the total population, male and female adolescents had the highest intakes, with an average of 20% of their total energy derived from this source. The most significant contributors to refined sugar intake were non-diet soft drinks (~one third of the total intake), table sugar, syrups, sweets, sweetened grain products, other sweetened drinks and milk products (Guthrie & Morton, 2000). Similar intakes of NMES have been reported among 11 and 12 year olds in the UK (Fletcher *et al.*, 2004), with intakes averaging 82g/day in 2000, and remaining consistently above recommended guidelines at an average of ~16-17% of total energy for the period between 1980-2000.

This group also identified confectionery and soft drinks as the major sources of NMES, contributing 61% of the total intake. Importantly, they later reported a very significant increase in the intake of NMES from soft drinks over the 20 year study period, rising from 15g/day in 1980 to 31g/day in 2000 (Rugg-Gunn *et al.*, 2007).

Overall, the associations which have been elucidated in the current study and elsewhere between increased NMES intake and increased energy density and reduced micronutrient density, identify high NMES intake as a potent predictor of poorer overall dietary quality. In this context, the preponderance of such high intakes among those of low SES merits detailed investigation. A recent US study indicated that greater use of NMES significantly lowered household intakes of several important nutrients including protein, iron, vitamin A, vitamin C, vitamin B6, vitamin B12 and potassium among low income households (Bhargava & Amialchuk, 2007). They concluded that "added sugars should be discouraged in dietary guidelines, because of their adverse effects on diet quality that were evident in this low income population". Others have also described the adverse impact of high sugary food and beverage consumption on the dietary quality of those living in disadvantage (Drewnowski & Specter, 2004).

From the Irish perspective, the NSIFCS literature describing the macronutrient intakes of the Irish adult population (Harrington *et al.*, 2001) does not refer to the intake of NMES *per se*, but rather to total sugars. Nonetheless, the prominent position of biscuits, cakes, pastries and puddings and sugars, preserves, confectionery and savoury snacks as contributors to overall energy and carbohydrate intake among the full NSIFCS cohort, is indicative of a generally high population intake of these foods groups.

The 2002 Survey of Lifestyles and Nutrition (SLAN) reports compliance levels with food pyramid guidelines according to both social class and education level. No statistical differences are described for intakes of high sugar and high fat "top shelf" foods across these socio-economic indices for either men or women. However, among women, the smallest improvement in compliance with this guideline from 1998-2002 was observed among those in the lowest occupational social classes, and this group now have lower *compliance levels* for these top shelf foods than their more advantaged peers (National Nutrition Surveillance Centre, 2003).

With regard to the current study, while there is a general tendency towards higher sweet food, sugar and confectionery consumption among those of lower status for each of the eleven socio-economic indicators investigated, it is only for those parameters which are specifically indicative of *material* disadvantage (relative income poverty (p=0.047), consistent poverty (p=0.008)) that this trend reaches statistical significance. Overall, these findings point to material disadvantage as a much more potent predictor of high sweet food consumption than social disadvantage. This is in keeping with the findings of several international studies which have identified a significant, graded increase in the consumption of high sugar, high fat, energy dense, nutrient dilute foodstuffs among low SES groups as the dietary budget constricts (Darmon *et al.*, 2004; Drewnowski, 2004; Drewnowski & Specter, 2004). Apart from individual socio-economic circumstances, the importance of local supply (vending machines, fast food outlets etc.) and cultural factors, as mediators of adverse food intake patterns, including high sugar consumption, among low SES groups have also been recognised (Forsyth *et al.*, 1994). Overall, the ready availability, low price and convenience of these sweet foods may contribute significantly to their high intake in disadvantaged communities.

Attitudinally, dietary stage of change does show a significant association with the consumption of sweet foods, sugar and confectionery, with those in the action and maintenance stages reporting a significantly lower median intake of these foods ($p=0.003$). The significant association between conscious effort to consume a healthy diet and lower intake of these foods ($p=0.006$), also suggests that those who are motivated to improve their diet choose to limit their intake of these foods to achieve that objective. The lack of any significant association between poor self-perceived dietary knowledge and higher sweet food intake, also indicates that poor knowledge is not a strong predictor of adverse behaviour when it comes to sweet food consumption.

Behaviourally, significant correlations are not observed between high intake of sweet foods, sugar and confectionery and any of the health behaviours investigated (physical activity, smoking, dietary supplement use, high alcohol consumption), although this may again relate to the exclusion of sugary soft drinks from such analyses. Anthropometrically, those with elevated waist measurements however, report a higher median intake of these foods which just fails to reach statistical significance ($p=0.057$).

As was the case for fruit and vegetables, some evidence suggests that high refined sugar intakes may have their origins in early life, and that at least some of these precipitants may be socio-economically mediated. One study found that the mothers of children receiving sweet foods more than once or twice per week were more likely to be young, to be single parents, to smoke during pregnancy and to be of low education, all notable correlates of poverty and disadvantage (Brekke *et al.*, 2007).

This early habituation which conditions children living in disadvantaged circumstances to prefer and seek out sweet and sugary foods and drinks, is of great significance in light of other research which suggests that taste is a primary driver of sugar consumption (Drewnowski, 1995; Drewnowski & Specter, 2004), and that it is a potent determinant of food choice in general among the Irish population (Kearney *et al.*, 2000).

4.4.2.1.4. Red Meat, Meat Products, Poultry and Fish

High red meat intake, particularly high intake of processed meat products, has been associated with overall nutrient intake patterns which are less conducive to health. For example, these foods contain high amounts of total fat, saturated fat and cholesterol, and in the case of many processed varieties, high amounts of salt and *trans*- fatty acids. Over cooked varieties of these foods are also known to contain significant quantities of other compounds damaging to health, such as heterocyclic amines (Sinha, 2002) and other carcinogenic agents. The European Prospective Investigation into Cancer and Nutrition (EPIC) (Norat *et al.*, 2005) identified a significantly increased risk of colorectal cancer among the highest consumers of red meat and processed meat combined, among their very large cohort of 478, 040 adults from 10 European countries.

In addition to the adverse nutrient profile of these foods themselves, they are also thought to have a significant displacement effect on other foods such as poultry and especially fish, which are known to be lower in these health damaging constituents (fat, saturated fat, trans-fats, cholesterol, salt, etc.), as well as conferring potential health benefits in their own right (e.g. omega-3 fatty acids in fish).

The significant benefits of fish, and especially oily fish, consumption have been described in terms of cardiovascular health (Konig *et al.*, 2005), cerebrovascular health (Iso *et al.*, 2001; Bouzan *et al.*, 2005), neurological and cognitive development (Cohen *et al.*, 2005), and reduced risk of colo-rectal cancer (Norat *et al.*, 2005).

The current study categorises meat, poultry and their processed derivatives (but not fish) into one food group for subsequent analysis. Examining the study data, those in the disadvantaged group are found to have a significantly greater intake of these meat and meat products ($p<0.001$), one which is roughly 30% greater than that of their more advantaged peers. This is at variance with data from the corresponding population in NSIFCS (see Chapter 1), where no significant differences were observed for meat and meat group intake according to either social class ($p=0.366$) or educational status ($p=0.695$). The very high proportion of meat consumers among both the disadvantaged (99.3%) and advantaged (98.4%) populations in the current study, suggests that the disparities in their mean intake relate to differences in either frequency of consumption and/or portion size between the two groups.

Intake of fish and fish products is significantly lower among the disadvantaged than the advantaged women in the current study ($p<0.001$). Unlike the variation in meat and meat products described previously however, it appears that the *prevalence* of fish consumption differs markedly between the two groups. 76.2% of advantaged respondents versus 47.1% of the disadvantaged group consume fish, meaning that any difference in *mean* intake between the two groups is at least partially attributable to the marked variation in the proportion of fish consumers between the two groups.

When median fish intakes are assessed among consumers only, significant differences in intake persist however ($p<0.001$), raising the likelihood that differences in the *frequency of consumption*, and possibly variation in portion size, mediate some of the observed disparity in overall intakes between the two groups. Although they are more pronounced in the current study, the socio-economic differences in fish consumption described above, are largely in agreement with the significantly lower intakes among young women of lower social class ($p=0.025$) and the tendency towards lower intakes among less educated young women ($p=0.080$) revealed by the analysis of the NSIFCS dataset (see Chapter 1).

The association of high meat and meat product consumption with variations in nutrient intake among this population has been described previously. High intake of these foods is significantly associated with higher energy intake ($p<0.001$), but does not relate significantly to intake levels of the macronutrients or vitamins. This is a surprising outcome, and one which may suggest a preponderance of low quality processed meats and poultry, given the negligible relationship with vitamin intakes. The lack of association between high meat consumption and saturated fat intake may relate to the use of univariate analyses in these investigations. In addition to its association with higher magnesium ($p=0.010$) and selenium ($p=0.025$) intakes, high meat intake also coincides with higher sodium ($p<0.001$) but not with higher iron intakes ($p=0.210$) in the current population, perhaps further suggesting a high consumption of low grade, processed meats and poultry.

High intake of fish is associated with higher dietary fibre ($p<0.001$) intake and lower fat ($p=0.032$) and NMES ($p=0.008$) intake, although these differences are unlikely to be functionally related to fish consumption itself. Similarly, high fish consumption is also associated with increased intake of certain micronutrients (e.g. vitamin C, $p<0.001$), which are not contained in appreciable amounts in fish, suggesting the co-segregation of high fish consumption with other "healthy" dietary choices such as high fruit and vegetable consumption. In addition to the trends described above however, high fish intake also associates with higher vitamin D (p=0.019), vitamin E (p=0.045), magnesium (p=0.026) and selenium (p<0.001) intakes, where the differences may well relate, at least partially, to the constituents of the fish itself.

In contrast to the trends observed for high fish consumption, it is thought that high processed meat intakes co-segregate with other unfavourable dietary habits, patterns which do not necessarily relate to a direct displacement effect of these meats on other food groups. In Ireland, meat intake data from the North/South Ireland Food Consumption Survey (NSIFCS) have been examined in detail (Cosgrove *et al.*, 2005). This group identified a lower level of compliance with dietary recommendations for fat, carbohydrate and dietary fibre among men, and lower wholemeal bread, vegetable, fruit and fish intakes among men and women as processed meat intake increased.

Regarding the nutrient contribution made by meat and meat products in the current study, the disadvantaged group derives a greater proportion of their energy (15% vs. 12%), total fat (20% vs. 14 %) and protein (39% vs. 34%) from meat and meat products than their more advantaged peers. They also derive a greater proportion of their vitamin B1 (24% vs. 15%), vitamin B2 (18% vs. 15%), vitamin B3 (44% vs. 40%), vitamin B6 (26% vs. 24%), vitamin D (42% vs. 28%) and vitamin E (12% vs. 7%) from these foods, as well as a greater percentage of their sodium (37% vs. 31%), iron (21% vs. 12%), calcium (8% vs. 5%), magnesium (16% vs. 13%) and zinc (39% vs. 27%).

While these findings illuminate the pivotal role played by meat and meat products in the overall nutritional adequacy of the disadvantaged cohort, the considerably higher fat and sodium intakes derived from this food group among the low SES women, again suggest a preponderance of low quality, processed meats in the diets of these women.

In contrast to the findings for meat and meat products, fish contribute a considerably lower proportion of energy (1% vs. 2%), fat (1% vs. 3%) and protein (3% vs. 8%) to the diets of the disadvantaged than the advantaged women. They also receive less of their vitamin B3 (3% vs. 9%), vitamin D (4% vs. 24%) and vitamin E (2%vs %) from fish, as well as a lower percentage of their iron (1% vs. 2%), magnesium (1% vs. 3%), zinc (1% vs. 3%) and selenium (9% vs. 25%).

Examining socio-economic disparities in meat consumption, one study found that US women with a high level of formal education consumed less beef and processed pork and more chicken, than their less educated counterparts (Guenther *et al.*, 2005). Slightly higher fruit intakes were also observed among chicken consumers, in comparison to beef and pork consumers, again indicating the co-segregation of less favourable dietary habits. Higher intakes of meat and meat products, especially high fat meat products, have also been described among low income groups in the UK (Ministry of Agriculture Fisheries and Food (MAFF), 1996)

In Ireland, Cosgrove *et al.,* (2005) found that processed meat intakes were significantly lower among those in managerial occupational classes compared with the lower social classes in the NSIFCS population, and identified large differences in overall dietary quality according to choice of red, white or processed meats. This group concluded that processed meat intake might even be usefully employed as an indicator of low overall dietary quality for the Irish adult population.

With regard to fish consumption, evidence from several European studies indicates lower intake of this important food group among those of lower socio-economic status. Galobardes *et al.*, (2001) identified lower fish consumption among those from the lower educational and occupational classes, and also reported that these lower intakes correlated with a generally less healthy dietary pattern among these groups. An investigation among the Italian EPIC population (Vannoni *et al.*, 2003), has also reported socio-economic differences in fish consumption, with those in the lower educational tiers significantly more likely to have low intakes. Again, this lower fish consumption among the lower socio-economic group correlated with several other adverse dietary patterns, as seems to be the case in the current study. A further Spanish study has also described a positive association, albeit less pronounced, between familial socio-economic status, including maternal education level, and fish consumption among their cohort of 3534 2-24 year olds (Aranceta *et al.*, 2003).

Examining meat and fish intakes among the current study population, mean intake of meat and meat products tends to be higher among those of lower status for all of the socio-economic indicators examined, although these trends only reach statistical significance for disadvantage as designated by recruitment site ($p<0.001$), social class ($p<0.001$), medical card eligibility ($p=0.008$) and benefit entitlement ($p=0.035$). This is suggestive of a role for both material and sociological/structural disadvantage in the increased intake of these foods.

Unlike the meat and meat product group, fish intakes are *lower* among the lower tiers for virtually all of the socio-economic parameters examined, although this again suggests that lower intakes may relate to both the sociological/structural and material dimensions of poverty.

Attitudinally, those with a chance locus of health control have significantly lower fish intakes ($p<0.001$), while those with an external locus also tend towards lower fish intakes ($p=0.066$), suggesting a role for greater fatalism as a precipitant of depressed fish intake. Action and maintenance stages of dietary change predict a significantly lower intake of meat and meat products ($p=0.025$), and a significantly higher intake of fish ($p<0.001$), as does the conscious pursuit of a healthy diet ($p=0.017$ and $p<0.001$ respectively). Individuals who cite taste as a barrier to healthy eating have significantly lower mean fish intakes ($p=0.009$), and also tend non-significantly towards higher meat intakes ($p=0.087$), which may suggest a lack of exposure to fish in early life. Those citing poor dietary knowledge as a barrier to healthy eating show significantly lower fish intakes ($p=0.015$), indicating the potential benefit of educating young women about the positive health benefits of consuming fish. Those using mass media for health information have significantly lower meat and meat product intake ($p=0.036$) and significantly higher fish intakes ($p=0.003$), again highlighting the utility of this channel for communicating healthy eating messages.

Of the health behaviours examined, only the association between high alcohol intake and higher meat consumption reaches statistical significance ($p=0.019$). Regarding fish however, vigorous exercisers ($p=0.011$) and those taking dietary supplements ($p=0.023$) have significantly higher intakes, while smokers have markedly lower intakes ($p<0.001$).

Anthropometrically, those with a high BMI (p=0.010) or a high waist circumference measurement (p<0.001) have significantly higher meat intakes, an association which may relate to the high energy and fat content of these foods, particularly processed varieties.

When discussing socio-economic differences in the consumption of meat and meat products it is important to consider the positive impact which these foods can have on the micronutrient density of the diet, as well as their potential adverse effects. Evidence from NSIFCS indicates that meat and meat products make a valuable contribution to carotene, vitamin A, vitamin D, vitamin B1, vitamin B2, vitamin B3, vitamin B5, vitamin B6, vitamin B12 and biotin intakes (O'Brien *et al.*, 2001), as well as magnesium, phosphorous, copper and zinc intakes (Hannon *et al.*, 2001). These foods also constitute a critical source of dietary iron for the Irish population (Hannon *et al.*, 2001).

The latter is particularly noteworthy in the current context, as data from the same NSIFCS study indicated that 50.2% of 18-35 year old women consume less than the average daily requirement for iron (10.8 mg), while 17.5% of women in this age group had intakes below the lower threshold intake (LTI) of 7mg/day. These findings mean that any reduction in intake of such a nutritionally important staple must be adequately compensated for, and that overly simplistic messages which advocate avoidance or injudicious reduction of these foods have the potential to do significantly more harm than good.

4.4.2.1.5. Dairy Foods

Dairy foods constitute a critical food group in determining the overall quality of the diet. The current study demonstrates significantly lower median intakes of dairy foods (milk, cheese, cream) among the disadvantaged group (166g/day) in comparison to their more affluent peer group (228g/day) ($p=0.001$). The surprising lack of association between high dairy intake and high saturated fat intake may relate to other confounding positive dietary patterns among the high dairy consumers, which remain elusive to univariate analyses. There is, however, evidence that low dairy food consumption coincides with considerably less favourable nutrient intake profiles among the current study population. Those in the lower dairy food intake category have lower dietary fibre intakes, but importantly, also show a tendency towards higher NMES consumption ($p=0.054$). The low dairy consumers also have significantly lower thiamin ($p=0.001$), riboflavin ($p<0.001$), niacin ($p=0.018$) and folate ($p<0.001$) intakes, as well as poorer intakes of vitamin A ($p=0.004$), vitamin C ($p<0.001$), vitamin D ($p=0.022$) and vitamin E ($p=0.002$). Regarding their mineral intakes, this group unsurprisingly display lower calcium intakes than their peers ($p<0.001$), but also show significantly lower iron ($p=0.008$) and magnesium ($p<0.001$) intakes.

With regard to the nutrient contribution of dairy foods, differences are observed between the disadvantaged and advantaged groups in the proportion of energy, macronutrients and micronutrients provided by this food group. Those in the disadvantaged group receive less of their energy (8% vs. 11%), fat (12% vs. 16%) and protein (13% vs. 15%) from dairy foods. They also receive a lower proportion of their vitamin B2 (28% vs. 32%), vitamin D (4% vs. 7%), sodium (6% vs. 9%), calcium (37% vs. 45%) and zinc (15% vs. 18%) from these dairy foods than their more advantaged peers.

The nutritional importance of dairy foods has been extensively reported in the literature. In Ireland, the NSIFCS indicated that dairy produce (milk, yoghurt, cheese) makes a significant contribution to population intakes of retinol, total vitamin A, vitamin B2, vitamin B12 and vitamin B5 (O'Brien *et al.*, 2001) and calcium, phosphorous and zinc (Hannon *et al.*, 2001). The significant proportion of the NSIFCS population, and particularly young women falling beneath the average requirement (615mg/day) and the lower threshold intake (430mg/day) for calcium (26.4% and 9.3% respectively) is indicative of a significant deficit in milk and dairy intake among this cohort in particular. In support of this assertion, the SLAN survey of 2002 revealed that only 29% of the population (27% of men and 30% of women) achieved the recommended intake of 3 milk, cheese or yoghurt servings per day (National Nutrition Surveillance Centre, 2003).

International studies have also described the valuable contribution of dairy foods to overall nutritional intake. One described an increase in all of the micronutrients examined (with the exception of vitamin C) as total dairy and milk intake increased (Weinberg *et al.*, 2004). Furthermore, despite rises in saturated fat intake with increased cheese consumption, the positive micronutrient effect of milk and total dairy consumption was achieved in this study population, without an adverse effect on dietary total fat or cholesterol intakes.

Similarly, another study cited increases in calcium, magnesium, potassium, zinc, folate, thiamin, riboflavin, and vitamins B6, B12, A, D and E as total dairy intake increased (Ranganathan *et al.*, 2005). These increased intakes were also associated with decreased intakes of sucrose and fructose, primarily as a result of the displacement effect of these dairy products on non-diet soft drinks.

Higher milk intakes have also been associated with an increased intake of other nutrient dense foods in the diet such as RTEBCs (Song *et al.*, 2006; van den Boom *et al.*, 2006) thereby strengthening their association with overall dietary quality. Notwithstanding the considerable nutritional advantages attributed to milk and dairy foods, Ranganathan *et al.*, (2005) recommended the judicious selection of reduced fat dairy products and optimised eating patterns to offset some potentially adverse effects of increased dairy consumption such as higher saturated fat and sodium intakes.

Of the above mentioned micronutrients, the one which has become almost synonymous with dairy intake is calcium. This mineral plays a pivotal role in a diverse range of metabolic processes, with low intakes being associated with a variety of pathological conditions including osteoporosis, hypertension, pre-eclampsia, obesity, kidney stones, colon cancer, pre-menstrual stress syndrome, polycystic ovarian disease, insulin resistance syndrome and dyslipidamia.

There is a significant body of evidence to suggest an endemic dietary insufficiency of calcium in many industrialised countries however. Examination of the NHANES III data from 1999-2002 concluded that many US adults, particularly men and those from ethnic minorities and socially disadvantaged groups, were consuming insufficient calcium (Ma *et al.*, 2007). One of the principal determinants of this widespread inadequacy is a limited intake of dairy produce. The significant difficulty of achieving adequate calcium intake during adolescence, the major period of skeletal mineral accretion, has also been highlighted (Gao *et al.*, 2006), particularly for those who avoid milk and dairy products.

Further research from the US examining secular shifts in adolescent food intake patterns suggests that the risk of calcium insufficiency among US adolescents has been exacerbated by a decline in total milk intake by 36% between 1965 and 1996, a change largely attributable to its displacement by the coincident increase in consumption of soft drinks and non-citrus juices (Cavadini *et al.*, 2000). It has been estimated that 3-4 servings of dairy products are required each day to ensure that adequate calcium intakes are met in adolescence (Fulgoni *et al.*, 2004).

The health effects of low dairy and calcium intakes have been extensively described in the literature. The importance of adequate dairy intake during adolescence in the achievement of optimal peak bone mineral density and the minimisation of osteoporotic fracture risk has been cited by many studies (Teegarden *et al.*, 1999; Kalkwarf *et al.*, 2003). Furthermore, these beneficial effects of dairy consumption are thought to relate not just to calcium, but also to other nutritional components of dairy foods (Weaver, 1992), emphasising the importance of this food group, rather than its selected constituent nutrients, in population skeletal health. Overall, the health effects of dairy and calcium intake on skeletal health have been exhaustively investigated, with roughly 80% of the over 150 observational studies for calcium, and ~76% of the 38 studies for dairy foods reporting positive effects on skeletal endpoints (Heaney, 2007).

There are other crucial health effects of both dairy and calcium intake however. The Dietary Approaches to Stop Hypertension (DASH) trial (Appel *et al.*, 1997; Vollmer *et al.*, 2001) clearly demonstrated the significant anti-hypertensive effect of a diet rich in fruit and vegetables and low fat dairy produce.

These findings were substantiated by the Coronary Artery Risk Development in (Young) Adults (CARDIA) study (Pereira *et al.*, 2002) which clearly showed a considerable reduction in the prevalence of hypertension (~62% decline) as dairy intake increased from 0 to >35 servings per week among 3157 US 18-30 year olds.

The latter study also investigated the association between dairy intake and development of the insulin resistance syndrome and its constituent clinical elements. Dairy consumption was inversely associated with the development of all components of the insulin resistance syndrome (obesity, hyperinsulinaemia, and insulin resistance), with the odds ratio of developing this insulin resistance syndrome falling by 21% for each extra daily serving of dairy foods. Among the risk factors for insulin resistance, obesity has received the most attention regarding its association with dairy and calcium intake. Data from the NHANES III study (Zemel *et al.*, 2000) and the Quebec Family Study (Jacqmain *et al.*, 2003) both demonstrated an inverse association between calcium intake and prevalence of obesity (Heaney *et al.*, 2002). Adequate and particularly high general dairy intakes have also been associated with body fat loss, particularly reduction of truncal adiposity, in clinical trials (Zemel, 2004). This preferential central fat loss with high dairy intakes has recently been forwarded as a possible therapeutic intervention to elicit weight loss in patients with diabetes mellitus (Shahar *et al.*, 2007).

The nutritional importance of dairy foods outlined above, along with their ready availability and low cost, defines the adequate intake of these foods as a key priority for low socio-economic groups. Many of the studies describing socioeconomic variations in dairy intake among children however, have reported poorer intakes among those in the lower social groupings, although for adults, the evidence is more equivocal.

One US study has described widespread dietary calcium inadequacy among pre-school children from a low SES community, a phenomenon driven primarily by a low intake of milk among these disadvantaged children (Nitzan Kaluski *et al.*, 2001). Among adults, it was demonstrated that while low income Canadian households allocate a higher percentage of their food budget to milk and dairy products, they still purchase fewer of these foods than their more advantaged peers (Kirkpatrick & Tarasuk, 2003).

While one study failed to identify lower milk intakes among low SES respondents across the EU (Sanchez-Villegas *et al.*, 2003), while another even reported a higher milk intake among low SES groups in Finland (Roos *et al.*, 1996), the positive association between SES and cheese consumption appears to be more robust (Roos *et al.*, 1996; Hulshof *et al.*, 2003; Sanchez-Villegas *et al.*, 2003). In Ireland, the SLAN survey of 2002 (National Nutrition Surveillance Centre, 2003) indicated little difference in total milk intakes across the different social classes, although there were significant differences in the types of milk consumed, with low fat varieties used much more commonly among the higher social classes, and the use of full fat varieties more prevalent among the lower classes.

Significantly lower intakes of dairy foods are observed among those of lower status for many of the socio-economic indicators examined in the current study. As well as the lower consumption levels noted for the disadvantaged group previously ($p=0.001$), those of low social class ($p<0.001$), low socio-economic group ($p<0.001$) and low education ($p=0.006$) all display lower intakes, as do early school leavers ($p=0.001$) and those in single adult family units ($p=0.022$).

There is a conspicuous lack of association with the material indices of disadvantage like relative income poverty (p=0.878), deprivation (p=0.931), consistent poverty (p=0.678) and medical card entitlement (p=0.159) however, indicating that low intakes among the disadvantaged cohort may be mediated more by the social dimensions of poverty, than by its material deficits.

The strong social gradients in dairy food intake described here are at variance with findings from 18-35 year old women in the NSIFCS. The latter study revealed no significant differences in dairy food intake according to either social class (p=0.969) or education (p=0.417) among women in this age group, although crucially, as stated previously, this study population does not include those of very low status. This highlights the importance of specialised studies like the current one, to reveal disparities in food and nutrient intake between the lowest socio-economic groups and the wider population.

The attitudinal differences in dairy intake are more modest than those observed for some of the food groups like fruit and vegetables or breakfast cereals. Intakes are higher for those in the action or maintenance stage of change (p=0.019) however, as well as those who pursue a healthy diet (p=0.001), and non-significantly, for those attempting to limit dietary fat (p=0.064). These findings suggest that those who actively pursue a healthy diet are able to correctly identify dairy foods as an integral element of this healthy diet. Those who cite poor dietary knowledge as a barrier to healthy eating however, display lower intake of this food group (p=0.021), suggesting that if their poor self-perceived knowledge is reflective of actual nutritional knowledge deficits, that this poor knowledge may constitute a barrier to dairy consumption among those with low intakes.

As was the case for many of the other "healthier" food groups, low dairy intake coincides with several other adverse health behaviours including smoking (p=0.008) and non-use of dietary supplements (p=0.047). Interestingly, from the anthropometric perspective, those with central obesity (waist circumference >88cm) report a significantly lower median intake of dairy foods than their non-obese peers (p=0.016). This supports the findings of many previous studies in this area (Zemel, 2004), and highlights the potential value of increased dairy food consumption as a measure to protect against central adiposity and metabolic syndrome among low SES women.

4.5. Conclusions

In conclusion, the data presented in this chapter identify significant disparities in the intake of key food groups, most notably fruit, vegetables, breakfast cereals, sweet foods, sugar and confectionery, meat and meat products, fish and dairy between the two groups. While material deprivation in particular appears to be associated with some of the adverse food group patterns observed among low SES women (high intake of sweet foods), other negative patterns associate more with markers of structural and social deprivation (low dairy intake, high meat intake), or with both material and structural/social disadvantage in combination (low fruit intake, low vegetable intake, low breakfast cereal intake, low fish intake).

The adverse patterns observed among the disadvantaged young women coincide with several attitudinal variables. Many associate with markers of fatalism (chance or external locus of control), passive stages of dietary change (pre-contemplation, contemplation or decision), and reduced effort to eat healthily or to limit fat in the diet.

Food group intake patterns also differ according to the perceived barriers to healthy eating cited by respondents. Some adverse intakes are associated with poorer self-perceived dietary knowledge (lower fruit, vegetable, fish and dairy intakes, and higher starchy carbohydrates), while others coincide with identification of taste as a barrier (lower intake of fruit, vegetables, breakfast cereals and fish, higher intake of meat and meat products). Willpower, and especially the price of healthy foods do not appear to be important barriers in determining unfavourable intake patterns for the food groups examined.

The food group intake patterns also appear to co-segregate with other health behaviours. Participation in vigorous exercise and supplement use predict generally more favourable patterns, while smoking is strongly predictive of less healthy dietary patterns.

Anthropometrically, there is a significant association between high intake of certain food groups (meat and meat products, starchy carbohydrates, potatoes and potato products) and high BMI or waist circumference, while inverse associations are observed between dairy food and breakfast cereal intakes and increased waist circumference.

The socio-economic differences in food group consumption described above have a profound deleterious impact on the energy, dietary fibre, macronutrient and micronutrient profile of the diet for those in the disadvantaged population. These differences are further illuminated by examining the different food sources from which the disadvantaged and advantaged respondents derive their energy, macronutrients, vitamins and minerals. These investigations demonstrate a preponderance of energy-dense, micronutrient-dilute sources in the diets of the disadvantaged women.

Mean energy intakes are significantly higher, and dietary fibre intakes significantly lower, among the disadvantaged group. The percentage of energy derived from fat, saturated fat and NMES is significantly higher among the disadvantaged women, while that derived from overall carbohydrate is significantly lower in this group. Disadvantaged respondents are less likely to achieve the recommended intake targets for virtually all of the macronutrients and their constituent sub-groups such as NMES and saturated fat. The mean intakes of many vitamins and minerals are also significantly lower among the disadvantaged group, although these social variations are diminished (particularly for the vitamins) when the contribution from supplements is excluded from the analyses. Nonetheless, subsequent analyses reveal a significantly greater micronutrient density per MJ energy consumed for virtually all of the vitamins and minerals examined, and these differences persist upon the exclusion of supplements.

Those in the disadvantaged group are significantly less likely to achieve the recommended intake levels for several key micronutrients, most notably folate, vitamin C, vitamin D and calcium. They also have non-significantly lower compliance with sodium and iron guidelines. For the overall population, inadequate intakes of dietary fibre and several key nutrients including folate, vitamin A, vitamin C, vitamin D, omega-3 fatty acids, iron, calcium, selenium and iodine occur with high prevalence in both the disadvantaged and advantaged groups and present serious cause for concern. Compliance with macronutrient guidelines is similarly low for both groups, particularly for carbohydrate, fat, saturated fat, NMES and alcohol, revealing further significant deficits in the nutritional intake of this young female population.

Overall, the endemic dietary inadequacies which appear to charactertise the young women in the current study are particularly pronounced among the disadvantaged respondents. These socio-economic differences are likely to yield a significant adverse impact on chronic health status among these low SES women, if sustained over the full life course, and may be viewed as a major precipitant of health inequalities in this group. They are also likely to have a significant negative impact on the long-term health of the children of these women, perpetuating the impact of nutritionally-mediated health inequalities across generations.

4.6. References

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Chapter 5

Health Behaviours and Anthropometry

5.1. Introduction

This chapter explores differential patterns in five important health-related behaviours according to socio-economic status.

Prevalence of tobacco usage shows a strong inverse socio-economic gradient, with those in the lower social strata showing a significantly higher smoking prevalence, a trend that is remarkably robust across countries and regions (Graham, 1996, Huisman *et al.,* 2005). The adverse health effects of smoking have been established for several decades, with tobacco use contributing significantly to morbidity and mortality from cardiovascular disease and various cancers, particularly those of the oro-pharynx, oesophagus, lung and colo-rectum (CDC, 2004). Evidence from New Zealand further elucidates the considerable health impact of smoking, with models estimating a 26% and 25% fall in total mortality for men and women respectively, were tobacco usage to be completely eradicated (Blakely & Wilson, 2005). It has become increasingly clear over the past 30 years, that SES gradients in smoking prevalence mediate at least some of the increased morbidity and mortality seen in the lower social strata (Marmot, 1997).

Excessive alcohol consumption has also long been forwarded as a potential effector of socio-economic health inequalities. Rehm *et al.*, (2006) estimated that the European WHO regions had a *per capita* alcohol intake which at 12.1 litres per year of pure ethanol, was more than double the global average.

These researchers concluded that alcohol consumption “caused a considerable disease burden”, accounting for 6.1% of all deaths, 12.3% of all years of life lost (YLLs) and 10.7% of all disability-adjusted life years (DALYs) in Europe. Makela *et al.*, (2003) have demonstrated that the higher mortality levels observed in lower SES groups are at least partially attributable to increased alcohol-related morbidity among these groups.

The use of dietary supplements has been suggested to improve micronutrient intake and adequacy among both the general population and among specific population sub-groups with increased requirements or at increased risk of dietary deficiency (Kiely *et al.,* 2001; Archer *et al.,* 2005; Murphy *et al.,* 2007), with little apparent risk of micronutrient toxicity from these products in the Irish population (Kiely *et al.,* 2001). Given the sub-optimal intake of several micronutrient dense food groups (e.g. fruit and vegetables, dairy foods, RTEBCs) commonly observed among disadvantaged women, these supplements may constitute a simple, pragmatic and efficacious means of improving their overall micronutrient intakes despite variations in their nutrient bioavailability. However, Yu *et al.*, (2003) identified a significantly lower prevalence of supplement use among poor women and those of lower education in the US, and these trends are replicated in many other countries including Ireland (Kelleher *et al.*, 2002).

Like smoking and excessive alcohol consumption, physical inactivity and sedentarism have been consistently associated with poorer health indices and outcomes. There is now a substantial body of research which suggests a preponderance of less favourable physical activity behaviours among those of low SES. For example, Laaksonen *et al.*, (2008) identified physical inactivity as one of the three main factors explaining increased cardiovascular- and all-cause mortality among subjects of lower education in their large prospective Finnish cohort, and these findings are echoed by numerous other investigations around the world.

With regard to infant feeding, a dose-response relationship between breastfeeding and lower infant morbidity and mortality rates has been described (von Kries *et al.*, 1999). However, protective effects of breast feeding against obesity, metabolic syndrome, cardiovascular disease and many other chronic disorders have also been identified (Yngve & Sjostrom, 2001). Unfortunately, significant socio-economic gradients in breast feeding are observed in many developed countries, particularly Ireland (Fitzpatrick *et al.*, 1994, Bonham, 2007), with those of lower social class and lower educational status demonstrating significantly lower initiation and continuation rates. These trends are thought to contribute significantly to the socio-economic health inequalities which exist in these countries.

All of the health behaviours discussed above will be investigated among the full current study population (n=295), with a view to comparing the practices of the disadvantaged cohort against those of their more affluent peers. Because of their multiple deleterious effects on health, any adverse patterns in these behaviours observed among the low SES respondents, may be viewed as mediators of long term ill-health in this group, factors whose nascent health effects are likely to be amplified in later years. In addition to examining socio-economic differences in individual health behaviours, further analyses will be performed to assess whether they co-segregate with one another among the low SES cohort, a feature which might exacerbate their negative health effects.

This chapter will also describe the socio-economic differences in anthropometric status (height, BMI and waist circumference) which exist among the full current study population (n=295). Again, socio-economic differences in these parameters could be viewed as potential effectors of future health inequalities whose effects may be played out in later life.

5.2. Methodology

5.2.1. Participants

295 women in total aged 18-35 years were surveyed regarding their health behaviours. Of these women, 221 (74.9%) were derived from the lowest quintile of electoral districts (EDs) identified by the novel socio-economic sampling frame, while the other 74 (25.1%) came from EDs within the top four quintiles of the same sampling frame. These respondents were to act as a “non-poor” or advantaged reference group. 90.7% of respondents were Caucasian Irish, with 3.6% from other EU states, 3.4% of Black African ethnicity, 1.7% classified as travellers and 0.6% from Asia. Details of the sampling procedure are described in the methodology section of Chapter 2.

5.2.2. Health Behaviours

5.2.2.1.1. Smoking

Subjects were asked to state whether they currently smoked, had smoked in the past but had given up, or had never smoked. Current and former smokers were also asked to state the age at which they started smoking from a list of categories spanning two years each. The mid-interval values of these categories were used to estimate the age of smoking commencement. Current and former smokers were then asked to estimate the number of cigarettes which they would smoke in a typical day, from a choice of seven categories extending from 0 to over 60 per day. All of the questions employed to ascertain respondents’ smoking habits are shown in Appendix I.

For smoking status, five categories were generated from these data: “ever smokers” which included current and former smokers, current smokers, former smokers, never smokers and “current non-smokers” which included never smokers and former smokers. Approximate cumulative lifetime exposure to smoking was assessed in “pack years”. This figure is calculated by multiplying the duration of smoking in years by the average number of cigarettes smoked per day, and dividing this figure by 20.

5.2.2.1.2. Statistical Analysis

The relationship between smoking status and disadvantage was examined among the disadvantaged and advantaged women using crosstabulations and chisquare analyses, with significance assessed at the $p<0.05$ level using Yates’ Continuity Correction for these dichotomous analyses. Among the “ever smokers” in this population, the mean age of smoking commencement was then compared between the disadvantaged and advantaged groups by means of independent t-tests. Among current smokers, the number of cigarettes smoked per day and the estimated number of pack years were non-normally distributed, and non-parametric Mann-Whitney U tests were employed to compare the differences in these parameters between the disadvantaged and advantaged groups. The data were also examined to estimate the difference in smoking cessation rates between the disadvantaged and advantaged populations, by expressing the percentage of ever smokers now classified as former smokers in each group.

The social class and educational differences in the relative proportions of current smokers, former smokers and never smokers among women aged 18-35 years from NSIFCS were also assessed. This was to provide context for the discussion of smoking prevalence among the current study population.

5.2.2.2.1. Alcohol Consumption

A unit of alcohol is defined as 10mls (8 grams) of pure ethanol (Gill, 2002). For alcohol consumption, average units per week were calculated for each respondent by first estimating the approximate number of units per half pint of beer/stout (284mls=1.15 units), measure of spirits (38mls=1.5 units), glass of wine (150mls=2.0 units) and bottle of alcopops (330mls=1.8 units). These figures were then multiplied by the number of each of these drinks the respondent reported consuming in a typical week, according to the questions detailed in Appendix I.

5.2.2.2.2. Statistical Analyses

Because data for all of the continuous alcohol intake variables examined (units/week, % contribution to total energy, units/drinking occasion, drinking occasions/week) were non-normally distributed, differences between the disadvantaged and advantaged groups for these variables were assessed by non-parametric analyses (Mann-Whitney U tests).

Differences in the median number of units consumed per week between the disadvantaged and advantaged populations were first assessed. These analyses were performed for both the full cohort and among alcohol consumers only.

The percentage of total energy derived from alcohol was then calculated by multiplying the units per week for each respondent by 8 to get estimated grams of alcohol per week. This figure was divided by 7 to derive the mean grams of alcohol consumed per day, and this figure was then multiplied by 29.3 to estimate the mean kilojoules per day contributed by alcohol.

This figure was divided by the total kilojoules per day for each respondent, and multiplied by 100 to give the final percentage of energy from alcohol. Non-parametric Mann-Whitney U tests were again employed to analyse the difference in median percentage of energy from alcohol between the disadvantaged and advantaged groups. This test was carried out for both the full population and for alcohol consumers only.

The median number of drinking occasions per week was next compared between disadvantaged and advantaged alcohol consumers using Mann-Whitney U tests. Although a relatively crude estimate, the mean number of units consumed per drinking occasion among alcohol consumers was estimated by dividing the number of units per week for each respondent by the number of days on which they typically consume alcohol. The median of these estimates for average units of alcohol per drinking occasion was then compared between disadvantaged and advantaged consumers, again using Mann-Whitney U tests; to assess their comparative propensity towards "binge" alcohol consumption (intake of >6 units at any one time) (Anderson, 1984; Bridgewood *et al.*, 2000; National Institute on Alcohol Abuse & Alcoholism, 2004).

The overall prevalence of alcohol consumption was compared between the disadvantaged and advantaged groups using crosstabulation and Chisquare analysis. The comparative prevalence of consumption for each of the different types of alcoholic beverage was assessed by the same method. Finally, compliance with alcohol consumption guidelines (<14 units per week in total, <6 units per drinking occasion) between the disadvantaged and advantaged populations was compared, again using crosstabulation and Chisquare analyses. For all of these analyses between dichotomous categorical variables, Yates' Continuity Correction was reported, with statistical significance defined at the $p<0.05$ level.

5.2.2.3.1. Dietary Supplement Use

Dietary supplement use was assessed by asking respondents "Do you currently take any nutritional supplements (e.g. vitamins, minerals etc.)?" Pilot studies had indicated that while respondents who took supplements generally knew what *type* of products they were taking, they usually had a poor knowledge of the *brand names* of these preparations. For this reason, and to avoid recording the incorrect *type* of supplement based on poor reliability of brand names provided, respondents were asked to indicate the generic type of supplement used (e.g. iron tablets, multivitamins etc.). The composition of these supplements was then estimated from a standard, widely available preparation of that type.

5.2.2.3.2. Statistical Analysis

The prevalence of dietary supplementation among the disadvantaged and advantaged populations in the current study was compared by crosstabulation with Chisquare analysis, with Yates' Continuity Correction quoted for this 2 x 2 dichotomous analysis. Supplement users were classified as those who answered "yes" to the question above.

The estimated contribution of dietary supplements to the vitamin and mineral intakes of both the disadvantaged and advantaged populations was calculated from WISP® data which assessed the contribution of different food groups to nutrient intakes with supplements both included and excluded. The main types of supplements used by the disadvantaged and advantaged groups were also described.

Having obtained permission to analyse the NSIFCS database, dietary supplement use among women aged 18-35 years from that study population was also assessed according to social class and educational status using crosstabulation and Chisquare analysis. These analyses were performed to provide context for the investigation of socio-economic variation in supplementation practices among the current study population.

5.2.2.4.1. Physical Activity

For assessment of physical activity and sedentarism, three indices were employed. The reliability of the data returned for estimation of light activity was questionable however, and these data were not used in subsequent analyses.

Sedentarism was estimated from sitting time per day. Mean combined occupational and recreational sitting time per day was initially calculated by asking respondents to estimate how long they spent sitting on a typical weekday and a typical weekend day from a range of 13 options as described in Appendix I. The mid-interval values from the categories selected were taken to represent the typical weekday and weekend day sitting times. The mean weekday sitting time was multiplied by five and this figure was added to the mean daily weekend sitting time multiplied by two. The total figure was divided by seven to yield an estimated mean daily sitting time which was reflective of both weekdays and weekends. Mean daily duration of vigorous physical activity was calculated from three questions which asked respondents to indicate the type(s) of vigorous activity they engaged in, the frequency with which they participated in those activities each week, and the typical time they would spend in these activities on each occasion.

For each vigorous activity reported, the usual time spent in that activity per occasion was multiplied by the number of times per week to derive a weekly total duration for that activity. These figures for each activity were added together to give the total weekly duration for vigorous activity, and this figure was divided by seven to estimate the mean daily duration of such activity. Prevalence of participation in vigorous activity was assessed by categorising those who partook in any vigorous activity as “exercisers” and those who did not engage in any vigorous activity as “non-exercisers”.

5.2.2.4.2. Statistical Analysis

The estimated mean daily sitting time was non-normally distributed in this population, and was compared between the disadvantaged and advantaged women by means of non-parametric Mann-Whitney U tests. Estimated mean daily duration of vigorous physical activity was again non-normally distributed, and comparison between the disadvantaged and advantaged groups again made by non-parametric Mann-Whitney U tests. Differences in vigorous activity participation between the disadvantaged and advantaged cohorts were assessed by comparing the proportion of each group classified as “exercisers” using crosstabulation and Chisquare analysis. Yates’ Continuity Correction was again reported for this crosstabulation between dichotomous variables, and significance defined at the $p<0.05$ level.

5.2.2.5.1. Parity & Breastfeeding Practices

With regard to parity and breastfeeding practices, respondents were first asked to report their own birthweight and whether or not they were breastfed in infancy (if known). They were also to indicate whether they had had any children, and if so, how many.

Subjects who had had children were asked to record their primiparous age (i.e. their age at the time of the first child's birth), and also whether they had breastfed their children and for how long.

5.2.2.5.2. Statistical Analysis

Reported birthweights were normally distributed in this population, and consequently mean birthweights were compared between the disadvantaged and advantaged respondents who had reported a birthweight (n=109) using independent t-tests. The relative proportions of the disadvantaged and advantaged groups who were breastfed in infancy were then compared by crosstabulation and Chisquare analysis among respondents who had reported a feeding method (n=190). Yates' Continuity Correction was quoted for this analysis between dichotomous variables.

The mean primiparous age and mean number of children were then described for mothers in the disadvantaged and advantaged groups. Differences in the prevalence of breastfeeding between the disadvantaged and advantaged mothers were also described. Because the low number of mothers in the advantaged group (n=7) precluded meaningful statistical comparison between the two groups for these parameters, findings are presented alongside data from the most recently published national perinatal statistics (Bonham, 2007) for comparative purposes.

The anthropometrical characteristics (height, BMI and waist circumference) for those reporting how they were fed as infants (n=253) are normally distributed. The mean height, BMI and waist circumference of breastfed women (n=67) were consequently compared against those of their formula fed peers (n=186) by independent t-tests.

5.2.2.6.1. Anthropometry

The protocols used for the anthropometric measurement of respondents are described in Chapter 2. Weight was measured to the nearest 0.2kg using a Seca Compact Digital Floor Scale IIII, model 888. Height was measured to the nearest 0.5cm using a collapsible "Leicester Height Measure" stadiometer (CMS Weighing Equipment, London). Waist circumference was measured around the umbilicus to the nearest 0.5cm with a Seca Measuring Tape, model 200. Anthropometric data were collected for 292 respondents in the final cohort (n=218 disadvantaged & 74 advantaged subjects).

5.2.2.6.2. Statistical Analysis

All anthropometrical indices under examination (height, BMI, waist circumference) were normally distributed in the full population. Consequently, these parameters were compared between the disadvantaged and advantaged groups using independent t-tests. Crosstabulation with Chisquare analyses were also employed to compare the prevalence of overweight (BMI $\geq$25kg/m^2) and central obesity (waist $\geq$88cm) between these groups. Findings are presented alongside data describing social class and educational differences in anthropometry among women aged 18-35 years from the NSIFCS.

5.2.2.7. Socio-economic and Attitudinal Predictors of Health Behaviour and Anthropometry

Differences in the health behaviours and anthropometric indices under examination were next compared according to various socio-economic and attitudinal indicators. Normally distributed continuous variables (e.g. the anthropometrical indices) were compared using independent t-tests, while data from non-normally distributed parameters (e.g. tobacco exposure, alcohol consumption, sitting time, vigorous activity duration), were compared using non-parametric Mann-Whitney U tests.

Relationships between the categorical health behavioural variables (e.g. smoking prevalence, participation in vigorous activity, prevalence of high alcohol consumption, dietary supplement usage and breastfeeding prevalence) and the SES and attitudinal categories, were assessed by means of crosstabulation and Chisquare analyses. These categorical variables are all dichotomous, and therefore Yates' Continuity Correction was used to define statistical significance at the $p<0.05$ level in each case. The attitudinal variables used were defined according the details in Table 5.1 below.

Attitudinal Variable	Definition
Chance Health Locus	Describes those who report their health to be determined by chance (yes/no).
External Health Locus	Describes those who report their health to be determined by external factors over which they have no control (yes/no).
Dietary Stage of Change Score	Categorises subjects into the passive or "low" stages (pre-contemplation, contemplation, decision), or into the active or "high" stages (action, maintenance) (high/low).
Pre-contemplation Stage of Change	Describes those who report themselves to be in the pre-contemplation stage of dietary change (yes/no).
Action/Maintenance Stage of Change	Describes those who report themselves to be in the action or maintenance stage of dietary change (yes/no).
10 year Future Salience	Describes whether respondents think about their lives in ten years time "fairly often" or "very often" ("yes") or "rarely" or "not very often" ("no") (yes/no).
Mass Media as Health Information Source	Describes those who select mass media (TV, radio, magazines, internet) as sources of health information (yes/no)
Psychological Stress	Describes whether subjects are experiencing psychological stress (stress > once/day) or not (stress < once/day) (yes/no)
"My weight is ok for my age"	Categorises subjects based on their perception of their current weight (agree/disagree)
"My exercise level is already good enough"	Categorises subjects based on self-perceived adequacy of their current physical activity level (agree/disagree)
Safe Fields for Recreation near home	Describes whether respondents feel that there are sufficient, safe recreational areas in their locality (yes/no)
Facilities/Environment is a Health Barrier	Describes whether poor healthcare or other facilities or poor environment are selected as barriers to health (agree/disagree)
Poor Support is a Health Barrier	Describes whether poor family support is selected as a barrier to health (agree/disagree)
Cost is a Health Barrier	Describes whether cost is selected as a barrier to health (agree/disagree)
Knowledge is a Health Barrier	Describes whether poor health knowledge is selected as a barrier to health (agree/disagree)
Willpower Barrier to Healthy Eating	Describes whether willpower is selected as a barrier to health (agree/disagree)
No Changes Required Health Barrier	Describes whether subjects feel that no changes in health behaviour are required (agree/disagree)
Self Rated Health	Describes whether subjects view their health as good (excellent/very good/good) or poor (fair/poor)

Table 5.1 Definition of Attitudinal Parameters

Following investigation of the socio-economic and attitudinal variations in each of the five individual health behaviours, further analyses were performed to ascertain whether poorer health behaviours coincided with each other, and with poorer dietary behaviour, among individuals in this study population. The main objective in this case was to establish whether *co-occurrence* of these distinct health behaviours was more prevalent among those of low SES than their more affluent peers. Such a trend might suggest that these behaviours are reflective of some broader sociological phenomenon influencing general health attitudes and behaviours among the low SES women.

Five indicators were selected to assess overall dietary quality. These were combined fruit and vegetable intake, breakfast cereal consumption, sweet food and confectionery intake, fish consumption and dairy food intake. These food groups had previously been dichotomised into high and low intakes around their medians as described in Chapter 4.

Scores of 1 were awarded for high fruit and vegetable intake, high breakfast cereal intake, low sweet food and confectionery intake, high fish intake and high dairy food intake, while scores of zero were awarded to those in the opposite category in each case. This scoring system is based on the premise that dichotomisation at the median yields two groups of equal size, thereby increasing the power and utility of subsequent analyses. Absence of explicit intake targets for most food groups precludes dichotomisation around a guideline amount, although the likely low numbers achieving such a guideline (e.g. fruit & vegetables) would, in any case, compromise the utility of any subsequent analyses. Using these dichotomised food groups, the 216 valid reporters were scored from 0 to 5 on the overall nutritional quality of their diet, with higher scores indicating more positive dietary habits. Those who scored 0, 1 or 2 (n=114, 52.8%) by this method were subsequently designated as respondents with "poor diet", while those who scored 3, 4 or 5 (n=102, 47.2%) were adjudged to have a "good diet".

A scoring system was also developed for alcohol consumption. A score of 1 was attributed to those with total intakes less than 14 units per week, with another point awarded to those who had typical mean intakes less than 6 units per drinking occasion. Respondents were subsequently scored out of 2 for alcohol consumption, with higher scores indicating more healthy patterns. These overall alcohol consumption scores were then dichotomised into "unhealthy alcohol consumption pattern" (scores of 0 and 1 (*n*=139, 65%) and "healthy alcohol consumption pattern" (scores of 2 (*n*=75, 35%).

Regarding the other health behaviours, the population were dichotomised into those who took dietary supplements (*n*=109, 37.3%) and those who did not (*n*=183, 62.7%) and those who participated in vigorous exercise (*n*=99, 33.6%) and those who did not (*n*=196, 66.4%). Similarly, respondents were dichotomised into current smokers (*n*=143, 48.8%) and ex- or never-smokers (*n*=150, 51.2%) to assess tobacco usage.

For each of the five health behavioural indicators described above (diet, alcohol consumption, dietary supplement use, participation vigorous exercise and smoking), subjects were awarded a score of 1 if they resided in the more healthy grouping (e.g. non-smokers, good diet, vigorous exercisers), and a score of 0 if they were in the "unhealthy" category. This enabled each of the 216 valid dietary reporters to be scored from 1 to 5 based on their overall diet and health behaviours, with higher scores indicating more favourable overall lifestyle patterns.

As was the case for the other categorical health behaviours described previously, overall "health scores" were compared between the disadvantaged and advantaged subjects using crosstabulation and Chisquare analysis. In this case Pearson's Chisquare was used to designate statistical significance at the $p<0.05$ level.

5.3. Results

5.3.1. Smoking

Table 5.2 describes the prevalence of smoking among the full disadvantaged and advantaged groups in the current study population. There is a more than three-fold difference in the proportion of the population who have ever smoked, indicating considerably greater initiation rates among the disadvantaged group. Although the overall proportion of former smokers in the disadvantaged (10.5%) and advantaged (9.6%) groups is virtually the same between the two groups (p=1.000), such comparison may be misleading. When the proportion of "ever smokers" who are now classified as former smokers is compared between the two groups, stark differences arise. In this instance, 23/156 of the disadvantaged ever smokers (14.7%) are now classified as former smokers, compared with 7/17 (41.2%) of the advantaged ever smokers (p=0.013). These analyses reveal that both higher initiation rates *and* lower cessation rates are precipitants of the significantly higher current smoking rates observed among the lower SES women.

Smoking Status (n=293)	Disadvantaged % (n)	Advantaged % (n)	p value
Ever smokers (n=173)	70.9 (156)	23.3 (17)	<0.001
Current smokers (n=143)	60.5 (133)	13.7 (10)	<0.001
Former smokers (n=30)	10.5 (23)	9.6 (7)	1.000
Ever smokers now former smokers (n=30)	14.7 (23)	41.2 (7)	0.013
Never smokers (n=120)	29.1 (64)	76.7 (56)	<0.001
Current non-smokers (n=150)	39.5 (87)	86.3 (63)	<0.001

Yates' Continuity Correction Coefficient reported for all of these 2 x 2 associations between categorical variables.

Table 5.2 Prevalence of Smoking among Disadvantaged and Advantaged Respondents

Table 5.3 estimates differences in lifelong exposure to smoking according to socio-economic status. Those in the disadvantaged group commence smoking considerably earlier (~2 years younger) than their more affluent counterparts (p=0.009). The mean and median number of cigarettes smoked per day, approximated from the mid-interval values of the categories selected by respondents, is also substantially greater among the disadvantaged group than their more advantaged peers (p=0.001). Together, these factors yield a mean lifetime exposure to smoking (pack years) among the disadvantaged smokers which is very significantly greater than that of the advantaged smokers, even at this relatively young age (p=0.013).

	Disadvantaged		**Advantaged**		**p value**
	Mean (SD)	**Median (IQR)**	**Mean (SD)**	**Median (IQR)**	
Age of Smoking Commencement (years) (Ever Smokers (n=171))	14.5 (2.8)	15.0 (2.0)	16.5 (3.4)	15.0 (5.0)	0.009
Number Smoked per Day† (Current Smokers (n=143))	13.8 (7.9)	15.0 (7.5)	6.0 (6.2)	2.5 (12.6)	0.001
Pack Years† (Current Smokers (n=141))	7.6 (7.3)	5.3 (7.1)	3.5 (4.2)	1.4 (7.3)	0.013

† Non-parametric tests (Mann-Whitney U) used to compare number of cigarettes smoked per day and pack years as these variables are non-normally distributed.

Pack years among current smokers calculated from duration of smoking (years) multiplied by cigarettes per day divided by 20.

Table 5.3 Intensity of Tobacco Consumption among Disadvantaged and Advantaged Respondents

5.3.2. Alcohol Consumption

Table 5.4 shows the differences in alcohol consumption between the disadvantaged and advantaged groups. Analysis on the full population indicates a considerably higher *mean* intake in terms of units per week among the disadvantaged group. However, the similar median intakes between the disadvantaged and advantaged groups (p=0.306) suggest that the mean intake among the disadvantaged group is being disproportionately raised by a minority of high consumers.

Status	Disadvantaged		Advantaged		p value
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Units per Week (Full Population, n=292)	14.1 (13.8)	10.0 (15.6)	10.2 (7.2)	9.1 (10.3)	0.306
Units per Week (Consumers Only†, n=265)	15.8 (13.7)	11.4 (15.7)	10.6 (7.1)	9.2 (9.0)	0.029
% of Total Energy from Alcohol (Full Population, n=292)	5.1 (5.1)	3.9 (5.5)	4.4 (3.1)	4.0 (4.3)	0.854
% of Total Energy from Alcohol (Consumers Only†, n=265)	5.7 (5.1)	4.4 (5.0)	4.6 (3.0)	4.3 (3.9)	0.420
No. of Drinking Occasions per Week (Consumers Only‡, n=221)	1.9 (1.43)	2.0 (2.0)	1.8 (1.0)	2.0 (1.0)	0.476
Units averaged per Drinking Occasion$^{\gamma}$ (Consumers Only‡, n=221)	13.2 (12.0)	9.6 (8.8)	8.0 (3.6)	7.8 (4.7)	<0.001

Data from all of these continuous alcohol intake variables examined are non-normally distributed with differences assessed by non-parametric analyses (Mann-Whitney U tests)

† Consumers only refers to the 265 respondents who report any alcohol consumption.

‡ Consumers only refers to the 221 respondents who report any alcohol consumption and who have provided details of the typical no. of days per week on which alcohol is consumed.

$^{\gamma}$ Mean units consumed per drinking occasion refers to typical weekly consumption divided by typical days per week on which alcohol is consumed.

Table 5.4 Differences in Alcohol Consumption Amounts between Disadvantaged and Advantaged Groups

When these analyses are repeated for just the 265 respondents (89.8%) of the population classified as alcohol consumers, significant socio-economic differences in intake become apparent.

Median intakes are now significantly greater among disadvantaged consumers than their advantaged peers (p=0.029), while the difference in mean intake between the two groups is also increased. Among the disadvantaged group, median intake among consumers only approaches the recommended limit of 14 units per week, while the mean intake for this disadvantaged population now exceeds this threshold.

When the contribution of alcohol to overall energy intake is examined between the two groups, median intake levels are found to be very similar between the disadvantaged and advantaged groups for both the full population (n=292) (p=0.854) and among alcohol consumers only (p=0.420). Again, the substantially greater *mean* intakes observed among disadvantaged respondents in both the full population and among consumers only, reflect the influence of a minority of high consumers in this group.

The mean number of drinking occasions per week among consumers is almost identical between the two groups (p=0.476), at ~2 per week. However, the median of the estimated average units consumed per drinking occasion is significantly greater among the disadvantaged group (9.6 units) than the advantaged group (7.8 units) (p<0.001). This is suggestive of a higher prevalence of binge consumption (intake >6 units per drinking occasion (Bridgewood *et al*., 2000)) among the disadvantaged group.

Table 5.5 depicts the differences which exist in alcohol consumption patterns between the disadvantaged and advantaged groups. There is little difference in the prevalence of alcohol consumption between the disadvantaged and advantaged populations (p=0.121), with a high proportion of consumers in both groups. Consumption of wine is significantly less prevalent (p<0.001), and consumption of alcopops significantly more prevalent (p=0.001), among disadvantaged than advantaged consumers. Although a lower proportion of the disadvantaged group consume spirits (p=0.061), this trend does not reach statistical significance.

Status	% Disadvantaged (n=218)	% Advantaged (n=74)	p value
Alcohol Consumers (n=265)	89.0	95.9	0.121
Beer/Stout Consumers (Consumers Only†, n=265)	55.2	40.8	0.181
Spirits Consumers (Consumers Only†, n=265)	33.0	46.5	0.061
Wine Consumers (Consumers Only†, n=265)	20.1	74.6	<0.001
Alcopops Consumers (Consumers Only†, n=265)	29.9	9.9	0.001
Individuals exceeding 14 units per week (Full Population, n=292)	37.6	27.0	0.131
Individuals exceeding 14 units per week (Consumers Only†, n=265)	42.3	28.2	0.050
Individuals exceeding a mean of 6 units per drinking occasion (Consumers Only‡, n=221)	81.8	64.3	0.012

Yates' Continuity Correction Coefficient reported for all of these 2 x 2 associations between categorical variables.
† Consumers only refers to the 265 respondents who report any alcohol consumption.
‡ Consumers only refers to the 221 respondents who report any alcohol consumption and who have provided details of typical no. of days per week on which alcohol is consumed.

Table 5.5 Differences in Alcohol Consumption Patterns between Disadvantaged and Advantaged Groups

Among the full population, while the proportion of individuals exceeding the recommended 14 units (112 g pure ethanol) per week is greater among the disadvantaged group, this trend does not reach statistical significance (p=0.131).

However, when non-consumers are excluded from these analyses, this trend does reach statistical significance (p=0.050), with a 50% greater proportion of disadvantaged than advantaged alcohol consumers exceeding the recommended guidelines. The percentage of alcohol consumers whose average intake per drinking occasion exceeds 6 units, the defining threshold for binge consumption (National Institute on Alcohol Abuse and Alcoholism (NIAAA) (2004)), is also significantly greater among the disadvantaged group (p=0.012), confirming the preponderance of higher risk consumption patterns among this group. Although this just fails to reach statistical significance (p=0.074), the greater prevalence of high weekly alcohol consumption among the disadvantaged women is illustrated in Figure 5.1 below.

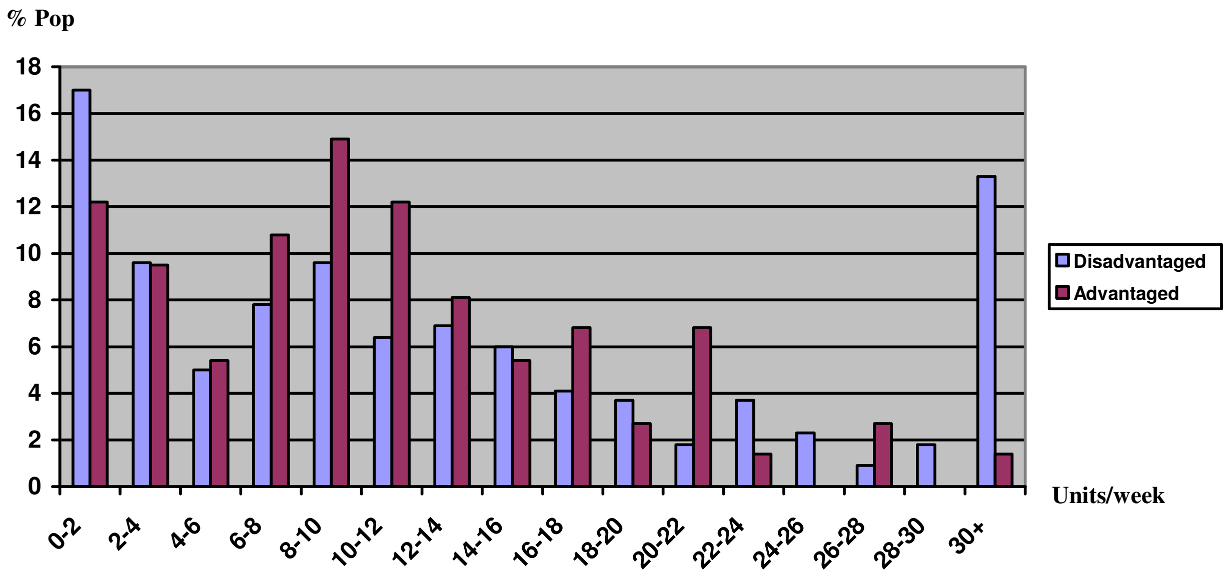

Figure 5.1 Weekly Alcohol Intake among Disadvantaged and Advantaged Women Reporting Alcohol Consumption (n=292)

This figure clearly demonstrates a considerably greater preponderance of very high alcohol intake (>28 units per week) among the disadvantaged women. However, of perhaps even greater significance than the socio-economic disparities in alcohol consumption patterns outlined above, is the high prevalence of alcohol over-consumption among both groups.

Forty-two percent of the disadvantaged group and 28% of the advantaged group exceed the recommended intake level of 14 units per week, while 82% of the disadvantaged group and 64% of their advantaged peers average more than six units of alcohol per drinking occasion. These findings suggest that although unhealthy patterns of alcohol consumption may be more prevalent among women of low SES in Ireland, they occur with high frequency at all societal levels.

5.3.3. Dietary Supplement Use

Table 5.6 shows the percentage of disadvantaged and advantaged respondents who are currently using dietary supplements, with those in the latter group demonstrating a significantly higher prevalence of usage (p=0.004).

	Disadvantaged (n=219)	Advantaged (n=73)	p value
% Supplement Users	32.4	52.1	0.004

Yates' Continuity Correction Coefficient reported for this 2 x 2 associations between categorical variables.

Table 5.6 Prevalence of Dietary Supplementation between Disadvantaged and Advantaged Populations

Table 5.7 demonstrates that no such socio-economic gradients in dietary supplement use were observed among young women in the NSIFCS. In fact, supplementation appears to be slightly more prevalent among those in both the lower social classes (p=0.510) and the higher educational groups (p=0.531), although these variations do not reach statistical significance.

	Low Social Class (n=75)	High Social Class (n=173)	p value	Low Education (n=82)	High Education (n=182)	p value
% Supplement Users	28.0	23.1	0.510	29.3	24.7	0.531

Yates' Continuity Correction Coefficient reported for this 2 x 2 associations between categorical variables.

Table 5.7 Prevalence of Dietary Supplementation according to Social Class and Educational Status in NSIFCS

Table 4.13 has previously illustrated the estimated contribution made by dietary supplements to vitamin intakes among the disadvantaged and advantaged populations. For most of the vitamins examined, those in the advantaged population derive roughly twice the percentage of their overall intake from these preparations, reflecting their greater overall prevalence of dietary supplement use.

The high percentage of vitamin intake derived from dietary supplements in both groups, but particularly among the advantaged group, emphasises the importance of these products to overall vitamin intakes and adequacy among young women.

Similarly, Table 4.17 has previously demonstrated the contribution made by dietary supplements to mineral intakes among the disadvantaged and advantaged populations respectively. Apart from iron, the contribution of these preparations to mean mineral intakes is considerably less than that to mean vitamin intakes. However, their impact upon mean iron intakes among both populations is likely to be substantial.

Table 5.8 describes the different types of dietary supplements consumed by the disadvantaged and advantaged populations. Multivitamins are by far the most commonly used preparations in both cases.

	% of the Disadvantaged Population (n=221)	% of the Advantaged Population (n=74)
Multivitamins	8.6	18.9
Cod Liver Oil	5.0	6.8
Vitamin C	3.6	5.4
Omega-3 Fish Oils	3.2	8.1
Iron Tablets	2.3	1.4
Evening Primrose Oil	1.8	9.5
Vitamin B Complex	1.4	4.1
Vitamin B6	0.9	4.1
Calcium	0.9	2.7
Folic acid	0.5	5.4
Vitamin D	0.5	1.4
Zinc	0.5	0.0
Magnesium	0.0	2.7
Vitamin E	0.0	1.4

Table 5.8 Percentage of Disadvantaged and Advantaged Respondents taking Different Types of Supplements

The proportion of the population taking evening primrose oil, vitamin B complex, vitamin B6 and magnesium is higher among the advantaged group, and all of these have been associated with relief from the symptoms of pre-menstrual stress disorder (PMSD) (Bendich, 2000), and marketed at those who suffer from it. Omega-3 fish oils are also taken more commonly by the more affluent group.

Critically, although this will also be contained as a component of all multivitamins and B complex products, the prevalence of folic acid supplementation is much lower among the disadvantaged group. However, both populations show a very low prevalence of supplementation for this important nutrient. Similarly, prevalence of vitamin D (and calcium) supplementation is very low for both groups, highlighting issues of very significant concern for these young women, given the low *dietary* intakes of vitamin D shown in Chapter 4, and the typically low cutaneous synthesis of vitamin D which takes place at northern latitudes (Holick, 2006), including Ireland.

Finally, the dietary profile of dietary supplement users is also particularly noteworthy. Those who take supplements have higher median intakes of fruit and fruit juices (p=0.030), vegetables (p=0.001), breakfast cereals (p=0.001), fish P=0.023) and dairy foods (p=0.047), all of which have been associated with more favourable micronutrient intakes (see Chapter 4). Put simply, this means that those taking dietary supplements in this population will frequently be the individuals in least need of additional micronutrient intakes from this source.

5.3.4. Physical Activity

While the measures of physical activity used in this study are relatively crude, they do offer some indication of the variation in levels between the disadvantaged and advantaged groups.

Table 5.9 describes the differences in sedentarism (median daily sitting time) and vigorous activity (median daily time spent in strenuous activity) between the two groups. Those in the disadvantaged group have a significantly lower median daily sitting time than their more affluent peers ($p<0.001$). However, they also show a significantly lower median duration ($p=0.001$), and a considerably lower mean duration of vigorous activity than the advantaged group.

Status	Disadvantaged (n=221)		Advantaged (n=74)		p value
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Sitting Time per Day (minutes)	225 (128)	210 (201)	291 (142)	321 (257)	<0.001
Time in Vigorous Activity per Day (minutes)	8.8 (25.9)	0 (4.3)	21.5 (91.7)	1.1 (16.7)	0.001

Data from both of physical activity variables examined above are non-normally distributed with differences assessed by non-parametric analyses (Mann-Whitney U tests).

Table 5.9 Mean Duration of Sitting and Vigorous Activity per Day among Disadvantaged and Advantaged Respondents

Table 5.10 reveals that the lower daily durations of vigorous activity among the disadvantaged group may relate primarily to significantly lower rates of participation in strenuous activity among this group ($p=0.001$). The proportion of disadvantaged respondents engaging in some form of vigorous exercise in a typical week is approximately half that of their more advantaged peers.

Status	Disadvantaged (n=221)	Advantaged (n=74)	p value
Participate in Vigorous Activity	62 (28.1%)	37 (50.0%)	0.001

Yates' Continuity Correction Coefficient reported for this 2 x 2 association between categorical variables.

Table 5.10 Participation in Vigorous Activity among Disadvantaged and Advantaged Respondents

Of perhaps even greater significance than these socio-economic differences in participation however, are the very low levels of participation in vigorous activity among both groups. These findings suggest that a significant majority of respondents within both groups are failing to achieve the levels of physical activity recently recommended by the American College of Sports Medicine and the American Heart Association for optimal health maintenance (Haskell *et al.*, 2007).

5.3.5. Parity and Breastfeeding

Low birthweight and low rates of breast feeding have both been associated with poorer chronic health status, especially poorer cardiovascular health indices. Low socio-economic status has been consistently linked with both lower birthweights and lower breast feeding rates in Ireland and other developed countries.

Table 5.11 illustrates the differences in these factors between the disadvantaged and advantaged groups. Among the 156 respondents (109 disadvantaged, 47 advantaged) who reported their birthweight, there was no significant difference in mean birthweight between the two groups. However, among the 256 respondents (190 disadvantaged, 66 advantaged) who were able to report how they were fed as infants, a significant social gradient in breastfeeding was observed. Those in the advantaged group reported a breastfeeding prevalence of 48.5%, a figure slightly above the current national average, and almost three times the rate of those in the disadvantaged group (p<0.001). The disadvantaged women reported rates which are similar to those of the lowest social class in the most recent national perinatal statistics (Bonham, 2007).

	Disadvantaged	**Advantaged**	**p value**	**Lowest SC nationally†**
Birthweight (kg) (n=109 disadvantaged, 47 advantaged)	3.28	3.38	0.434	Nat. Avg. 3.500kg
% Breast Fed as an Infant (n=190 disadvantaged, 66 advantaged)	18.4	48.5	<0.001*	19.9
% Who Breast Fed Own Children (n=156 disadvantaged, 7 advantaged)	25.5	100.0	---------	41.3

SC – Social Class, Nat. Avg. – National average birthweight. † Lowest occupational social class nationally - *Report on Perinatal Statistics for 2003* (Bonham, 2007).

* Yates' Continuity Correction Coefficient reported for this 2 x 2 association between categorical variables.

Table 5.11 Birthweights and Infant Feeding Methods of Disadvantaged and Advantaged Respondents

When the proportion of mothers who breastfed their own children was investigated, similar socio-economic trends emerged. Among disadvantaged mothers, the prevalence of breastfeeding was considerably lower than that of their advantaged reference group, all of whom breastfed; and also fell well below the overall national average (41.3%) (Bonham, 2007). Rates among the disadvantaged group however, exceeded those of the lowest occupational social class (19.9%) from the most recent national statistics, and encouragingly, do not appear to be disproportionately raised by the small number of non-national breast feeding mothers (*n*=2) in the disadvantaged group.

Table 5.12 describes differences in parity between the disadvantaged and advantaged women who have already had children. Unfortunately, the low proportion of mothers in the advantaged cohort precludes meaningful statistical comparison between the two groups. However, the mean primiparous age is clearly much lower among mothers in the disadvantaged group. Mothers in the advantaged group have a mean primiparous age which, at just over thirty years, is similar to the national average (30.6 years). The mean primiparous age of the disadvantaged women however (21.0 years), falls substantially below this national average. Because the current study population is confined to those aged 18-35 years (unlike the national population), direct comparison cannot be drawn in this regard. Nonetheless, the current study data are strongly suggestive of endemic precocious parity among the disadvantaged women.

	Disadvantaged (n=156)	**Advantaged (n=7)**	**Population Mean†**
Primiparous Age (years)	20.98	30.14	30.58
No. of Children (average maternal parity)	1.78	1.57	1.05

† *Report on Perinatal Statistics for 2003* (Bonham, 2007)

Table 5.12 Parity of Disadvantaged and Advantaged Mothers

Although the *current* number of children born to mothers in the disadvantaged group is greater than that of their advantaged counterparts, this may merely reflect a more advanced stage of the family life cycle among disadvantaged mothers at that age, due to their earlier parity.

Breastfeeding in infancy has been associated with lower truncal adiposity and lower BMI in later life, although the myriad other influences on these parameters which intervene during the life course, make it difficult to apportion causality to this one factor. Table 5.13 describes differences in anthropometric status according to feeding method in infancy among the current study population. These data reveal that those who report being breastfed as infants have a significantly greater mean height than their bottle-fed peers. However, although mean BMI and mean waist circumference are both lower among those who were breastfed as infants, these trends do not reach statistical significance (p=0.188 and p=0.270 respectively). Mean BMI and waist circumference for both groups lies just beneath the upper levels recommended for good health.

	Not Breast Fed (n=186)	**Breast Fed (n=67)**	**p value**
Mean Height (SD) (m)	1.627 (0.06)	1.660 (0.07)	<0.001
Mean Body Mass Index (SD) (kg/m^2)	25.06 (5.72)	24.06 (4.11)	0.188
Mean Waist Circumference (SD) (cm)	86.6 (14.1)	84.4 (12.4)	0.270

Table 5.13 Anthropometric Status according to Neonatal Breast Feeding Exposure

5.3.6. Anthropometry

Higher Body Mass Index (BMI) and particularly high waist circumference, a marker for *abdominal* obesity, have both been associated with the development of serious chronic health problems including cardiovascular disease and stroke.

Among the present study population, both mean BMI (p=0.001) and mean waist circumference measurements (p<0.001) are significantly higher in the disadvantaged group than among their more advantaged peers, as shown in Table 5.14. Mean linear height measurements are also significantly lower among the disadvantaged group (p=0.004). Mean BMI and waist circumference approach or exceed the upper recommended levels among the disadvantaged group.

	Disadvantaged (n=218)	Advantaged (n=74)	p value
Height (SD) (m)	1.630 (0.06)	1.654 (0.07)	0.004
Body Mass Index (SD) (kg/m^2)	25.32 (5.50)	22.91 (3.66)	0.001
Waist Circumference (SD) (cm)	87.9 (13.9)	79.7 (8.9)	<0.001

Table 5.14 Anthropometric Status among Disadvantaged and Advantaged Respondents (n=292)

Table 5.15 illustrates the differences in prevalence of overweight (BMI ≥25kg/m^2) and central obesity (waist circumference ≥88cm) between the disadvantaged and the advantaged women.

	% Disadvantaged (n=218)	% Advantaged (n=74)	p value
Overweight (Body Mass Index >25kg/m^2)	45.0	24.3	0.003
Central Obesity (Waist Circumference >88cm)	45.4	17.6	<0.001

Table 5.15 Differences in Prevalence of Overweight and Central Obesity between Disadvantaged and Advantaged Respondents (n=292)

Those who are disadvantaged have an almost two-fold greater prevalence of overweight, while their prevalence of central obesity is nearly three times that of their more affluent peers.

These findings are similar to the educational differences in anthropometric status revealed by the analyses of women aged 18-35 years in the NSIFCS study population, as illustrated in Table 5.16.

	Social Class	Low Social Class	High Social Class	p value	Education	Low Education	High Education	p value
Height (m)	n=248	1.617	1.632	0.268	n=263	1.606	1.639	<0.001
Body Mass Index (kg/m^2)	n=248	24.77	24.24	0.381	n=263	25.40	23.88	0.008
Waist Circumference (cm)	n=227	79.20	76.68	0.086	n=243	80.00	76.46	0.012

Table 5.16 Anthropometric Status according to Social Class and Educational Status in NSIFCS

Among these NSIFCS young women, significantly higher mean BMI and waist circumference measurements were recorded for those of low educational status in comparison to their more educated peers (p=0.008 and p=0.012 respectively), while mean height was also significantly lower in this less educated group (p<0.001). Overall, mean waist circumference levels for women in the NSIFCS are substantially lower than those recorded for both the disadvantaged and advantaged women in the current study.

5.3.7. Co-segregation of Diet and Health Behaviours

Figure 5.2 below describes the differences in overall “health scores” observed between the disadvantaged and advantaged cohorts in the current study. The disadvantaged women have a significantly greater prevalence of low scores and a significantly lower prevalence of high scores ($p<0.001$), indicating that the co-occurrence of multiple unhealthy behaviours is considerably more prevalent among these low SES women than among their more affluent peers.

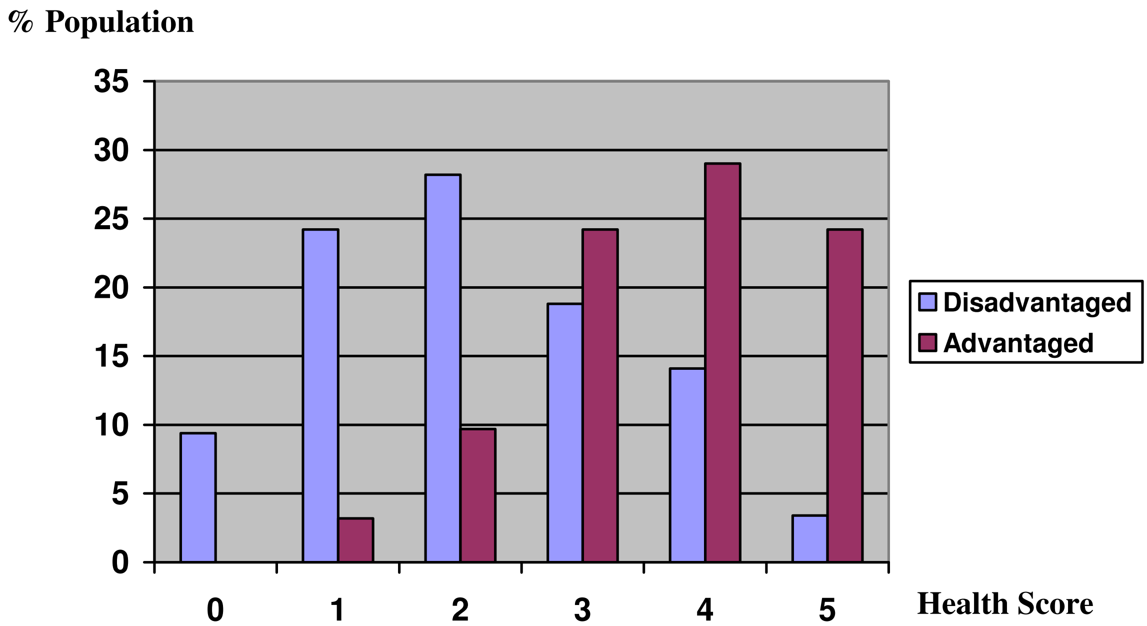

Figure 5.2 Distribution of Overall “Health Scores” among Disadvantaged and Advantaged Subjects (n=211)

While 9.4% of the disadvantaged population display negative patterns for all of the health behaviours investigated, none of the advantaged population reside in this category. Correspondingly, while just 3.4% of the disadvantaged population achieve a maximum “health score” of 5, 24.2% of the advantaged respondents are classified in this group. These data provide confirmatory evidence that negative dietary and health behaviours are not just more prevalent among the disadvantaged women, but that these patterns reflect the common co-occurrence of these poorer behaviours in disadvantaged individuals.

5.3.8. Socio-economic & Attitudinal Predictors of Health Behaviours and Anthropometric Status

Tables 5.17(a) and 5.17(b) show the differences in various health behaviours across a range of socio-economic indicators.

The profound difference in current smoking prevalence according to socio-economic status is clearly evident, with women of lower status demonstrating significantly higher rates for all of these indicators. Although the indicators of *material* deprivation do not associate significantly with younger age of smoking commencement, those which are indicative of social deficits (e.g. low social class (p=0.025), low socio-economic group (SEG) (p<0.001)) are predictive of significantly earlier smoking inception.

Participation in vigorous physical activity is significantly lower among those of lower status for both indicators of social disadvantage (social class (p=0.005), socio-economic group (p=0.042), low education (p=0.012) and early school leaving (p=0.003)) and material disadvantage (relative income poverty (p=0.002), deprivation (p=0.001), consistent poverty (p=0.009) and medical card entitlement (p=0.012)). However, lower estimated median sitting times per day appear to be predicted primarily by markers of material deprivation such as relative income poverty (p=0.007), deprivation (p=0.050), consistent poverty (p=0.001) and medical card entitlement (p=0.042). These findings indicate that while participation in vigorous activity may be generally lower among the disadvantaged respondents, those who are experiencing material deprivation also have a lower degree of sedentarism, a factor which may reduce the differences in overall physical activity levels between the two groups.

High alcohol consumption (intake >14 units per week) associates significantly only with low social class ($p=0.041$). However, there is a general, non-significant trend towards greater prevalence of high consumption among the lower social groupings.

As was the case for early smoking commencement, low prevalence of dietary supplement use appears to associate particularly with markers of social disadvantage (e.g. low social class ($p=0.001$), low socio-economic group ($p=0.002$)). However, the non-significant tendency towards lower supplement use among those in relative income poverty ($p=0.056$) suggests a further role for material disadvantage in this regard.

While the proportion of women who were breastfed in infancy is significantly lower among those of lower status for many of the socio-economic parameters investigated, this is not the case for either deprivation ($p=0.080$) or consistent poverty ($p=0.334$), perhaps indicating a greater association between *social* indices of disadvantage and lower propensity to breastfeed. This concept would seem to be supported by the patterns observed in women's own breastfeeding behaviour. Here, socio-economic indicators which reflect *social* disadvantage, specifically low formal education ($p=0.030$), and early school leaving ($p=0.043$), are seen as more potent predictors of low breast feeding rates than those related to material poverty.

With regard to anthropometric status, BMI and waist circumference tend to be greater among the lower socio-economic strata, with material structures of disadvantage appearing to be more potent predictors of higher BMI and waist circumference than social factors. For example, deprivation predicts higher BMI ($p=0.018$), benefit entitlement is associated with both higher BMI ($p<0.001$) and waist circumference ($p<0.001$) and medical card entitlement predicts higher waist circumference ($p=0.010$).

SE Indicator	Status	Current Smoker		Mean Age Commenced Smoking (SD) †		Participation in Vigorous Exercise		Median Sitting Time per Day (IQR)*		High Alcohol Intake	
		% Yes	p value	Years	p value	% Yes	p value	Minutes	p value	% >14 units per week	p value
Disadvantage	No (n=74)	13.7	<0.001	16.5 (3.4)	0.009	50.0	0.001	321 (257)	0.732	27.0	0.131
	Yes (n=221)	60.5		14.5 (2.8)		28.1		206 (184)		37.6	
Social Class	High (n=155)	31.8	<0.001	15.4 (3.2)	0.025	41.3	0.005	270 (236)	0.621	29.2	0.041
	Low (n=140)	67.6		14.3 (2.6)		25.0		184 (161)		41.3	
Socio-economic Group (SEG)	High (n=199)	40.4	<0.001	15.4 (3.0)	<0.001	37.7	0.042	236 (251)	0.312	32.8	0.336
	Low (n=96)	66.3		13.8 (2.4)		25.0		195 (165)		39.4	
Education	High (n=173)	32.2	<0.001	14.8 (3.0)	0.643	39.9	0.012	266 (254)	0.478	35.7	0.929
	Low (n=120)	72.5		14.6 (2.8)		25.0		193 (159)		34.5	
Early School Leaving	No (n=190)	35.6	<0.001	15.1 (2.9)	0.131	40.0	0.003	249 (266)	0.468	34.4	0.894
	Yes (n=105)	72.4		14.4 (2.9)		21.9		197 (169)		35.9	
Relative Income Poverty	No (n=180)	37.4	<0.001	14.9 (3.1)	0.514	40.6	0.002	261 (241)	0.007	33.5	0.609
	Yes (n=115)	66.7		14.6 (2.6)		22.6		184 (180)		37.2	
Deprivation	No (n=202)	41.0	<0.001	14.7 (2.7)	0.970	40.1	0.001	244 (244)	0.050	33.7	0.678
	Yes (n=92)	65.2		14.8 (3.2)		19.6		184 (184)		37.0	
Consistent Poverty	No (n=238)	44.5	0.006	14.8 (2.9)	0.796	37.4	0.009	246 (251)	0.001	36.2	0.359
	Yes (n=56)	66.1		14.6 (3.0)		17.9		167 (165)		28.6	
Benefit Entitlement	No (n=146)	36.1	<0.001	14.7 (3.0)	0.989	39.0	0.070	309 (236)	0.051	36.8	0.535
	Yes (n=148)	60.8		14.7 (2.9)		28.4		167 (154)		32.7	
Medical Card	No (n=141)	29.3	<0.001	15.1 (3.2)	0.212	41.1	0.012	309 (253)	0.042	30.5	0.158
	Yes (n=154)	66.7		14.5 (2.7)		26.6		184 (159)		39.1	
Single Adult Family Unit	No (n=196)	38.7	<0.001	14.7 (2.9)	0.958	36.2	0.217	266 (257)	0.801	33.7	0.619
	Yes (n=99)	68.7		14.7 (2.9)		28.3		184 (138)		37.4	

Yates' Continuity Correction Coefficient reported for all 2 x 2 associations between categorical variables.
† Population includes only current smokers or those who have smoked in the past (n=171)
* Non-parametric tests (Mann-Whitney U) to compare sitting times (non-normally distributed)

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 5.17(a) Health Behaviours among the Full Study Population according to Socio-economic Factors

SE Indicator	Status	Dietary Supplement Use		Breast Fed as a Child ††		Breastfed own Children†††		Mean Body Mass Index (BMI) (SD)		Mean Waist Circumference (SD)	
		% Yes	p value	% Yes	p value	% Yes	p value	Kg/m^2	p value	cm	p value
Disadvantage	No (n=74)	52.1	0.004	48.5	<0.001	100.0	<0.001	22.9 (3.7)	0.001	79.7 (8.9)	<0.001
	Yes (n=221)	32.4		18.4		25.5		25.3 (5.5)		87.9 (13.9)	
Social Class	High (n=155)	46.4	0.001	37.7	<0.001	35.6	0.196	24.5 (5.2)	0.493	84.6 (13.0)	0.100
	Low (n=140)	27.3		12.7		24.8		24.9 (5.1)		87.2 (13.6)	
Socio-economic Group (SEG)	High (n=199)	43.7	0.002	31.1	0.012	32.6	0.252	24.6 (5.2)	0.588	85.4 (12.7)	0.522
	Low (n=96)	24.2		15.2		23.2		24.9 (5.3)		86.5 (14.5)	
Education	High (n=173)	42.1	0.054	35.8	<0.001	38.8	0.030	24.3 (5.1)	0.184	84.5 (13.1)	0.056
	Low (n=120)	30.3		13.1		21.9		25.2 (5.3)		87.5 (13.6)	
Early School Leaving	No (n=190)	40.4	0.179	34.8	<0.001	36.7	0.043	24.4 (4.8)	0.114	84.7 (12.8)	0.061
	Yes (n=105)	31.7		11.6		21.2		25.4 (5.8)		87.8 (14.2)	
Relative Income Poverty	No (n=180)	41.9	0.056	32.3	0.009	27.7	0.921	24.8 (4.9)	0.819	85.3 (12.8)	0.425
	Yes (n=115)	30.1		16.8		29.6		24.6 (5.6)		86.6 (14.1)	
Deprivation	No (n=202)	37.5	1.000	29.5	0.080	29.0	1.000	24.2 (4.5)	0.018	84.7 (12.1)	0.064
	Yes (n=92)	37.4		18.3		28.6		25.8 (6.4)		87.9 (15.4)	
Consistent Poverty	No (n=238)	38.6	0.516	27.5	0.334	26.5	0.390	24.6 (4.9)	0.532	85.4 (12.7)	0.430
	Yes (n=56)	32.7		19.6		34.8		25.1 (6.3)		87.0 (15.6)	
Benefit Entitlement	No (n=146)	39.6	0.535	35.7	0.001	37.0	0.412	23.5 (4.3)	<0.001	82.5 (11.4)	<0.001
	Yes (n=148)	35.4		16.9		27.0		25.9 (5.7)		89.1 (14.3)	
Medical Card	No (n=141)	42.1	0.131	40.2	<0.001	40.0	0.105	24.1 (4.6)	0.060	83.7 (11.8)	0.010
	Yes (n=154)	32.9		13.4		25.0		25.3 (5.6)		87.7 (14.4)	
Single Adult Family Unit	No (n=196)	39.2	0.430	34.1	<0.001	41.5	0.005	24.0 (4.8)	0.001	83.9 (12.4)	<0.001
	Yes (n=99)	33.7		11.2		20.2		26.2 (5.7)		89.7 (14.3)	

Yates' Continuity Correction Coefficient reported for all 2 x 2 associations between categorical variables.
†† Sample size includes only the 256 respondents who were able to report how they were fed as infants (190 disadvantaged, 66 advantaged)
††† Sample size includes only the 164 women who have had children (157 disadvantaged and 7 advantaged).

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 5.17(b) Health Behaviours and Anthropometry among the Full Study Population according to Socio-economic Factors

Tables 5.18(a) and 5.18(b) reveal the associations between various attitudinal traits and the health behaviours under examination.

The description of significant associations between many of the attitudinal traits and health behaviours confirms the value of these attitudinal parameters as potent predictors of health-related practices.

Smoking for example, shows a strong positive association with both chance (p=0.010) and external (p=0.002) locus of health control, and also an inverse association with dietary stage of change, where those in the action or maintenance stage are significantly less likely to smoke (p=0.001). This latter finding provides further evidence of the co-segregation of health-conducive attitudes and behaviours, and health-subversive attitudes and behaviours. Those who rate their current health as "poor" are significantly more likely to smoke (p=0.017), as are those who consider themselves to be under psychological stress (p=0.003) and those who cite a lack of family support as a barrier to health (p=0.044).

The action and maintenance stages of dietary change are significantly associated with an older mean age of smoking commencement (p=0.019), again indicating the tendency of positive health attitudes and behaviours to co-segregate. This is important as smoking initiation is one of the principal points of variation in determining population smoking prevalence. Those who rate their health as poor commence smoking significantly earlier than respondents who are more positive about their overall health status (p=0.002), perhaps highlighting the particular negative health effects which are thought to arise from early tobacco use.

Chance locus of control ($p<0.001$) and external locus of health control ($p=0.006$) both coincide with lower participation in vigorous physical activity. However, the action and maintenance stages of dietary change are significantly associated with higher levels of participation in vigorous activity ($p<0.001$), again emphasising the co-existence of positive health attitudes and behaviours. Those who believe their weight to be appropriate for their age ($p=0.024$), those who believe that they do not need to make lifestyle changes to improve their health ($p=0.040$), and those who rate their health as good ($p=0.037$) are all more likely to participate in vigorous activity.

Perhaps unsurprisingly, high alcohol consumption is significantly more prevalent among women who are not in the action or maintenance stages of dietary change ($p=0.028$). Although the other attitudinal traits are not predictive of high alcohol consumption, there is a non-significantly greater tendency towards high intake among those who rate their health as poor ($p=0.061$).

With regard to dietary supplement use, those who believe their health to be primarily determined by outside influences over which they have no control (external health locus) display significantly lower rates of supplementation ($p=0.031$), perhaps indicating fatalism or imposed limitations such as price, as barriers to the use of these products. Conversely, those in the action and maintenance stages of change report a significantly higher prevalence of supplement use ($p<0.001$), as do those who use the mass media (TV, radio, magazines or internet) as a source of health information ($p=0.021$).

Overall, there is a generally poor degree of association overall, between the attitudinal variables examined and breastfeeding behaviour.

However, many of the attitudinal traits examined are significant predictors of higher BMI and waist circumference. For example, those with an external locus of health control show significantly higher BMI ($p=0.016$) and waist circumference ($p=0.006$) measurements. Those in the pre-contemplation stage of dietary change have significantly higher mean BMI ($p=0.004$) and waist measurements ($p=0.022$), while the opposite is true of those who feel that their weight is appropriate for their age ($p<0.001$ in both cases). This latter finding indicates that those who are overweight have a good appreciation of this fact. This view is supported by the greater acknowledgement among those with higher BMI ($p=0.014$) and waist measurements ($p=0.012$), that dietary and lifestyle changes are required. Importantly, those who view cost as a barrier to health have significantly higher mean BMI ($p=0.024$) and waist circumference measurements ($p=0.008$). Respondents who report poorer self-perceived health also have a higher mean BMI ($p=0.001$) and waist circumference ($p<0.001$). The latter point demonstrates that even at this early age, the adverse health ramifications of overweight and obesity may be beginning to emerge.

Attitudinal Variable	Status	Current Smoker		Age Commenced Smoking (SD)†		Participation in Vigorous Exercise		Median Sitting Time per Day (IQR) *		High Alcohol Intake	
		% Yes	p value	Years	p value	% Yes	p value	Minutes	p value	%>14 units/wk	p value
Chance Health Locus	Yes (n=48)	66.7	0.010	14.7 (2.6)	0.789	10.4	<0.001	193 (176)	0.963	37.5	0.755
	No (n=239)	45.1		14.8 (3.0)		38.9		238 (234)		33.9	
External Health Locus	Yes (n=33)	75.0	0.002	14.0 (2.8)	0.146	12.1	0.006	184 (153)	0.277	36.4	0.919
	No (n=246)	43.7		15.0 (2.9)		38.2		236 (238)		33.7	
Dietary Stage of Change Score	High (n=110)	35.8	<0.001	15.6 (3.4)	0.046	48.2	<0.001	225 (234)	0.789	26.4	0.071
	Low (n=151)	59.3		14.6 (2.5)		25.8		236 (229)		37.8	
Pre-contemplation Stage of Change	Yes (n=30)	70.0	0.023	14.3 (2.8)	0.425	23.3	0.289	204 (227)	0.526	40.0	0.660
	No (n=264)	46.2		14.8 (2.9)		34.8		236 (223)		34.1	
Action/Maintenance Stage of Change	Yes (n=110)	35.8	0.001	15.6 (3.4)	0.019	48.2	<0.001	225 (234)	0.663	26.4	0.028
	No (n=184)	56.3		14.4 (2.6)		25.0		236 (229)		39.8	
10 year Future Salience	Yes (n=119)	50.8	0.579	14.8 (3.1)	0.754	26.1	0.036	208 (207)	0.010	35.3	1.000
	No (n=174)	46.8		14.7 (2.8)		38.5		253 (226)		35.1	
Mass Media as Health Information Source	Yes (n=159)	37.3	<0.001	15.1 (2.9)	0.115	39.6	0.024	238 (255)	0.037	30.1	0.085
	No (n=136)	62.2		14.4 (2.9)		26.5		219 (206)		40.4	
Psychological Stress	Yes (n=121)	59.5	0.003	14.9 (3.1)	0.516	28.1	0.126	212 (215)	0.047	34.2	0.917
	No (n=174)	41.3		14.6 (2.7)		37.4		253 (226)		35.5	
"My weight is ok for my age"	Agree (n=142)	46.1	0.935	15.0 (2.9)	0.162	40.1	0.024	249 (214)	0.661	32.1	0.434
	Disagree (n=132)	47.3		14.4 (2.8)		26.5		210 (237)		37.4	
"My exercise level is already good enough"	Agree (n=85)	56.5	0.085	14.7 (2.7)	0.825	42.4	0.093	197 (201)	0.242	28.6	0.220
	Disagree (n=202)	44.5		14.8 (3.0)		31.2		257 (236)		37.0	
Safe Fields for Recreation near home	Yes (n=211)	43.5	0.007	14.9 (2.8)	0.256	35.5	0.313	236 (221)	0.393	33.0	0.340
	No (n=84)	61.9		14.4 (3.0)		28.6		216 (244)		39.8	
Facilities/Environment is a Health Barrier	Agree (n=69)	51.5	0.716	15.2 (3.0)	0.279	29.0	0.439	264 (236)	0.823	44.9	0.065
	Disagree (n=226)	48.0		14.6 (2.9)		35.0		227 (219)		31.8	
Poor Support is a Health Barrier	Agree (n=14)	78.6	0.044	14.2 (3.4)	0.452	21.4	0.487	236 (135)	0.085	50.0	0.355
	Disagree (n=281)	47.3		14.8 (2.9)		34.2		227 (230)		34.2	
Cost is a Health Barrier	Agree (n=70)	57.1	0.144	14.5 (2.5)	0.519	25.7	0.148	191 (190)	0.067	34.8	1.000
	Disagree (n=225)	46.2		14.8 (3.0)		36.0		253 (234)		35.0	
Knowledge is a Health Barrier	Agree (n=30)	62.1	0.190	13.9 (1.6)	0.190	26.7	0.522	261 (215)	0.320	41.4	0.574
	Disagree (n=265)	47.3		14.8 (3.0)		34.3		227 (231)		34.2	
Willpower is a Health Barrier	Agree (n=147)	49.7	0.860	14.8 (2.8)	0.910	33.3	1.000	257 (234)	0.204	34.5	0.970
	Disagree (n=148)	47.9		14.7 (3.0)		33.8		210 (230)		35.4	
No Changes Required Health Barrier	Agree (n=31)	40.0	0.409	13.4 (2.7)	0.078	51.6	0.040	244 (272)	0.618	30.0	0.692
	Disagree (n=264)	49.8		14.9 (2.9)		31.4		227 (221)		35.5	
Self Rated Health	Poor (n=74)	61.6	0.017	13.7 (2.8)	0.002	23.0	0.037	227 (227)	0.476	44.6	0.061
	Good (n=221)	44.5		15.2 (2.9)		37.1		231 (230)		31.7	

Yates' Continuity Correction Coefficient reported for all 2 x 2 associations between categorical variables. † Includes only those who have started smoking previously (i.e. current smokers and ex smokers) (n=171). * Non-parametric tests (Mann-Whitney U) to compare sitting times (non-normally distributed)

Table 5.18(a) Health Behaviours among the Full Study Population according to Attitudinal Factors

Attitudinal Variable	Status	Supplement Use		Breast Fed as a Child ††		Breastfed own Children†††		Mean Body Mass Index (BMI) (SD)		Mean Waist Circumference (SD)	
		% Yes	p value	% Yes	p value	% Yes	p value	Kg/m²	p value	cm	p value
Chance Health Locus	Yes (n=48)	31.3	0.369	16.7	0.240	23.5	0.676	24.9 (6.0)	0.619	88.0 (15.2)	0.161
	No (n=239)	39.4		27.6		29.0		24.5 (4.9)		85.1 (12.6)	
External Health Locus	Yes (n=33)	18.8	0.031	11.5	0.110	30.4	1.000	26.9 (7.3)	0.016	92.2 (17.4)	0.006
	No (n=246)	40.2		28.3		29.2		24.6 (4.9)		85.3 (12.7)	
Dietary Stage of Change Score	High (n=110)	52.3	<0.001	27.7	1.000	34.0	0.536	24.3 (5.0)	0.764	83.9 (12.9)	0.173
	Low (n=151)	24.8		27.0		27.5		24.5 (4.9)		86.2 (13.3)	
Pre-contemplation Stage of Change	Yes (n=30)	20.0	0.064	19.0	0.598	29.4	1.000	22.2 (3.3)	0.004	80.6 (9.9)	0.022
	No (n=264)	39.1		26.9		28.8		25.0 (5.3)		86.4 (13.5)	
Action/Maintenance Stage of Change	Yes (n=110)	52.3	<0.001	27.7	0.779	34.0	0.435	24.3 (5.0)	0.239	83.9 (12.9)	0.055
	No (n=184)	28.0		25.3		26.5		25.0 (5.3)		87.0 (13.5)	
10 year Future Salience	Yes (n=119)	31.6	0.110	24.1	0.567	32.9	0.356	24.9 (5.3)	0.692	86.4 (13.9)	0.565
	No (n=174)	41.6		28.1		25.0		24.6 (5.2)		85.5 (12.8)	
Mass Media as Health Information Source	Yes (n=159)	43.7	0.021	33.8	0.003	35.5	0.102	24.3 (5.0)	0.101	84.2 (13.2)	0.026
	No (n=136)	29.9		16.7		22.7		25.3 (5.4)		87.7 (13.2)	
Psychological Stress	Yes (n=121)	40.0	0.506	21.8	0.218	28.9	1.000	25.0 (5.9)	0.353	86.8 (15.0)	0.273
	No (n=174)	35.5		29.5		28.4		24.5 (4.6)		85.1 (12.0)	
"My weight is ok for my age"	Agree (n=142)	43.3	0.143	32.3	0.016	27.9	1.000	22.7 (3.8)	<0.001	81.0 (11.0)	<0.001
	Disagree (n=132)	33.8		17.9		26.8		26.8 (5.8)		90.3 (14.2)	
"My exercise level is already good enough"	Agree (n=85)	41.2	0.508	14.7	0.011	24.1	0.380	24.0 (5.1)	0.147	85.0 (13.9)	0.512
	Disagree (n=202)	36.2		31.0		32.0		25.0 (5.2)		86.1 (13.1)	
Safe Fields for Recreation near home	Yes (n=211)	39.2	0.350	29.2	0.129	34.9	0.027	24.5 (4.8)	0.371	84.9 (11.9)	0.063
	No (n=84)	32.5		19.2		17.2		25.1 (6.0)		88.1 (16.2)	
Facilities/Environment is a Health Barrier	Agree (n=69)	40.3	0.668	28.3	0.789	24.2	0.680	25.6 (5.5)	0.101	88.9 (14.1)	0.026
	Disagree (n=226)	36.4		25.5		29.8		24.4 (5.1)		84.8 (13.0)	
Poor Support is a Health Barrier	Agree (n=14)	28.6	0.681	7.7	0.218	12.5	0.525	24.8 (7.6)	0.935	88.4 (18.5)	0.449
	Disagree (n=281)	37.8		27.2		29.5		24.7 (5.1)		85.7 (13.0)	
Cost is a Health Barrier	Agree (n=70)	34.8	0.720	23.1	0.621	36.7	0.192	26.0 (6.2)	0.024	89.5 (15.2)	0.008
	Disagree (n=225)	38.1		27.2		25.2		24.3 (4.8)		84.7 (12.5)	
Knowledge is a Health Barrier	Agree (n=30)	28.6	0.422	16.7	0.385	31.3	1.000	25.6 (6.0)	0.312	89.7 (14.3)	0.100
	Disagree (n=265)	38.3		27.2		28.4		24.6 (5.1)		85.4 (13.2)	
Willpower Barrier to Healthy Eating	Agree (n=147)	36.3	0.809	23.8	0.481	26.8	0.730	25.3 (5.9)	0.068	87.1 (14.9)	0.088
	Disagree (n=148)	38.4		28.5		30.5		24.2 (4.3)		84.5 (11.4)	
No Changes Required Health Barrier	Agree (n=31)	33.3	0.781	36.7	0.242	23.1	0.885	22.5 (3.7)	0.014	80.1 (10.1)	0.012
	Disagree (n=264)	37.8		24.8		29.1		25.0 (5.3)		86.5 (13.5)	
Self Rated Health	Poor (n=74)	27.8	0.073	23.9	0.738	23.5	0.430	26.5 (6.2)	0.001	90.9 (15.2)	<0.001
	Good (n=221)	40.5		27.0		31.0		24.1 (4.7)		84.1 (12.2)	

Yates' Continuity Correction Coefficient reported for all 2 x 2 associations between categorical variables. †† Sample size includes only the 256 women who were able to report how they were fed as infants (190 disadvantaged, 66 advantaged) ††† Sample size includes only the 164 women who have had children (157 disadvantaged and 7 advantaged).

Table 5.18(b) Health Behaviours and Anthropometry among the Full Study Population according to Attitudinal Factors

5.4. Discussion

The preceding sections have described pronounced disparities in health behaviours across the socio-economic spectrum, with those in the lower social echelons exhibiting significantly less healthy patterns than their more advantaged peers. Findings relating to each of the health behaviours examined will now be discussed in the context of existing literature in that specific area.

5.4.1. Smoking

The current study demonstrates a significantly higher occurrence of smoking among disadvantaged women (60.5%), who display a greater than four-fold higher prevalence than their advantaged reference group (13.7%). This is in contrast to analyses describing a smoking prevalence of ~42% among women aged 18-35 years in the NSIFCS, which showed no significant social class (p=0.116) or educational (p=0.337) gradients with regard to current smoking, and indeed demonstrated a significantly greater proportion of "never smokers" in the lower social classes (p=0.047).

The absence of such socio-economic differences may relate to the low proportion of very low SES respondents in the NSIFCS. Alternatively, the differences observed in the current study could reflect a greater response to anti-smoking campaigns among women of high SES in the intervening period. Socio-economic differences in smoking cessation rates have previously been shown to contribute significantly to temporal shifts in smoking prevalence across the socio-economic spectrum (Graham, 1996; Kanjilal *et al.,* 2006).

The socio-economic differences in smoking behaviours identified in the current study are consistent with those from many other national (Layte & Whelan, 2004) and international studies (Huisman *et al.*, 2005) which have investigated this issue. Among young adults surveyed across 21 European countries in 1995, it was estimated that 33.1% and 29.0% of young adult male and female students respectively were smokers (Steptoe *et al.*, 1995), although the higher socioeconomic status of that cohort may have elicited an unrepresentatively low estimate for their overall age group. In Ireland, smoking rates are currently estimated at ~30-31%, and this prevalence has remained relatively constant from 1998-2001 (Layte & Whelan, 2004), although the SLAN surveys of 1998 and 2002 indicated a slight decline in overall prevalence during this 4 years period. Although similar to the 32% smoking prevalence among the full NSIFCS female population, these rates are considerably higher than the 13.7% prevalence among the advantaged reference group in the current study, but are also substantially lower than those observed among the disadvantaged cohort (60.5%) currently under examination.

The factors contributing to socio-economic variations in smoking may relate to differences in both initiation and cessation rates. The current study demonstrates that higher initiation rates among disadvantaged women are a potent determinant of their greater current smoking prevalence, with 70.5% of the disadvantaged cohort being classified as current or former smokers, compared with just 23.3% of the advantaged group ($p<0.001$). However, the prevalence of former smokers, at ~9.6% in the advantaged group out of 23.3% "ever smokers", is proportionately much higher than the 10.5% out of 70.9% "ever smokers" in the disadvantaged group. These data indicate that apart from their substantially higher initiation rates, those in the disadvantaged group are roughly three times less likely to quit smoking than more affluent smokers ($p=0.013$).

Irish data from the Health Behaviour in School Age Children Survey (HBSC) in 2002 suggests that working class children are more likely to smoke (i.e. initiate smoking) than their more affluent peers (Kelleher *et al.,* 2003). However, as in the current study, the HBSC Survey also suggests that children and adolescents from the lower social strata are less likely to quit smoking, and such differences in smoking cessation have been described elsewhere in the literature. For example, Kanjilal *et al.,* (2006) cited significant decreases in smoking prevalence among socially advantaged US adults from 33% in 1971 to 14-17% in 2002. The decline in smoking rates was far less pronounced among those of low income and education however, falling by only 6 percentage points in the equivalent period.

The present study illuminates significant inverse gradients in smoking prevalence for all of the socio-economic indicators investigated, including markers of social and material disadvantage. One of the problems which arises in attempting to disentangle the actual effectors of socioeconomic differences in smoking behaviour however, is the fact that much of the research in this area is observational in nature, focusing on empirical differences according to education, social class, unemployment, income etc., without any critical examination of how these parameters might actually exert their respective effects. Graham & Hunt (1994) highlighted the fact that some dimensions of women's smoking behaviour are not captured by the use of conventional proxies of disadvantage, and that this had significant implications for policy formulation based on such research.

Lynch *et al.,* (1997) further explored the psychosocial correlates of low education, low occupational social class and low childhood SES which coincided with smoking, among middle-aged Finnish men. They employed a number of measures to assess psychometric variables like hopelessness, depression, cynical hostility and sense of coherence.

The first part of this study, like many others before and since, identified a greater preponderance of smoking among those of lower education, occupational social class and childhood SES. The second part of the study however, revealed that low status for each of these parameters was significantly associated with a higher prevalence of depression, hopelessness, cynical hostility and diminished sense of coherence. All of these psychosocial traits were judged likely to increase the likelihood of smoking (and other health subversive behaviours), and consequently, their over-representation among the lower socioeconomic groups indicated that they might well be potent proximate effectors of poor health behaviours in these groups. From the attitudinal perspective, the present study describes a significantly higher prevalence of smoking among those with a chance ($p=0.010$) or external ($p=0.002$) locus of health control, suggesting a perceived lack of control or increased fatalism as a possible precipitant of tobacco use. Those in the action and maintenance stages of dietary change are also significantly less likely to be smokers ($p=0.001$), perhaps again implying a greater degree of hopelessness and a perceived lack of control, among those who smoke.

Layte & Whelan (2004) in their authoritative examination of socioeconomic trends in smoking behaviour in Ireland, begin to address the correlates of poverty which modulate smoking behaviour. This paper, entitled "Explaining Social Class Differentials in Smoking: The Role of Education" explores the mediators of social gradients in smoking among a representative sample of the Irish population. It aims to determine whether the correlation of low education with increased smoking prevalence is attributable to lower knowledge *per se*, or whether these behavioural differences are more closely related to other dimensions of low educational status.

These other dimensions include lower future orientation and risk perception related to low education itself (e.g. diminished capacity for abstract thought relating to risk and perception of health in non-functional terms), lower future orientation related to the lived experience of socioeconomic disadvantage (e.g. increased fatalism), and the indirect effect of social deprivation in eliciting “ push factors” which encourage and perpetuate smoking behaviour, such as lack of control and psychosocial stress.

They discovered that while knowledge differences mediated a low proportion of social variability in smoking behaviour (~10%), lower future orientation and risk awareness derived from either knowledge deficits or pervasive cultural influences mediated little or no effect. This is in agreement with the findings of the current study, which similarly, reveal no association between ten year future salience and smoking prevalence (p=0.579).

Rather than poor knowledge or lower future orientation, Layte and Whelan (2004) cited the “push” factors as the greatest determinants of socio-economic differences in smoking behaviour. The preponderance of these push factors among those of lower education relates to higher stress levels and a lower autonomy and capacity to control one’s own circumstances among these groups. In this way, smoking is perceived as “a coping mechanism which gains cultural acceptance through the shared collective experience of economic hardship and strain”. This view is supported by the current study, in which those citing a high degree of psychological stress were significantly more likely to smoke (p=0.003).

Overall, the precipitating stimuli (endemic psychosocial stress) and perceived gains (relaxation, social inclusion and comfort) may be greater, while the perceived barriers (abstract notions of health damage, social undesirability) may be less among the lower SES groups, propagating initiation and inhibiting cessation in these groups. The authors highlight the different intervention strategies which will be required to redress these behavioural differences, with an emphasis on structural interventions to alleviate the fundamental socioeconomic inequalities which are proposed to exert the greatest impact on smoking behaviour. These findings are largely supported by research from elsewhere, which has suggested that apart from any physiological anxiolytic effect of smoking (Chamberlain & O'Neill, 1998), that it represents a "replacement reward" (Graham, 1994), which is one of the few autonomous self-comfort mechanisms which may be available to socially and materially deprived individuals.

Given the weight of evidence cited above concerning the precipitants of tobacco use among socially deprived groups, these considerations should form the basis for effective strategies to limit or reduce smoking among low SES groups. While health messages regarding the hazards of smoking have been widely disseminated by health agencies for several decades now, there is evidence that still more needs to be done to improve awareness of the adverse health effects of smoking among young adults, as belief in the health benefits of not smoking correlates with non-smoking behaviour (Steptoe *et al.*, 2002).

The current study reveals a significantly lower mean age of smoking initiation among the disadvantaged group (14.5 years) compared with their more advantaged peers (16.5 years) ($p=0.009$), with 6.8% of the disadvantaged group commencing before the age of 12 years, and 29.9% beginning before their fourteenth birthday. This phenomenon, along with their greater smoking intensity (number of cigarettes smoked each day) ($p=0.001$), contributes to a significantly greater lifetime exposure to smoking among this group ($p=0.013$).

de Vries (1995) explained the sociological origins of the socioeconomic gradient in smoking behaviour among Dutch youths, citing more positive norms and less social pressure to smoke among those of higher social class. In contrast, smoking was suggested to be "embedded in the social culture" and to have a stronger social function among adolescents of lower social class, with many viewing smoking as a way to meet people and affiliate with peers. The current study supports this notion, with those who identify poor family and social support as a barrier to health significantly more likely to smoke (p=0.044). Because adolescence is the life stage at which initiation, an important precipitant of higher smoking rates among the disadvantaged women in this study, is most likely, interventions should prioritise smoking *prevention* among these adolescents as a key element of population strategies to reduce tobacco-related harm.

Legislative restrictions on tobacco promotion activities including cigarette promotional items (CPIs) (Sargent *et al.*, 2000) and general advertising (Slater *et al.*, 2007), and the introduction of prohibitive pricing structures and supportive taxation policies (Liang & Chaloupka, 2002; Ross & Chaloupka, 2003) are all effective methods of discouraging smoking among adolescents.

Although some studies have failed to show positive effects, a recent Cochrane Database review provided evidence that school-based intervention and education programmes may reduce adolescent smoking prevalence (Thomas & Perera, 2006). An Irish intervention study in 10 year old school children, revealed significantly lower smoking rates among girls (8% of the intervention group vs. 16% of the control group), but not boys (10% prevalence in both groups) at the end of a 5 year smoking education programme in Leitrim (McHugh & Share, 2001).

This group recommended a more extensive campaign to address the wider contributors to smoking at the adult, family and community level. In this context, Sargent & Dalton, (2001) found that children who perceived strong parental disapproval of their smoking were less than half as likely to have high smoking index scores as those who did not perceive strong parental disapproval, indicating an important potential role for family-based interventions.

While such initiatives to prevent uptake of smoking may be effective, they need to be accompanied by cohesive and effective initiatives to facilitate smoking cessation among those who smoke already. Possible interventions in this regard would include cognitive behavioural therapy, hypnotherapy, counselling, education and pharmacological aids such as nicotine-replacement therapy.

All of these interventions also need to be supported by legislative and policy interventions at the structural level. The introduction of a nationwide ban on workplace smoking in Ireland from March 2004 has already yielded significant respiratory health gains among bar workers (Goodman *et al.*, 2007), and these benefits are also likely to accrue to the patrons who frequent these bars.

Finally, there is substantial evidence, including that from this study, which demonstrates the co-segregation of smoking with other adverse health behaviours such as poor diet, physical inactivity and obesity (Healton *et al.*, 2006), factors which exacerbate its adverse effects on health. This suggests that health promotion interventions effectively targeted at smokers may yield synergistic improvements in other health behaviours, if additional health messages are incorporated into anti-smoking campaigns.

5.4.2. Alcohol

Despite the limited cardiovascular health benefits which are thought to accrue from alcohol consumption at very moderate levels, risk factor profiles among women, including serum HDL, fibrinogen and homocysteine levels all deteriorate at intakes exceeding ~10-20g per day (Burger *et al.*, 2004). A direct dose-response relationship between alcohol intake and risk of death from a number of common causes (cancers of the lip, oral cavity, pharynx, oesophagus, colon, rectum, liver, larynx and breast, essential hypertension, coronary heart disease, stroke, cirrhosis, non-cirrhotic liver disease, chronic pancreatitis and injuries) has been demonstrated for women aged 16-54 years (White *et al.*, 2002). This study showed increased mortality among higher consumers, even at intake levels well within current population health guidelines, and these risks were particularly marked among younger women. Apart from the considerable health risks imposed by excessive alcohol consumption on women themselves, additional hazards to the foetus arise from alcohol consumption when pregnant (O'Connor & Whaley, 2003).

The adverse health impacts of excessive alcohol consumption become particularly salient when typical population intakes in Ireland, and those which prevail among disadvantaged young women in particular, are considered. In 2001, Ireland had the second highest *per capita* alcohol consumption in the EU (after Luxembourg), for those aged 15 years or over, averaging a total of 14.34 litres of pure ethanol each year (Strategic Task Force on Alcohol (STFA), 2004). While this has moderated somewhat in subsequent years, it still remains inordinately high in comparison to our EU neighbours. This issue is compounded when one considers that Ireland also has a high proportion of non-consumers of alcohol (~20% for both men and women) (Harrington *et al.*, 2001), indicating that the intake figures *among* *consumers only* may be considerably higher than would first appear to be the case. The current study categorises 89.0% of the disadvantaged women and 95.9% of the advantaged women as alcohol consumers, a greater proportion than that estimated for the wider population in NSIFCS. This may relate to the wider age profile of the NSIFCS women.

Many studies have investigated the issue of increased alcohol-related ill-health and mortality among lower SES groups, with some research highlighting *increasing* socio-economic differences in alcohol-related mortality among women (Herttua *et al.*, 2007). Makela *et al.*, (2003) demonstrated that the higher mortality levels among lower SES populations related directly to increased alcohol-related morbidity in these groups.

Alcohol intake in the current study is estimated by means of the type, frequency and amount of alcoholic beverages which respondents report consuming, with high consumers identified by reported typical intakes ≥14 week. Although a slightly lower proportion of dietary under-reporters are high alcohol consumers (p=0.409), and a greater proportion of over-reporters are high alcohol consumers (p=0.058), than their valid-reporting peers, these differences do not reach statistical significance. Consequently, alcohol intake analyses are conducted on the full population who have reported intakes (n=292).

The current study demonstrates a considerably higher mean alcohol intake, expressed in units per week, among the disadvantaged women than among their more affluent reference group. However, among the full population, median intakes do not differ significantly between the disadvantaged and advantaged groups (p=0.306), indicating that the mean intake among the disadvantaged cohort has been disproportionately raised by a number of high consumers in this group (~18% have intakes ≥24 units/week, see Figure 5.1, p. 337).

Significant differences do emerge however, when these analyses are repeated among alcohol consumers only, with the median weekly intake now significantly higher for the disadvantaged group (11.4 units) than the advantaged group (9.2 units) (p=0.029). Additionally, the mean intake per week rises to 15.8 units per week among disadvantaged consumers, a figure almost one and a half times the 10.6 units per week reported by the advantaged consumers. Importantly, the mean intake for the disadvantaged group exceeds the recommended 14 units per week, while that for the advantaged group falls beneath this threshold. While Chapter 4 described higher mean and median weekly intakes among the disadvantaged group in terms of percentage of total energy derived from alcohol, these differences in median intake did not reach statistical significance (p=0.163). Absolute intake in units per week is likely to yield a more meaningful comparison between the two groups however, given the significantly higher mean total energy intakes observed among the disadvantaged women.

Although the contribution of excess alcohol consumption to morbidity and mortality among lower SES groups is thought to show substantial geographic differences (Kunst *et al.*, 1998; Bloomfield *et al.*, 2006), studies from several developed countries have associated low educational attainment (Herttua *et al.*, 2007) and, particularly, low occupational social class (Makela *et al.*, 1997; Norstrom & Romelsjo, 1998; Harrison & Gardiner, 1999; Hemstrom, 2002; Blomgren *et al.*, 2004) with increased alcohol-related mortality. Our analyses concur with these findings, indicating a strong association between lower occupational social class and higher prevalence of excessive (≥14 units per week) alcohol consumption (p=0.041). The other indices of social and material disadvantage, including low education, relative income poverty and consistent poverty, do not appear to be strongly predictive of high alcohol intake in the current study population however.

In any discussion of this nature, it is important that associations between the various indicators of low socio-economic status and high alcohol consumption are not over-simplified. Makela *et al.*, (1999) suggests that the total impact of socio-economic status on alcohol-related mortality cannot be adequately captured by only one or two measures of SES. For example, the association between low income, a commonly employed index of SES, and alcohol-related mortality is inconsistent, with many studies showing an association between neither income nor income inequality and alcohol-related mortality (Blomgren *et al.*, 2004). Similarly, the associations between low education and health subversive alcohol consumption can sometimes be confounded by extraneous factors. Bloomfield *et al.*, (2006) demonstrated that those in the higher educational categories are more likely to have risky alcohol consumption patterns in many *developing countries*. This illustrates a theme which is pertinent to Ireland, namely that SES parameters which are simply a proxy for income or wealth, often have unanticipated associations with health behaviours in rapidly changing economies. In simple terms, wealthy respondents who have achieved their wealth rapidly, may remain bereft of the cultural, structural, ecological or psycho-social resources which would enable them to use this monetary wealth for health gain, precipitating adverse health behaviours including high alcohol consumption.

Another potential confounder of SES variations in alcohol-mediated harm is the choice of alcohol consumption parameter which is measured. While those in the higher educational groups may display greater frequency of consumption (Casswell *et al.*, 2003), or in some cases greater overall amounts of intake, these measures may actually be indicative of *healthier consumption patterns* where low to moderate amounts are consumed with greater regularity.

Such measures as frequency of consumption or absolute intake in isolation, may fail to capture the preponderance of binge drinking which is thought to prevail among those of lower education (Casswell *et al.*, 2003; Jefferis *et al.*, 2007). While some studies have failed to demonstrate a relationship with binge pattern alcohol consumption and morbidity or mortality (Britton & Marmot, 2004), there is broad consensus that this is the most health-damaging pattern of alcohol intake (Wechsler *et al.,* 1998). Although the present study does not indicate any socio-economic difference in frequency of alcohol consumption, the data do suggest a significantly higher median intake per drinking occasion among the disadvantaged (9.6 units) than the advantaged (7.8 units) cohort. While it is high among both groups, the prevalence of binge alcohol consumption, defined in this study as a mean intake per drinking occasion of over 6 units, is significantly greater among the disadvantaged (81.8%) than the advantaged (64.3%) cohort in this study (p=0.012), confirming a greater preponderance of binge consumption among the former group. With regard to total intake, Figure 5.1 demonstrates that the very high consumers (i.e. those >24 units per week) are almost all in the disadvantaged group.

In terms of intervention, Casswell *et al.*, (2002) have emphasised the importance of early life experiences including parental alcohol consumption, access to alcohol in the home at 15 years of age, and age of onset of regular drinking, on later alcohol consumption patterns. They also pointed to the significant influence of structural factors such as education and early access to licensed premises on later alcohol consumption habits however. Others have also stressed the crucial importance of social conditions (Jonas *et al.*, 2000) and social structural factors (Harrison & Gardiner, 1999) in determining alcohol intake, with the latter group advocating the use of social interventions aimed at reducing poverty and inequality as effective measures to reduce the burden of alcohol-related harm among low SES groups.

Marmot, (1997) suggested that pricing measures may be a particularly effective means of addressing heavy alcohol consumption among low income groups. In support of this view, the current study does suggest a greater reliance on low cost beverages (alcopops, and, non-significantly, beer) among the disadvantaged group, in addition to a lower prevalence of wine consumption. As well as reflecting cultural drinking norms, these findings may indicate a limited price elasticity for alcohol among disadvantaged women.

As with smoking, several studies have examined the co-occurrence of other adverse health behaviours among high alcohol consumers, factors which together, are thought to exert a synergistic effect on ill-health. McCann *et al.*, (2003) observed that compared to wine, consumers of beer and spirits had lower education and income, were more likely to smoke, had higher energy and total fat intakes and consumed lower amounts of fruit, vegetables and wholegrain products. Similarly, the preponderance of additional negative health behaviours including smoking, physical inactivity and poor diet, has also been observed among those with high alcohol consumption among Finnish (Laaksonen *et al.*, 2003), Canadian (Pomerleau *et al.*, 1997), Japanese (Fukuda *et al.*, 2005) and American (Moore *et al.*, 2001) populations. In each of the first three of these studies, indicators of low socio-economic status including low educational status and low occupational social class, were significant predictors of both high alcohol consumption and its concurrent adverse health behaviours.

The literature above citing the co-occurrence of high alcohol intake and other negative health behaviours like smoking, low physical activity and poor diet, is largely in agreement with the present research which identifies a greater co-segregation of these habits and high alcohol consumption among disadvantaged women in the current study population.

The coincidence of diverse health-subversive patterns in this way, is strongly suggestive of a pervasive psycho-social malaise which may embrace elements of fatalism and lower health consciousness as attitudinal precipitants of behaviour. This view would seem to be supported by the significantly lower prevalence of high alcohol consumption among those in the action or maintenance stages of dietary change, a crude indicator of overall health consciousness.

While low occupational social class, a dimension of social disadvantage often associated with reduced social cohesion, is the strongest socio-economic predictor of high alcohol consumption in the current study, it is not the only influence at work. In Ireland, the conditions which predispose those in low SES groups to adverse drinking behaviour are superimposed on a prevailing socio-cultural system which tolerates and even encourages health-damaging patterns of alcohol consumption, as evidenced by the findings of the SFTA (2004). It is therefore unsurprising that the epidemiological patterns which characterise the Irish population, and particularly those living in disadvantage (e.g. high prevalence of cardiovascular disease, gut cancers, liver disease), are largely consistent with those which would be expected for a population with widespread high alcohol intake.

Alleviation of alcohol related harm and mortality among low SES groups therefore requires a two-dimensional approach to first of all address the precipitants of high alcohol consumption among the general population, while simultaneously providing targeted interventions for the specific resolution of pathological intake patterns among low SES groups.

5.4.3. Dietary Supplementation

Chapter 4 has demonstrated a significant association between dietary supplement use and higher intakes of several vitamins and minerals, as well as an increased micronutrient density and lower prevalence of micronutrient inadequacy among supplement users. This chapter has revealed that such supplementation is significantly less prevalent among women in the lower socio-economic groups, with markers of social disadvantage (e.g. disadvantage (p=0.004), low social class (p=0.001) and low socio-economic group (p=0.002)) appearing to be particularly predictive of lower rates of supplement use. These data suggest the potential efficacy of judicious dietary supplementation in alleviating dietary micronutrient inadequacy among Irish adults, particularly among young, low SES women where low dietary intakes may be endemic.

Archer *et al.*, (2005) showed that daily intakes of several nutrients including vitamins A, C and E, B3, folate and iron increased significantly when the contribution of dietary supplements was considered. Similarly, Troppmann *et al.*, (2002) found multivitamin/ multimineral users to have higher intakes of folic acid, iron, calcium and vitamin D among their population of Canadian adults. Murphy *et al.*, (2007) indicated that the prevalence of overall micronutrient adequacy increased by 8% among their multi-ethnic population of US adults when intake from supplements was included in their analyses. In Ireland, Kiely *et al.*, (2001) reported significantly higher micronutrient intakes among supplement users vs. non-users. Among women, prevalence of iron intake below the EAR of 10.8mg/day fell from 50% to 25% when supplemental intakes were considered. Similarly, the proportion of women failing to meet the EARs for calcium and vitamin B2 fell from 23% to 16% and 23% to 14% respectively when their supplemental intakes were included.

Unfortunately, evidence from international and domestic studies indicates that the low SES women who have potentially the most to gain from supplementation, may be the least likely to use these products. In the UK, McNaughton *et al.*, (2005) described lower supplementation rates among women of lower occupational social class. In Ireland, the NSIFCS indicated that 36% of women and 19% of men took supplements regularly, with the lowest prevalence of usage among women recorded at 30% in the 18-35 year age group (Kiely *et al.*, 2001).

Subsequent analysis on this NSIFCS dataset as part of the current study indicates no significant difference in supplementation rates according to either social class (p=0.510) or educational status (p=0.531) among women aged 18-35 years. However, the SLAN study (NNSC, 2003) does report very significant differences in the prevalence of supplement use among men and women across the occupational social classes. In this case, those in social class 1 and 2 had supplementation rates of 58.2%, falling to 48.2% for those in social class 3 and 4, and 40.9% for those in social class 5 and 6. These trends are mirrored by very significant declines in folic acid supplementation in women, going from social class 1 and 2 (18.3%) to social class 3 and 4 (14.6%) to social class 5 and 6 (11.8%) (Kelleher *et al.*, 2002). The current study is in agreement with the social gradients in supplementation described in SLAN. The prevalence of dietary supplement use at 52.1% in the advantaged group, is significantly higher than that reported for the disadvantaged cohort (32.4%) (p=0.004).

The elements of disadvantage which may effect these differences in supplementation practices have been extensively documented in the literature.

While disadvantaged area of residence (Relton *et al.*, 2005) and income (Nilsen *et al.*, 2006; Robbins *et al.*, 2006) have been forwarded as predictors of low supplementation rates, the socio-economic trait most frequently cited in this regard is low education (Lyle *et al.*, 1998; Yu *et al.*, 2003; Radimer *et al.*, 2004; Rock, 2007). The current study reveals significantly lower supplementation rates among those resident in disadvantaged areas, those of lower social class and lower socio-economic group, with a tendency towards lower rates among those of lower educational status (p=0.054). However, apart from these indicators of social deprivation, a tendency towards lower rates is also observed among those in relative income poverty (p=0.056), suggesting a possible additional role for material deprivation in this regard.

While the potential benefit of dietary supplements in improving micronutrient intakes and alleviating micronutrient inadequacy has been discussed, the relative extent to which this actually occurs among different SES groups also requires consideration. In the present study, the contribution of supplements to the total intake of many micronutrients and to micronutrient adequacy, is considerably lower among the disadvantaged group, reflecting their lower prevalence of supplementation.

Several studies have highlighted less favourable dietary patterns as additional effectors of poor micronutrient intake and compliance among those not using supplements. Dwyer *et al.*, (2001) demonstrated higher micronutrient intakes *from food* for 16 of the 20 micronutrients examined, among supplement users in their US cohort of adolescent females. These findings are echoed by those of Stang *et al.*, (2000), who also reported more favourable dietary and total micronutrient intakes among adolescent females taking supplements.

McNaughton *et al.*, (2005) indicated that the more health conducive dietary and other behavioural differences observed among supplement users may be particularly pronounced among women, a finding supported by Kiely *et al.*, (2001) whose Irish data from the NSIFCS revealed higher *dietary* micronutrient density among female (but not male) supplement users. The preponderance of additional health conducive traits such as regular exercise and smoking cessation among adult females using supplements (Yu *et al.*, 2003), suggests that supplementation practices may be largely determined by an overall greater health consciousness, which may also elicit positive effects on other health behaviours.

In the current study, this view is supported by the significantly lower prevalence of supplement use among those with an external locus of health control (p=0.031), and the tendency towards lower supplementation rates among those in the pre-contemplation stage of dietary change (p=0.064), despite a limited sample size in the latter case (*n*=30). The significantly higher rates of supplementation among those in the action or maintenance stages of dietary change (p<0.001), and among those who use the mass media for health information (p=0.021), would seem to lend further credence to this argument.

Lower supplementation rates among low SES *women* are of specific concern for a number of reasons. Although women's diets are often of greater nutrient density, their lower absolute levels of food intake predispose them to micronutrient inadequacy. Furthermore, young women often require additional micronutrients such as iron, folate, vitamin D and calcium to optimise their own health and that of their offspring. Finally, because the diets of low SES women are less micronutrient-rich as demonstrated in Chapter 4, they will have even greater micronutrient deficits than their more advantaged peers. Notwithstanding concerns regarding nutrient bioavailability, these findings highlight dietary supplements as an effective pragmatic measure to offset some of these nutrient deficits in low SES women.

5.4.4. Physical Activity

The current study reports a mean vigorous activity duration of 83 minutes per week (11.9 minutes per day) for the full population. A considerable socio-economic difference is observed however, with those in the disadvantaged group averaging 8.8 minutes per day compared with a mean of 21.5 minutes per day in the advantaged cohort ($p=0.001$). On further examination, it is found that the socio-economic variation in mean vigorous activity duration which prevails in the current population is mainly attributable to significant differences in participation rates between the two groups. 28.1% of women in the disadvantaged group report taking part in some form of regular vigorous activity, versus 50.0% of the advantaged women ($p=0.001$). Other research has also identified lower participation in vigorous activity to be a principal component of lower overall activity levels among low SES women. For example, Albert *et al.*, (2006), analysing data from nearly 23,000 females in the prospective Women's Health Study in the US, found that women in the lower educational strata were significantly less likely to engage in vigorous physical activity.

The current study also assesses variations in the degree of sedentarism between the disadvantaged and advantaged groups, by estimating mean daily sitting times between the two cohorts. Because these estimates are generated from mid-interval values of categories spanning up to 1 hour, and because they do not distinguish between occupational and recreational sedentarism, their related findings must be interpreted with caution. Notwithstanding these limitations however, those in the disadvantaged group (210 minutes per day) reported a significantly lower median daily sitting time than their advantaged peers (321 minutes per day) ($p<0.001$), a feature which may possibly relate to a high degree of occupational sedentarism among the more affluent women. In contrast to these findings, many studies have suggested a greater degree of sedentarism among lower socio-economic groups. Sidney *et al.*, (1996), described greater TV viewing, an established correlate of low physical activity, among those of low education and income, while Metcalf *et al.*, (2007) also demonstrated lower recreational physical activity levels among those of both low education and low income. As stated previously, it is possible that the greater degree of sedentarism among those of higher socio-economic status in the current study, relates to the use of a measure which includes both occupational and recreational activity, rather than just the latter, and this highlights the need to categorise these different types of activity.

Many studies have demonstrated an inverse association between various measures of habitual physical activity and overweight and obesity as defined by either BMI or body fat (Sidney *et al.*, 1996; Kruger *et al.*, 2002; Molarius, 2003; Sharpe *et al.*, 2004). There is also evidence that the secular rise in physical inactivity over recent years has contributed substantially to the considerable increases in the prevalence of obesity observed in most countries (Sherwood *et al.*, 2000; Lindstrom *et al.*, 2003). Physical inactivity has also been associated with less favourable metabolic profiles including raised serum triglycerides, and higher fasting insulin and 2-hour post-prandial blood glucose (Ekelund *et al.*, 2007), and also with more rapid progression towards the metabolic syndrome (Ekelund *et al.*, 2005). Indeed, when TV viewing was employed as a proxy for physical inactivity, similarly adverse metabolic profiles emerged (Dunstan *et al.*, 2005). These findings are supported by other studies which have suggested a protective effect of regular physical activity against the development of type II diabetes mellitus, especially among women (Di Donato *et al.*, 2005; Meisinger *et al.*, 2005).

A further recent study has described an inverse association between leisure time physical activity and BMI, body fat, waist circumference, resting heart rate, diastolic blood pressure and serum triglycerides, and a positive association with HDL among a cohort of 5478 French adults (Oppert *et al.*, 2006). Unsurprisingly, those with habitually lower recreational physical activity and fitness levels have frequently displayed greater overall and cardiovascular mortality rates (Haapanen-Niemi *et al.*, 2000; Schnohr *et al.*, 2004), presumably due to these differentials in their risk factor profile. Apart from its profound impact on cardiovascular risk, physical inactivity has also been implicated as a risk factor for cancer at several sites including the colo-rectum, breast and endometrium.

Because of its multiple deleterious effects on overall health, physical inactivity has been forwarded as a potential effector of poor health status among lower socio-economic groups. Several studies have identified less favourable patterns in physical activity among those of lower education (Cirera *et al.*, 1998; Crawford *et al.*, 1999; Parks *et al.*, 2003; Albert *et al.*, 2006; Borodulin *et al.*, 2007). Lower activity levels have also been highlighted among those resident in low SES areas, where the built environment may be less conducive to physical activity (Giles-Corti & Donovan, 2002; Kavanagh *et al.*, 2005; Ball *et al.*, 2007). The current study, like those cited above, reveals significant differences in vigorous activity participation among those of low education (p=0.012) and low income (p=0.002).

Much of the socio-economic variation in physical activity reported in the previous studies relates to differences in vigorous activity profiles in particular, and this trend is also echoed among Irish women in NSIFCS. This NSIFCS cohort reported an average vigorous activity duration of 86 minutes per week for women aged 18-35 years, with greater occupational and total physical activity levels, lower household activity levels and significantly greater vigorous activity levels among women in the professional and skilled non-manual classes than their less advantaged peers.

The attitudinal factors previously suggested to mediate socio-economic differences in physical activity include low self-efficacy, fatalism and optimistic bias. The significantly greater participation in vigorous activity among those in the action and maintenance stages of dietary change in the current study ($p<0.001$), suggests that lower health consciousness could indeed play a role in physical inactivity. The significantly lower levels of participation among those with a chance ($p<0.001$) or external ($p=0.006$) locus of health control would also seem to support a role for fatalism in low vigorous activity participation.

Lower neighbourhood safety has been identified as a potential impediment to physical activity in both adults and children in a number of studies (Gordon-Larsen *et al.*, 2000; Molnar *et al.*, 2004; Burdette & Whitaker, 2005; van Lenthe *et al.*, 2005). In the current study, vigorous activity participation is not lower among those citing lack of safe recreational space in the local area ($p=0.313$), nor is any significant association apparent between crime/social disorder and low activity ($p=0.277$). Perceived lack of facilities and poor built environment do not appear to predict lower participation in vigorous activity in this population either ($p=0.439$) despite much evidence to this effect from other studies (Giles-Corti & Donovan, 2002; Gordon-Larsen *et al.*, 2006). Finally, although family and community support have been cited by many as important correlates of increased physical activity (Rohm Young & Voorhees, 2003; Miles & Panton, 2006), the lower vigorous activity participation reported among those citing lack of family support as a health barrier, fails to reach statistical significance among the current population ($p=0.487$).

5.4.5. Parity and Breastfeeding

The guidelines of exclusive breastfeeding for the first six months of life disseminated by the WHO are founded on research which describes a dose-response relationship between breastfeeding and lower infant morbidity and mortality rates (von Kries *et al.*, 1999). These benefits are thought to be optimised by exclusive breastfeeding for the first six months of life (Kramer & Kakuma, 2001) and by extension of breastfeeding into at least the second year of life (Mortensen *et al.*, 2002), although the Department of Health and Children in Ireland recommend that children be exclusively breastfed for the first 4-6 months of life.

Among the specific health benefits attributed to breastfeeding are reduced risk of acute infectious diseases including respiratory tract infections (Bachrach *et al.*, 2003; Oddy *et al.*, 1999), otitis media (Dewey *et al.*, 1995), diarrhoeal disease (Beaudry *et al.*, 1995), pneumonia (Levine *et al.*, 1999) and urinary tract infection (Marild *et al.*, 2004). These benefits relate primarily to the immunological components of breast milk including immunoglobulins such as secretory IgA and various cytokines, as well as phagocytic cells such as macrophages. Breastfeeding has also been associated with reduced risk of allergic and autoimmune disorders including type I diabetes mellitus (Sadauskaite-Kuehne *et al.*, 2004; Ip *et al.*, 2007), coeliac disease (Chertok, 2007), Crohn's disease (Klement *et al.*, 2004) and allergic disease and asthma (Oddy *et al.*, 1999).

Of particular significance in the socioeconomic context however, is the relationship between breastfeeding and reduced risk of cognitive/developmental deficits and chronic degenerative disease, both of which can limit the potential of individuals to extricate themselves from poverty and disadvantage.

Breast feeding has been associated with improved cognitive development (Lucas *et al.*, 1992; Richards *et al.*, 1998; Anderson *et al.*, 1999), oral development (Palmer, 1998) and overall neurological development (Bouwstra *et al.*, 2003). It has also been associated with reduced risk of cardiovascular disease (Owen *et al.*, 2002) and its antecedent risk factors such as obesity (Grummer-Strawn & Mei, 2004) and type II diabetes mellitus (Owen *et al.*, 2006). The health benefits of breastfeeding are not confined to the infant however, but also include physiological and psychological benefits for the mother. These include post-partum weight loss (Dewey *et al.*, 1993), improved bonding between mother and child (Kuzela *et al.,* 1990), reduced post-partum bleeding (Sobhy & Mohame, 2004), reduced risk of breast cancer (Zheng *et al.*, 2001; Lee *et al.*, 2003) and ovarian cancer (Rosenblatt & Thomas, 1993) and reduced risk of post-menopausal osteoporosis (Karlsson *et al.*, 2001). The full health benefits of breast feeding for mother and child are fully elaborated by (Yngve & Sjostrom, 2001b).

Although the low number of mothers in the advantaged cohort of the current study precludes meaningful statistical comparison of breastfeeding practices with their disadvantaged peers, overall rates for this full study population (28.8%) are low. Just 25.5% of those in the disadvantaged group (n=156) breastfed their children, a similar proportion as that ascribed to the lowest occupational social class (19.8%) in the most recent 2003 Report on Perinatal Statistics (Bonham, 2007). These figures are in stark contrast to the overall prevalence of breastfeeding in Ireland (41.4%), and particularly that recorded for the highest occupational class (63.6%) in the same report.

The EURO GROWTH Study (Freeman *et al.*, 2000) examined infant feeding practices longitudinally across 12 European centres. This study found that across all 12 centres, 52%

of infants were exclusively breastfed at 1 month, declining to 35%, 25% and 15% at 2, 3 and 4 months respectively. Few infants received any breastmilk by 18-24 months. Within these rates for the full cohort (n=2245), there was significant geographical variability, with the highest rates for initiation observed in Umea, Sweden (97%) and Athens (99%) and the lowest rates recorded in Dublin (30%).

Apart from this geographical predisposition to low breastfeeding rates in Ireland, Yngve and Sjostrom (2001) described pronounced socioeconomic differences in breast feeding rates in virtually all European countries. For example, Kelly and Watt (2005) explored differences in breastfeeding initiation and duration according to occupational social class among a cohort of 18,125 single-birth infants born in the UK from 2000-2001. They reported significant social class differences in breastfeeding rates, with women in the lower occupational classes almost 4 times less likely to initiate breastfeeding than those in the professional and managerial categories.

Some studies have attempted to investigate the proximal effectors which mediate these socio-economic differences in breastfeeding rates. Sayers *et al.*, (1995) found a very low prevalence of breastfeeding initiation (38%) among their population of 162 Kildare mothers, with non-working mothers, smokers, those of low social class, and those whose mothers had not breastfed, significantly less likely to initiate breastfeeding. The present study similarly indicates a role for intergenerational learning deficits in determining lower breastfeeding rates among low SES women. A significantly lower proportion of subjects in the disadvantaged group (18.4%) than the advantaged group (48.5%) report being breastfed themselves as infants ($p<0.001$), diminishing the possibility of practical maternal support for breastfeeding their own children.

Fitzpatrick *et al.*, (1994) characterised a random sample of breastfeeding and bottle feeding Irish mothers according to socioeconomic and other parameters. They found that breastfeeding mothers were older than bottle feeding mothers, were more likely to come from social classes I and II, to have received third level education, to have planned their pregnancy, to have attended private or semiprivate clinics and to have been breastfed themselves and to have at least one sibling who was breastfed. From the social support perspective, breastfeeding mothers were more likely be married, to be living with their partner, to have a sister or sister in law and a close friend who breastfed, to have discussed infant feeding with their partner and to have been encouraged to breastfeed by him. This study ably illustrates some of the correlates of socioeconomic disadvantage which militate against breastfeeding among poor Irish women. The factors cited above reflect inequalities in formal education, intergenerational learning, peer, family and partner support, self-efficacy and future orientation between the socioeconomic strata, with lower breastfeeding rates merely representing the outcome of these underlying socio-cultural processes.

Indeed, some of the effects of these disparate conspiratory factors on low breastfeeding rates are evident among the lower social groupings in the current study. Significantly lower breastfeeding rates are observed among those in the disadvantaged group ($p<0.001$), those of low education ($p=0.030$) or who left school aged 16 years or under ($p=0.043$), and those in single adult family units ($p=0.005$). The latter in particular, may be reflective of diminished family support to breastfeed. With the exception of deprivation and consistent poverty, those of low status for each of the socio-economic variables investigated are significantly less likely to have been breastfed than their more affluent peers. Attitudinally, none of the variables in the current study appear to be meaningfully or statistically significantly associated with the prevalence of breastfeeding.

The mean primiparous age of disadvantaged mothers (20.98 years) is also much lower than that of either their advantaged counterparts (30.14 years), or the national average primiparous age (30.58 years).

In terms of intervention to increase breastfeeding rates, the importance of structural policy initiatives, improved parental leave, baby-friendly hospitals and peer support from family, friends and the wider community, to facilitate and encourage the initiation and maintenance of breastfeeding have been emphasised (Yngve & Sjostrom, 2001a). Eliciting greater support from women's partners in particular may prove fruitful, as many studies have shown this to be a key determinant of breastfeeding behaviour (Humphreys *et al.*, 1998; Mahoney & James, 2000).

5.4.6. Anthropometry

The current study demonstrates significantly higher mean BMI ($p=0.001$) and waist circumference ($p<0.001$) measurements among the disadvantaged group when compared with their advantaged reference group. These socio-economic differences are greater than those recorded for 18-35 year old women in the NSIFCS, who showed significantly higher mean measurements for both BMI ($p=0.008$) and waist circumference ($p=0.012$) among those of lower education, but not social class.

In addition to the observed differences in mean BMI and waist circumference among the disadvantaged population in the current study, further analyses reveal that *prevalence* of overweight and central obesity among these women significantly exceeds that recorded among their more advantaged counterparts ($p=0.003$ and $p<0.001$ respectively).

The mean BMI and especially waist circumference measurements for the full current study population (24.7kg/m^2 and 85.8cm respectively) are considerably greater than those reported among NSIFCS women aged 18-35 years (24.4kg/m^2 and 77.5cm respectively) (McCarthy *et al.*, 2001). The prevalences of overweight and obesity (39.7%) and central obesity (38.4%) among the full current study population are also considerably greater than those recorded for women of the same age in the NSIFCS (33.6% and 14.8% respectively), further emphasising the prominence of obesity among the current sample. However, the mean heights recorded are similar, with the difference in mean height between the disadvantaged (1.630m) and advantaged (1.654m) of similar magnitude to that observed between the low (1.606m) and high (1.639m) educational groupings in NSIFCS.

Although the current population could not be described as being representative of Irish women in this age group, the greater mean waist circumference and greater prevalence of overweight and obesity among the full population in comparison to women aged 18-35 years in the NSIFCS, may suggest a secular rise in these parameters in the eight years since the NSIFCS data were collected.

Among the disadvantaged group in the current study, the position of the *mean* population BMI (25.3kg/m^2) above the overweight threshold of 25.0kg/m^2, and the *mean* population waist circumference (87.9cm) just below the highest risk threshold of 88cm is particularly worrying among such a young population, and augurs poorly for their future health.

Several of the socio-economic indices show a significant association with high BMI and waist circumference. Significantly higher mean BMI is observed among those who are disadvantaged (25.3kg/m^2 vs. 22.9kg/m^2) ($p=0.001$), living in deprivation (25.8kg/m^2 vs. 24.2kg/m^2) ($p=0.018$), entitled to state benefits (25.9kg/m^2 vs. 23.5kg/m^2) ($p<0.001$) and living in single adult family units (26.2kg/m^2 vs. 24.0kg/m^2) ($p=0.001$). Higher mean waist circumferences are seen among those who are disadvantaged (87.9cm vs. 79.7cm) ($p<0.001$), those entitled to state benefits (89.1cm vs. 82.5cm) ($p<0.001$), those entitled to a medical card (87.7cm vs. 83.7cm) ($p=0.010$), and those living in single adult family units (89.7cm vs. 83.9cm) ($p<0.001$). The mix of social and material indicators of disadvantage in both instances, indicates a diverse constellation of potential effectors for these socio-economic differences in anthropometric status, one which may also be confounded by differences in parity between the two groups.

Several attitudinal factors are also significantly predictive of higher mean BMI and waist circumference measurements. Those with an external locus of health control have significantly higher mean BMI ($p=0.016$) and waist circumference ($p=0.006$) measurements, as do those in the pre-contemplation stage of dietary change ($p=0.004$ and $p=0.022$ respectively), strongly suggesting increased fatalism and reduced self-efficacy as potential mediators of these socio-economic differences in obesity. The significantly higher BMI (26.0kg/m^2 vs. 24.3kg/m^2) ($p=0.024$) and waist circumference (89.5cm vs. 84.7cm) ($p=0.008$) measurements observed among those who cite cost as a health barrier, and the significantly higher mean waist circumference measurement (88.9cm vs. 84.8cm) ($p=0.026$) among those citing environment/poor facilities as a health barrier, indicate that material deprivation may also play a role however.

There appears to be good awareness of weight status among this population. Those who agree that their weight is appropriate for their age demonstrate significantly lower BMI (22.7kg/m^2 vs. 26.8kg/m^2) ($p<0.001$) and waist circumference measurements (81.0cm vs. 90.3cm) ($p<0.001$) which fall well within guideline levels. Similarly, those who declare that they do not need to change their lifestyle to improve their health also have significantly lower BMI (22.5kg/m^2 vs. 25.0kg/m^2) ($p=0.014$) and waist circumference measurements (80.1cm vs. 86.5cm) ($p=0.012$) than their peers. Finally, those who rate their current health status as fair or poor show significantly higher mean BMI (26.5kg/m^2 vs. 24.1kg/m^2) ($p=0.001$) and waist measurements (90.9cm vs. 84.1cm) ($p<0.001$), indicating that this increased weight may already be mediating a deleterious effect on health.

5.5. Conclusions

This Chapter has elucidated profound differences in health behaviours and anthropometric status across the socio-economic spectrum. The disadvantaged women in the current study are significantly more likely to smoke than their advantaged peers and these trends are propagated by both higher initiation rates and lower cessation rates. Additionally, their significantly greater lifetime exposure to tobacco is precipitated not just by greater smoking duration, but also by greater smoking intensity.

Notwithstanding the very high prevalence of alcohol over-consumption among both the advantaged and disadvantaged women, those in the latter group display particularly unfavourable patterns in terms of both total intake and binge-pattern consumption.

With regard to dietary supplement use, the disadvantaged group are significantly less likely to use such preparations. In the context of the poorer micronutrient intakes described for these women in Chapter 4, the omission of these dietary supplements will have even greater ramifications for overall nutritional adequacy among this group.

Although levels of sedentarism are slightly lower among the low SES women, their participation in vigorous physical activity is significantly lower than that of their advantaged peers. The particularly low participation in vigorous activity among the disadvantaged women is also superimposed on an endemic physical inactivity which appears to pervade all strata of the socio-economic spectrum in this study.

Breast feeding levels are also significantly lower among the disadvantaged women. A considerably greater proportion of these women report that they were not breastfed themselves, perhaps revealing deficits in inter-generational learning as a key barrier in this respect. Poor overall family support, particularly lone parenthood, may also serve to exacerbate this problem.

Finally, with reference to anthropometric status, mean BMI and particularly mean waist circumference measurements are higher than ideal for both the disadvantaged and advantaged women, while both groups' prevalence of overweight and obesity and central obesity is also worryingly high. A strong inverse socio-economic gradient is observed for these parameters however, with rates of overweight and central adiposity significantly greater among the disadvantaged women.

The greater prevalence of all of these health damaging behaviours among the disadvantaged women suggests that they may co-segregate among individuals within this group. The creation of a scoring model to investigate this issue confirms that far from segregating towards the lower social strata in isolation, these seemingly disparate behaviours do indeed co-occur with high frequency in low SES individuals. While such co-occurrence of negative health behaviours has previously been cited in the literature (Steptoe *et al.*, 1997; Hyland *et al.*, 2004; Tsai *et al.*, 2007), there is a dearth of research which explicitly indicates the coincidence of these practices with poor dietary intake. Unfortunately, the current study confirms the coincidence of less favourable dietary patterns with these adverse health behaviours among these low SES women. This is likely to compromise any potential ability of an optimal nutritional intake to attenuate the deleterious impact of these negative health behaviours.

The co-segregation of adverse health behaviours and poor dietary patterns among the disadvantaged women suggests the influence of wider socio-cultural phenomena which preferentially "push" these disadvantaged women towards unhealthy behaviours (e.g. stress and smoking), and which fail to divert them away from these unhealthy behaviours (e.g. high alcohol consumption). In this way, the adverse behaviours observed may be viewed as mere symptoms or signs of more profound sociological processes which characterise life in low SES environments.

Chapter 6 will endeavour to elucidate the sociological precipitants of the health-damaging behaviours described above, with a view to informing evidence-based public health interventions to address these issues.

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Chapter 6

Attitudes and Beliefs

6.1. Introduction

The previous chapters have described significantly poorer dietary practices and health behaviours among young disadvantaged women in the current study population when compared against their more affluent peers. These poorer dietary patterns are associated with significantly less favourable dietary fibre, macronutrient and micronutrient intakes in these disadvantaged women, and also with significantly poorer adherence to several nutrient intake guidelines among this group. They are also manifest in significantly poorer anthropometric profiles among this disadvantaged cohort.

While many of the deleterious behavioural patterns described above coincide with lower socio-economic status as measured by a number of indices, the actual means by which poverty and disadvantage mediate these behavioural effects is not immediately clear. Analyses in previous chapters have demonstrated that certain attitudes and beliefs coincide with significantly poorer dietary and general health behaviours among the current study population. In this way, they emerge as potential psycho-social effectors of negative health behaviours among the disadvantaged respondents.

The current chapter aims to clarify the associations between low socio-economic status and the attitudinal traits which are thought to predispose to adverse dietary and health behaviours in these young women. Put simply, this will yield further insights into the psycho-social characteristics of poverty which elicit health-subversive behaviours, including poor dietary practices.

Any *quantitative* survey which aims to investigate the links between disadvantage and poor diet and health behaviours, will necessarily be based on an *a priori* knowledge of the putative correlates of poverty thought to predict such behavioural differences. Because this methodology is inductive rather than deductive, it often lacks the flexibility to capture information from respondents regarding additional, unanticipated factors which may also precipitate adverse health behaviours.

For this reason, *qualitative* research methods have been used alongside the current quantitative investigation. These qualitative techniques are particularly useful for exploring phenomena which remain elusive to quantitative research (Giacomini & Cook, 2000). As such they have been usefully employed to inform nutrition education among minority groups (Carter-Edwards *et al.*, 1998), and to elucidate the factors which impinge on food choice among disadvantaged populations (Shankar & Klassen, 2001). The inclusion of such focus group research in the current study aims to provide insights into poverty, diet, health behaviours and the linkages between these phenomena, and to more effectively elaborate on themes which may have received insufficient coverage in the quantitative survey. The data from these qualitative focus groups will provide a contextual narrative to more fully convey the lived experience of poverty and disadvantage and its negative impact on health.

6.2. Methodology

6.2.1. Quantitative Attitudinal Examination

Quantitative attitudinal and psycho-social data were collected from all 295 respondents by means of an interviewer-assisted questionnaire administered to groups ranging in size from 3-18 individuals. The derivation of these attitudinal and psychosocial questionnaires from previous studies is detailed in Chapter 2 (pp 73-75). The women, all aged 18-35 years, were recruited from a total of 20 sites across north, south, west and inner city Dublin according to the provisions of the sampling frame described in Chapter 2. These recruitment sites are documented in Appendix VI.

Respondents were asked to give their opinions on a range of issues thought to affect dietary and health behaviours. These issues included the local environment, food and healthcare facilities, future orientation, sources of health information, perceived influences on health, perceived level of control over health, self-rated health status, perceived barriers to health and healthy diet, intention to change dietary behaviour and definitions of a healthy diet. In addition, further questions focused on respondents' efforts to follow a healthy diet, the perceived adequacy of their current diet and exercise patterns, the perceived adequacy of their friends' diet and exercise habits and their opinions regarding the appropriateness of their current weight. For some questions, subjects selected the opinion(s) which best matched their own from a series of options (e.g. influences on health, barriers to a healthy diet). In other cases, they indicated their level of agreement or disagreement with a particular statement using a 5 point Likert scale, going from a score of 1 for strongly agree, to a score of 4 for strongly disagree.

The questions used to derive these attitudinal data are shown in Appendix I. After excluding scores of 5 (which indicate "Don't Know" on the Likert scale), subject responses to these questions were dichotomised into two categories of "agree" and "disagree" for statistical analyses.

6.2.1.1. Statistical Analysis

Once these dichotomous groups had been created, differences in perceived influences on health, perceived definitions of healthy eating and perceived barriers to healthy eating were compared between the disadvantaged and advantaged populations. This was achieved by crosstabulation of disadvantage against the categorical variables indicating participant responses to these questions, with Yates' continuity correction reported in each case. The outcomes of these analyses are presented in Tables 6.1, 6.2 and 6.3 respectively.

Statistical analyses were then performed to assess food group intake according to differences in opinion across a selection of attitudinal variables. For food groups with non-normally distributed intakes (fruit and fruit juices, vegetables, fruit and vegetables, breakfast cereals, sweet foods, sugar and confectionery, fish, dairy foods and potatoes and potato products), non-parametric Mann-Whitney U tests were performed to assess differences in intake between the dichotomised attitudinal categories. For comparison of meat and meat product intakes, which are normally distributed, parametric independent t-tests were employed to examine differences between the attitudinal categories. The attitudinal variables which yielded significant differences in food group intake patterns by these methods are summarised in Table 6.4.

The attitudinal factors associated with significant differences in health behaviours and anthropometric status were similarly assessed. For continuous variables which were normally distributed (body mass index (BMI) and waist circumference) parametric independent t-tests were used to reveal differences between the attitudinal categories. For mean daily sitting time which was non-normally distributed, non-parametric Mann-Whitney U tests were performed to investigate differences. The other health behaviours examined (current smoking status, participation in vigorous physical activity, high alcohol consumption, supplement use and breastfeeding) were dichotomous categorical variables. Differences in the prevalence of these behaviours between the attitudinal categories were assessed by crosstabulation with Chisquare analysis, reporting Yates' continuity correction in each case. The results of these analyses are shown in Table 6.5.

6.2.1.2. Socio-economic Distribution of Attitudinal Traits

Once the associations between the different attitudinal variables and dietary and health behaviours had been established, it was time to investigate whether the predictive attitudinal traits differed according to socio-economic status as measured by a range of indicators. The premise here is quite simple – to assess whether attitudes which predict poor dietary and health behaviours vary according to socio-economic status.

The prevalence of attitudes previously found to be predictive of less favourable food group intakes and health behaviours, was compared against eleven socio-economic indicators. The latter had also been dichotomised into high and low status (e.g. high vs. low social class, high vs. low education, early school leavers vs. not early school leavers, consistent poverty vs. no consistent poverty, deprivation vs. no deprivation).

These comparisons were carried out by means of crosstabulation with Chisquare analysis, again reporting Yates's continuity correction in each case.

6.2.2. Qualitative Attitudinal Examination

Qualitative research in its broadest sense encompasses data collection techniques such as in-depth interviewing and focus group discussions (Safman & Sobal, 2004). It is an important element of formative research, in which the putative factors which are thought to influence the phenomena at hand are being initially explored and identified (Ayala *et al.,* 2001, Strolla *et al.*, 2006). Such investigation is critical to health behavioural research, because of the imperative to identify the issues and themes of greatest importance to the behaviours in question (Betts *et al.*, 1996), before the research becomes focused on the measurement of these parameters. In essence, this is analogous to finding out what is important before beginning to measure it. While it has been used in public health nutrition research for many years (Trenkner & Achterberg, 1991), its value in this area of study has gained increasing recognition in recent years.

Qualitative research can also be usefully employed in the development and refinement of health interventions among disadvantaged groups as it is a means of investigating why an intervention failed or succeeded (Mitchell & Branigan, 2000; Simpson & Freeman, 2004), which does not rely on the researchers pre-conceived (and sometimes erroneous conclusions) about why such outcomes might have arisen. Collaboration with members of the community through focus group discussions also increases the sense of ownership and engagement which these communities feel with resulting nutritional interventions (Garcia & Henry, 2000).

6.2.2.1. Administration

A provisional topic list was initially prepared to act as a series of discussion points for exploration during the focus group sessions. The original list embraced *a priori* themes from the literature relating to poverty, health and diet, but also encompassed themes elucidated by respondents in the quantitative survey. This provisional topic list was piloted with a group of 5 young women of mixed occupational social class in DIT Kevin Street, and alterations made as required.

The topics for the subsequent semi-structured group discussions divided into six overarching themes; future salience, locus of health control, perceptions of a healthy diet, perceived barriers to health and healthy eating, perceptions of poverty and psychosocial stress. Sensitive issues such as household finance, poverty and deprivation and their impact on psychological well-being and health-related behaviours (including diet) appeared towards the end of the list, to encourage frank and open discussion of these issues once participants had become more comfortable with the process.

6.2.2.2. Data Collection

Five focus groups were conducted comprising five to eight individuals each (n=32 in total), according to guidelines described in the literature (Krueger & Casey, 2000). Respondents were all female and all aged 18-35 years. It has been previously demonstrated that discussants are more likely to have the confidence to express their views openly in such peer groups which are homogenous from the demographic and socio-cultural perspective (Sim, 1998).

The five interview sessions were conducted at two sites in North and Inner City Dublin between March and April 2007. Both sites were community education schemes for young women and both fell within the lowest quintile of electoral districts highlighted by the sampling frame described in Chapter 2. The value of such purposive sampling for focus groups discussions has previously been described elsewhere (Mays & Pope, 2000), and may be particularly useful in canvassing the opinions of minority groups such as that being investigated in the current study. According to best practice protocols (Britten, 1995; Kitzinger, 1995) the five focus groups were jointly coordinated by a facilitator and a rapporteur. The facilitator's (DMC's) role was to raise and encourage discussion among the group regarding themes outlined in the topic list, while at the same time taking care not to lead the group towards conditioned or coerced responses to confirm pre-existing hypotheses (Sim, 1998).

The facilitator for all five of the focus groups (DMC) was a male of similar age but different socio-economic background to the discussants. While such incongruity between the interviewer and the group participants can sometimes present problems, the selection of a settings-based, informal discussion format, and particularly the introduction of the researchers to the participants by a trusted trainer appeared to overcome any such issues. The rapporteur (BW) (young, female, high SES), documented noteworthy comments from the participants, as well as detailing various other group dynamics, interactions and nuances which were uncaptured on audiotape and which might be relevant to subsequent analysis (Krueger & Casey, 2000).

Prior to each focus group, participants were provided with an explanatory letter detailing the format and purpose of the meeting. Verbal re-assurances were also given regarding the protection of participants' anonymity and confidentiality. Each participant then signed a consent form to formally acknowledge their willingness to take part in the discussion group. The introductory letter and the informed consent declaration are included as appendices X and XI respectively at the end of this thesis.

The sessions were recorded digitally on an Olympus VN-2100 Digital Voice Recorder, and ranged in duration from 33 minutes to 67 minutes. Immediately after the discussion, participants were presented with a €10 voucher for a local food and clothing retailer as a token of appreciation for their contribution.

Five focus groups were conducted in total, until data saturation was achieved (Lincoln & Guba, 1985), with no new themes emerging from the discussion groups.

6.2.2.3. Transcription and Analysis of Qualitative Data by Grounded Theory

Following each focus group, the facilitator listened to the digital recordings of the session, making further independent notes. The facilitator and the raporteur then met for a debriefing session to discuss the meeting overall, examine both sets of notes and arrive at a consensus regarding the main issues which had emerged from the discourse.

The recorded sound file from each of the focus groups was transcribed by a contracted secretary, with speech inflections and nuances noted as appropriate. These transcripts were then examined by the facilitator and the rapporteur independently. A grounded theory approach was selected for the analysis of these transcribed data, as described by Strauss & Corbin (1998).

This technique follows an inductive format, in that it allows theory to evolve from data as a result of line by line analysis, identification of themes and comparison within and across themes (Fade, 2003). A fundamental precept of the grounded theory approach is that it enables the themes which emerge from each focus groups to generate a clearer picture of the sociological processes in question. In this way, examination of data from one focus group informed the topics to be discussed at the following group, until data saturation or "informational redundancy" (Lincoln & Guba, 1985) was reached. As a fluid and dynamic template to merely guide these discussions, the topic list evolved incrementally over the course of the five focus group sessions as new themes were highlighted by participants. The original and final topic lists are shown in Appendix VIII and IX respectively at the back of this thesis.

Independent examination of the full transcripts by the facilitator and the rapporteur enabled the constituent elements of the discussion to be separated into thematic categories. Subsequent discussion between both researchers yielded a final consensus regarding the themes generated by each focus group. Such triangulation and consensus measures have been employed in the past (Edstrom & Devine, 2001), to greatly enhance the credibility of such data analyses by limiting or negating inter-observer bias.

6.3. Results

6.3.1. The Quantitative Study

6.3.1.1. Socio-economic Differences In Attitudinal Variables

This section begins with a brief description of differences in perceived influences on health, perceived definitions of the healthy diet and perceived barriers to healthy eating between the disadvantaged and advantaged respondents. The attitudinal traits which are predictive of unfavourable dietary patterns and health behaviours are then re-visited, before examining the socio-economic distribution of these attitudinal variables across a number of indices. Table 6.1 below describes differences in perceived influences on health between the disadvantaged and the advantaged groups.

Influence on Health	Disadvantaged (%) (n=218)	Advantaged (%) (n=74)	p value
Stress	21.6	10.8	0.061
Smoking	21.1	13.5	0.207
Bodyweight	15.6	4.1	0.017
Diet	12.4	39.2	<0.001
Don't Know	7.3	0.0	0.036
Genes	6.4	20.3	0.001
Alcohol	5.5	2.7	0.509
Physical Activity	4.6	12.2	0.044
Environment	4.6	1.4	0.363
Family	0.9	0.0	0.991

Table 6.1 Differences in Perceived Influences on Health between Disadvantaged and Advantaged Respondents (n=295)

The top five perceived influences on health among the disadvantaged group are stress (22%), smoking (21%), bodyweight (16%), diet (12%) and genes (6%), while a considerable number stated that they are unsure about the major factors which influence health (7%). For the advantaged respondents, the top five perceived influences on health are diet (39%), genes (20%), smoking (14%), physical activity (12%) and stress (11%), with none of this group selecting the "Don't Know" option. A significantly lower proportion of the disadvantaged group selected diet (p<0.001), physical activity (p=0.044) and genes (p=0.001) as influences on health, while a significantly greater proportion of these disadvantaged women selected bodyweight (p=0.017). Although twice the percentage of the disadvantaged cohort selected stress as an influence on health, this difference just fails to reach statistical significance (p=0.061).

Table 6.2 illustrates differences in the top three perceived definitions of a healthy diet between the two groups.

Definition of Healthy Eating	**Disadvantaged (%)**	**Advantaged (%)**	**p value**
More Fruit & Vegetables	78.3	74.3	0.587
Plenty of Nutrients	38.9	27.0	0.088
Balance & Variety	31.2	73.0	<0.001
Less Fat	30.8	16.2	0.022
Less Alcohol	24.0	10.8	0.024
Less Sugar	22.6	12.2	0.075
Fresh & Natural Foods	19.5	25.7	0.331
Less Salt	16.3	9.5	0.211
More Dietary Fibre	10.9	35.1	<0.001
Less Bread, Potatoes & Pasta	10.0	0.0	0.010
No Chemicals	8.1	5.4	0.603
Less Red Meat, More White Meat	6.8	5.4	0.884
More Dairy Foods	1.4	0.0	0.735
Less Dairy Foods	0.9	0.0	0.998
More Lean Meat	0.9	0.0	0.998

Table 6.2 Differences in Perceptions of a Healthy Diet between Disadvantaged and Advantaged Respondents (n=295)

The top five definitions of a healthy diet selected by the disadvantaged group are more fruit and vegetables (78%), plenty of nutrients (39%), balance and variety (31%), less fat (31%) and less alcohol (24%). The top five definitions selected by the advantaged group are more fruit and vegetables (74%), balance and variety (73%), more dietary fibre (35%), plenty of nutrients (27%) and fresh and natural foods (26%).

A significantly greater proportion of the disadvantaged cohort selected less fat ($p=0.022$), less bread, potatoes and pasta ($p=0.010$) and less alcohol ($p=0.024$), while a significantly lower proportion of this group identified balance and variety ($p<0.001$) and more dietary fibre ($p<0.001$). While a considerably greater proportion of the disadvantaged group (23%) than the advantaged group (12%) selected less sugar, this difference does not reach statistical significance ($p=0.075$).

Differences in perceived barriers to healthy eating between the disadvantaged and advantaged respondents are depicted in Table 6.3 below.

Barrier to Healthy Eating	Disadvantaged (%)	Advantaged (%)	p value
Willpower	56.6	51.4	0.519
Busy Lifestyle	41.2	60.8	0.005
Taste	32.1	23.0	0.179
Healthy Foods are Too Expensive	24.1	20.3	0.607
I Lack Healthy Eating Knowledge	18.6	0.0	<0.001
Long Work Hours	16.7	54.1	<0.001
Experts Keep Changing their Minds	15.8	0.0	0.001
Poor Cooking Skills	14.5	10.8	0.547
Healthy Foods Are Less Filling	11.8	5.4	0.179
Don't Like Healthy Food	11.8	4.1	0.089
Family Preferences	10.0	12.2	0.751
Healthy Foods Take Longer to Prepare	7.2	18.9	0.008
Limited Choice When Eating Out	7.2	14.9	0.083
Requires Me to Eat Strange/Unusual Foods	5.9	1.4	0.204
I Don't Want to Change	5.0	1.4	0.305
Healthy Foods are Not Available	4.5	12.2	0.041
Too Great a Change from Current Diet	3.2	1.4	0.675
Healthy Food Goes Off More Easily	2.3	10.8	0.006
I Lack Cooking Facilities	1.8	2.7	1.000
Healthy Eating Makes Me Stand Out	1.8	0.0	0.559
Healthy Foods are More Awkward to Carry	0.9	1.4	1.000
I Lack Storage Facilities	0.9	1.4	1.000

Table 6.3 Differences in Perceived Barriers to Healthy Eating between Disadvantaged and Advantaged Respondents (n=295)

The top five perceived barriers to healthy eating selected by the disadvantaged group are willpower (57%), busy lifestyle (41%), taste (32%), the cost of healthy foods (24%) and lack of healthy eating knowledge (19%). Among the advantaged group, the top five perceived barriers are busy lifestyle (61%), long work hours (54%), willpower (51%), taste (23%) and the cost of healthy foods (20%). A significantly greater proportion of the disadvantaged group select "Experts keep changing their mind" ($p=0.001$) and especially lack of healthy eating knowledge ($p<0.001$), while a significantly lower proportion of this disadvantaged cohort select long work hours ($p<0.001$) and busy lifestyle ($p=0.005$).

A significantly lower proportion of the disadvantaged group feel that poor availability of healthy foods is a barrier to healthy eating ($p=0.041$), and they are also less likely to consider that healthy food goes off more quickly ($p=0.006$) and that healthy food takes longer to prepare ($p=0.008$). Although a greater percentage of the disadvantaged group (12%) than the advantaged group (4%) state that they "do not like healthy foods", this difference does not reach statistical significance ($p=0.089$). Overall, time constraints appear to be much less prominent barriers to healthy eating among the disadvantaged group, while poor nutritional knowledge seems to be a much more important barrier among this group.

6.3.1.2. Attitudinal Predictors of Dietary Intake and Health Behaviours

6.3.1.2.1. Attitudinal Predictors of Adverse Food Intake Patterns

The attitudinal traits which were most discriminatory for adverse food intake patterns are depicted in Table 6.4. Chance locus of health control coincides with several less favourable food consumption patterns including lower intakes of fruit and fruit juices ($p=0.032$), vegetables ($p<0.001$), fruit & vegetables combined ($p=0.003$), breakfast cereals ($p=0.012$) and fish ($p<0.001$), and with higher potato and potato product intakes ($p=0.016$). External health locus also coincides with lower vegetable intakes ($p=0.011$).

Conversely, those who perceive their health to be good demonstrate several more health-conducive dietary patterns including higher vegetable intakes ($p=0.002$), high fruit and vegetable intakes ($p=0.008$), higher breakfast cereal intakes ($p=0.003$) and lower potato and potato product intakes ($p=0.038$). Use of the mass media (radio, TV, magazines and the internet) for health information is also significantly associated with several more favourable dietary patterns including higher fruit and fruit juice intakes ($p<0.001$), higher vegetable intakes ($p<0.001$), higher fruit and vegetable intakes (<0.001), higher breakfast cereal consumption ($p<0.001$), lower meat and meat product intakes ($p=0.036$), higher fish intakes ($p=0.003$) and lower potato and potato product consumption ($p=0.001$).

Those who perceive their weight to be appropriate for their age have higher vegetable ($p=0.011$) and breakfast cereal intakes ($p=0.001$), and lower mean intakes of meat and meat products ($p=0.001$), and these trends to some degree reflect the lower breakfast cereal intakes ($p=0.004$) and higher meat and meat product intakes ($p<0.001$) observed among women whose measured waist circumference is ≥88cm.

Dietary stage of change, is also associated with significant differences in food group intake. Those with a low stage of change score, which designates the passive psychometric stages (pre-contemplation, contemplation, decision), have lower mean intakes of fruit and fruit juices ($p=0.006$), vegetables (<0.001), fruit and vegetables combined (<0.001), breakfast cereals (<0.001), fish (<0.001) and dairy foods ($p=0.033$), and also demonstrate significantly higher intakes of sugar, sweet foods and confectionery ($p=0.002$), meat and meat products ($p=0.019$) and potatoes and potato products ($p<0.001$).

When those in the pre-contemplation stage (i.e. those who are not considering any dietary change) are compared against all other respondents, they show a significantly lower intake of fruit and fruit juices ($p=0.029$), vegetables ($p=0.023$), fruit and vegetables combined ($p=0.011$) and a higher intake of potato and potato products ($p=0.006$). In contrast, respondents in the action or maintenance stages (i.e. those who have either made dietary changes within the last six months or those who have made changes more than six months ago and sustained them) show much more favourable dietary patterns. This group have significantly higher intakes of fruit and fruit juices ($p=0.009$), vegetables ($p<0.001$), fruit and vegetables combined ($p<0.001$), breakfast cereals ($p<0.001$), fish ($p<0.001$) and dairy foods ($p=0.019$), and significantly lower intakes of sugar, sweet foods and confectionery ($p=0.003$), meat and meat products ($p=0.025$) and potato and potato products ($p<0.001$).

While the different stages of dietary change emerge as the attitudinal factors of greatest discriminatory value in terms of food group intake patterns in the quantitative study, respondents who report actively pursuing a healthy diet also show more favourable dietary patterns.

Those who consciously restrict fat in their diet also display more favourable dietary patterns including higher intake of vegetables (p=0.001), fruit and vegetables combined (p=0.016), breakfast cereals (p=0.004) and fish (p=0.002), and lower intakes of sweet foods, sugar & confectionery (p=0.006) and potatoes & potato products (p=0.005).

Regarding proposed barriers to healthy eating, taste appears to be an important impediment to healthy diet predicting lower intakes of fruit (p=0.015), vegetables (p=0.001), fruit and vegetables combined (p=0.003), breakfast cereals (p=0.004) and fish (p=0.009), and higher intakes of potatoes and potato products (p=0.029). In contrast, willpower, and especially the price of healthy foods, do not appear to be barriers which predict less favourable dietary patterns. Selection of poor dietary knowledge as a barrier to healthy eating is predictive of lower mean intakes of several important food groups including fruit and fruit juices (p=0.032), fruit and vegetables combined (p=0.020), fish (p=0.015) and dairy foods (p=0.021).

Attitudinal Variable	Status	Fruit & Juices		Vegetables		Fruit & Vegetables		Breakfast Cereals		Sweet Foods		Meat & Meat Products		Fish		Dairy Products		Potatoes & Potato Products	
			p		p		p		p		p		p		p		p		p
10 year Future Salience	Yes	●	0.177	▼	0.049	●	0.066	●	0.163	▲	0.032	●	0.102	●	0.378	●	0.615	●	0.666
Chance Health Locus	Yes	▼	0.032	▼	<0.001	▼	0.003	▼	0.012	●	0.309	●	0.155	▼	<0.001	●	0.093	▲	0.016
External Health Locus	Yes	●	0.244	▼	0.011	●	0.097	●	0.121	●	0.331	●	0.499	●	0.066	●	0.055	●	0.152
Internal Health Locus	Yes	●	0.578	●	0.326	●	0.402	●	0.273	●	0.981	●	0.969	●	0.862	●	0.336	●	0.682
Self-perceived Health	Good	●	0.123	▲	0.002	▲	0.008	▲	0.003	●	0.406	●	0.382	●	0.305	●	0.900	▼	0.038
Mass Media used for Health Info	Yes	▲	<0.001	▲	<0.001	▲	<0.001	▲	<0.001	●	0.839	▼	0.036	▲	0.003	●	0.167	▼	0.001
"My Weight is OK for my Age"	Agree	●	0.546	▲	0.011	●	0.122	▲	0.001	●	0.159	▼	0.001	●	0.614	●	0.107	●	0.174
Dietary Stage of Change Score	Active	▲	0.006	▲	<0.001	▲	<0.001	▲	<0.001	▼	0.002	▼	0.019	▲	<0.001	▲	0.033	▼	<0.001
Pre-contemplation Stage of Change	Yes	▼	0.029	▼	0.023	▼	0.011	●	0.060	●	0.865	●	0.743	●	0.207	●	0.542	▲	0.006
Action/Maintenance Stage of Change	Yes	▲	0.009	▲	<0.001	▲	<0.001	▲	<0.001	▼	0.003	▼	0.025	▲	<0.001	▲	0.019	▼	<0.001
Conscious Effort to eat Healthily	Yes	▲	<0.001	▲	<0.001	▲	<0.001	▲	<0.001	●	0.363	▼	0.017	▲	<0.001	▲	0.001	▼	<0.001
Conscious Effort to Limit Dietary Fat	Yes	●	0.362	▲	0.001	▲	0.016	▲	0.004	▼	0.006	●	0.160	▲	0.002	●	0.064	▼	0.005
My Diet is Already OK	Agree	●	0.354	●	0.201	●	0.203	▲	0.004	●	0.321	●	0.571	●	0.231	●	0.165	●	0.166
Taste Barrier to Healthy Eating	Agree	▼	0.015	▼	0.001	▼	0.003	▼	0.004	●	0.289	●	0.087	▼	0.009	●	0.053	▲	0.029
Price Barrier to Healthy Eating	Agree	●	0.216	●	0.205	●	0.079	●	0.998	●	0.607	●	0.107	●	0.519	●	0.911	●	0.758
Knowledge Barrier to Healthy Eating	Agree	▼	0.032	●	0.056	▼	0.020	●	0.082	●	0.569	●	0.242	▼	0.015	▼	0.021	●	0.431

Fruit & Fruit Juices, Vegetables, Fruit & Vegetables, Breakfast Cereals, Sweet Foods, Fish, Dairy Food and Potato & Potato Product intakes are distributed non-normally, and differences are assessed by non-parametric methods (Mann-Whitney U tests). Meat and Meat Product intakes are normally distributed, and differences assessed by parametric independent t-tests.

▲ Higher ▼ Lower
● No significant difference

Table 6.4 Food Group Intakes according to General, Health and Dietary Attitudes

6.3.1.2.2. Attitudinal Predictors of Adverse Health Behaviours

The attitudinal traits which were most discriminatory for adverse health behaviours are depicted in Table 6.5. Ten year future salience is associated with both lower participation in vigorous activity ($p=0.036$), and with reduced sitting time ($p=0.010$), although the perceived presence of safe recreational areas does not associate significantly with either of these indices of physical activity ($p=0.313$ and $p=0.393$ respectively). Similarly, perceived adequacy of local leisure facilities and recreational amenities do not appear to be associated with differences in vigorous physical activity ($p=0.439$) or levels of sedentarism ($p=0.823$). Psychological stress associates only with increased prevalence of smoking ($p=0.003$) and reduced sedentarism ($p=0.047$) among the behaviours examined.

Unlike its strong association with less favourable food group intakes, chance locus of health control is predictive only of increased smoking prevalence ($p=0.010$) and lower participation rates in vigorous physical activity ($p<0.001$) among the health behaviours and indices under examination. External locus of control however, is associated with not just increased smoking prevalence ($p=0.002$) and lower participation in vigorous physical activity ($p=0.006$), but also with lower prevalence of dietary supplement use ($p=0.031$), as well as significantly higher BMI ($p=0.016$) and waist circumference ($p=0.006$).

Those who rate their health as “good” have a lower smoking prevalence ($p=0.017$) and greater participation rates in vigorous physical activity ($p=0.037$), as well as significantly lower BMI ($p=0.001$) and waist circumference ($p<0.001$) measurements. Those who cite the mass media (TV, radio, internet, magazines) as a source of healthy eating information also display generally more positive health behaviours including reduced smoking prevalence ($p<0.001$), increased participation in vigorous activity ($p=0.024$) and increased dietary supplement use ($p=0.021$). This group also have a significantly lower mean waist circumference ($p=0.026$). The group who agree that their weight is appropriate for their age, do indeed have both a lower mean BMI ($p<0.001$) and a lower waist circumference ($p<0.001$) than their peers, as well as higher participation in vigorous activity ($p=0.024$).

Active stage of dietary change score is associated with generally more health conducive behavioural patterns including reduced smoking prevalence ($p<0.001$), higher participation in vigorous physical activity ($p<0.001$) and greater prevalence of supplement use ($p<0.001$). Those in the action and maintenance stages show similar patterns, but in addition have a lower prevalence of high alcohol consumption ($p=0.028$) than their peers. Conversely, those in the pre-contemplation stage of dietary change show generally less health conducive behavioural patterns and health status including greater smoking prevalence ($p=0.023$) and significantly greater BMI ($p=0.004$) and waist circumference ($p=0.022$) measurements.

Regarding perceived barriers to health, neither poor knowledge nor lack of willpower are significantly predictive of any of the adverse health behaviours examined, while poor family support is associated only with increased smoking prevalence ($p=0.044$). The perception that no lifestyle changes are required is associated with significantly lower BMI ($p=0.014$) and waist circumference ($p=0.012$) measurements, while the reverse is true for those who cite cost as a health barrier ($p=0.024$ and $p=0.008$ respectively).

Attitudinal Variable	Status	Current Smoking		Vigorous Exercise Participation		Sedentarism		High Alcohol Intake		Supplementation Prevalence		Breastfeeding Prevalence		BMI		Waist Circumference	
			p		p		p		p		p		p		p		p
10 year Future Salience	Yes	●	0.579	▼	0.036	▼	0.010	●	1.000	●	0.110	●	0.356	●	0.692	●	0.565
Safe Fields for Recreation near home	Agree	▼	0.007	●	0.313	●	0.393	●	0.340	●	0.350	▲	0.027	●	0.371	●	0.063
Psychological Stress	High	▲	0.003	●	0.126	▼	0.047	●	0.917	●	0.506	●	1.000	●	0.353	●	0.273
Chance Health Locus	Yes	▲	0.010	▼	<0.001	●	0.963	●	0.755	●	0.369	●	0.676	●	0.619	●	0.161
External Health Locus	Yes	▲	0.002	▼	0.006	●	0.277	●	0.919	▼	0.031	●	1.000	▲	0.016	▲	0.006
Self Rated Health	Good	▼	0.017	▲	0.037	●	0.476	●	0.061	●	0.073	●	0.430	▼	0.001	▼	<0.001
Mass Media as Health Info Source	Yes	▼	<0.001	▲	0.024	▲	0.037	●	0.085	▲	0.021	●	0.102	●	0.101	▼	0.026
"My weight is ok for my age"	Agree	●	0.935	▲	0.024	●	0.661	●	0.434	●	0.143	●	1.000	▼	<0.001	▼	<0.001
"My exercise level is already good enough"	Agree	●	0.085	●	0.093	●	0.242	●	0.220	●	0.508	●	0.380	●	0.147	●	0.512
Dietary Stage of Change Score	Active	▼	<0.001	▲	<0.001	●	0.789	●	0.071	▲	<0.001	●	0.536	●	0.764	●	0.173
Pre-contemplation Stage of Change	Yes	▲	0.023	●	0.289	●	0.526	●	0.660	●	0.064	●	1.000	▲	0.004	▲	0.022
Action/Maintenance Stage of Change	Yes	▼	0.001	▲	<0.001	●	0.663	▼	0.028	▲	<0.001	●	0.435	●	0.239	●	0.055
Facilities/Environment is a Health Barrier	Agree	●	0.716	●	0.439	●	0.823	●	0.065	●	0.668	●	0.680	●	0.101	▲	0.026
Poor Support is a Health Barrier	Agree	▲	0.044	●	0.487	●	0.085	●	0.355	●	0.681	●	0.525	●	0.935	●	0.449
Cost is a Health Barrier	Agree	●	0.144	●	0.148	●	0.067	●	1.000	●	0.720	●	0.192	▲	0.024	▲	0.008
Knowledge is a Health Barrier	Agree	●	0.190	●	0.522	●	0.320	●	0.574	●	0.422	●	1.000	●	0.312	●	0.100
Willpower is a Health Barrier	Agree	●	0.860	●	1.000	●	0.204	●	0.970	●	0.809	●	0.730	●	0.068	●	0.088
No Changes Required Health Barrier	Agree	●	0.409	▲	0.040	●	0.618	●	0.692	●	0.781	●	0.885	▼	0.014	▼	0.012

Current Smoking Status, Vigorous Exercise Participation, Prevalence of High Alcohol Intake, Supplementation Prevalence and Breastfeeding Prevalence are dichotomous and differences in these variables are assessed by Crosstabulation reporting Yates' Continuity Correction. Sedentarism (daily sitting duration) is non-normally distributed, and differences assessed by non-parametric Mann-Whitney U tests. BMI and waist measurements are normally distributed and differences assessed by parametric independent t-tests.

Table 6.5 Health Behaviours according to General, Health and Dietary Attitudes

▲ Higher ▼ Lower
● No significant difference

6.3.1.3.1. Socio-economic Distribution of General Attitudes

The socio-economic distribution of the general attitudinal characteristics implicated in adverse dietary patterns and other health behaviours is described in Table 6.6. Both chance locus of health control and external locus of health control are significantly more prevalent among those of lower status for each of the socio-economic indices examined, with the exception of deprivation ($p=0.066$ and $p=0.085$ respectively) and single adult family structure ($p=0.248$ and $p=0.433$ respectively). This suggests an influence of both social and material deprivation in mediating these important predictors of poor diet and health behaviours

The absence of safe recreational areas, which predicted higher smoking and lower breastfeeding rates, is associated with low status for virtually all of the socio-economic indicators examined, with the exception of low socio-economic group (SEG) ($p=0.155$).

Psychological stress, which was predictive of increased smoking prevalence, is strongly associated with *material* indices of disadvantage including relative income poverty ($p=0.006$), deprivation ($p<0.001$), consistent poverty ($p<0.001$), benefit entitlement ($p=0.001$) and medical card entitlement ($p<0.001$). However, apart from an association with single adult family structure ($p=0.013$), stress does not appear to coincide with measures of *social* disadvantage such as low social class ($p=0.466$), low socio-economic group ($p=1.000$), or low education ($p=0.341$).

SE Indicator	Status	Chance Health Locus		External Health Locus		Safe Recreation Areas Nearby		Psychological Stress	
		% Yes	p value	%Yes	p value	% No	p value	% High	p value
Disadvantage	No (n=63)	4.1	0.001	1.4	0.002	12.2	0.001	28.4	0.016
	Yes (n=153)	21.1		15.6		33.9		45.2	
Social Class	High (n=113)	5.3	<0.001	5.9	0.002	21.3	0.006	38.7	0.466
	Low (n=103)	29.6		18.9		36.4		43.6	
Socio-economic Group (SEG)	High (n=144)	8.2	<0.001	7.8	0.003	25.6	0.155	41.2	1.000
	Low (n=72)	35.2		20.9		34.4		40.6	
Education	High (n=132)	8.9	<0.001	7.3	0.014	18.5	<0.001	38.7	0.341
	Low (n=82)	27.4		17.7		42.5		45.0	
Early School Leaving	No (n=145)	12.9	0.029	7.2	0.003	20.5	<0.001	36.8	0.066
	Yes (n=71)	23.8		20.2		42.9		48.6	
Relative Income Poverty	No (n=138)	7.4	<0.001	5.8	<0.001	21.7	0.002	34.4	0.006
	Yes (n=78)	31.5		21.7		39.1		51.3	
Deprivation	No (n=155)	13.8	0.066	9.4	0.085	21.8	<0.001	32.7	<0.001
	Yes (n=61)	23.3		17.4		42.4		59.8	
Consistent Poverty	No (n=180)	14.2	0.028	9.8	0.047	23.5	<0.001	35.7	<0.001
	Yes (n=36)	27.8		20.8		48.2		64.3	
Benefit Entitlement	No (n=115)	11.2	0.018	7.8	0.052	22.6	0.034	30.8	0.001
	Yes (n=100)	22.4		16.1		34.5		51.4	
Medical Card	No (n=112)	7.9	<0.001	5.0	0.001	16.3	<0.001	28.4	<0.001
	Yes (n=104)	25.0		18.6		39.6		52.6	
Single Adult Family Unit	No (n=146)	14.7	0.248	10.5	0.433	23.0	0.005	35.7	0.013
	Yes (n=70)	20.8		14.6		39.4		51.5	

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 6.6 Differences in General Attitudes according to Selected Socio-economic Indicators

6.3.1.3.2. Socio-economic Distribution of Health-related Attitudes

The socio-economic distribution of the *health-related* attitudes implicated in adverse dietary patterns and other health behaviours is described in Tables 6.7(a) and 6.7(b). Although any such association is weak overall, willpower appears to constitute a more significant barrier to health among more affluent respondents, where it is cited more frequently by those in the high socio-economic group (p=0.038) and those who are not living in relative income poverty (p=0.010). However, apart from an association with deprivation (p=0.014), no significant social gradient is observed for poor facilities or hazardous environment as perceived barriers to health.

Poor perceived family support, which was predictive of higher smoking prevalence, is significantly more common among those of low status for both social and material markers of disadvantage including low social class (p=0.034), low education (p=0.008), early school leaving (p=0.002), relative income poverty (p=0.023) and consistent poverty (p=0.048). “Cost” as a health barrier is, perhaps unsurprisingly, more strongly associated with material indices of disadvantage including relative income poverty (p<0.001), deprivation (p<0.001), consistent poverty (p<0.001), benefit entitlement (p=0.005) and medical card entitlement (p<0.001). However, it also coincides with markers of social deprivation including low education (p=0.006) and early school leaving (p=0.014). Those citing cost as a health barrier had significantly higher BMI (p=0.024) and waist (p=0.008) measurements.

Poor self-perceived knowledge does not appear to constitute a more prominent barrier to health among those in the less affluent groupings, except for women who are disadvantaged (p=0.007) and those of low socio-economic group (p=0.006). Poor knowledge did not emerge as a significant predictor of poorer health behaviours.

Poor self-rated health however, which is an important predictor of several adverse health behaviours including smoking, low participation in vigorous activity, low prevalence of supplement use and higher BMI and waist circumference, as well as lower vegetable, combined fruit and vegetable and breakfast cereal intakes, is cited more frequently by subjects in the lower social groupings. This poorer self-perceived health relates more closely to *material* indices of poverty such as relative income poverty ($p=0.001$), deprivation ($p<0.001$), consistent poverty ($p=0.004$), benefit entitlement ($p=0.003$) and medical card entitlement ($p=0.001$), as well as others like early school leaving ($p=0.045$).

The use of public health services (GP, public health nurse, local clinics) for health information is more common among the lower groupings, including those who are socially deprived (disadvantaged ($p<0.001$), low social class ($p<0.001$), low socio-economic group ($p=0.004$), single adult family structure ($p=0.013$)) and those who are experiencing material hardship (relative income poverty ($p=0.001$), medical card holders ($p<0.001$)).

In contrast, the use of mass media (TV, radio, magazines and the internet) as a source of health information is considerably less prevalent among disadvantaged respondents for all of the socio-economic variables examined apart from early school leaving ($p=0.084$). As demonstrated in Tables 6.4 and 6.5, the use of these mass media for health information coincides with more favourable dietary patterns (higher fruit, vegetables, fruit and vegetables combined, breakfast cereals and fish, and lower intakes of meat and meat products and potatoes and potato products) and more positive health behaviours (lower smoking prevalence, higher participation in vigorous activity, higher supplementation rates and lower waist circumference). There does not appear to be any significant social gradient in the use of family and friends as sources of health information.

SE Indicator	Status	Low Willpower a Health Barrier		Lack of Facilities or Poor Environment a Health Barrier		Poor Family Support a Health Barrier		Cost a Health Barrier		Poor Self-perceived Knowledge a Health Barrier	
		% Yes	**p value**	**% Yes**	**p value**	**% Yes**	**p value**	**% Yes**	**p value**	**% Yes**	**p value**
Disadvantage	No (n=63)	52.7	0.662	20.3	0.566	0.0	0.057	9.5	0.001	1.4	0.007
	Yes (n=153)	48.9		24.4		6.3		28.5		13.1	
Social Class	High (n=113)	54.2	0.144	25.2	0.536	1.9	0.034	21.3	0.369	7.7	0.208
	Low (n=103)	45.0		21.4		7.9		26.4		12.9	
Socio-economic Group (SEG)	High (n=144)	54.3	0.038	25.1	0.386	4.0	0.581	23.1	0.833	6.5	0.006
	Low (n=72)	40.6		19.8		6.3		25.0		17.7	
Education	High (n=132)	52.6	0.307	22.5	0.855	1.7	0.008	17.9	0.006	7.5	0.099
	Low (n=82)	45.8		24.2		9.2		32.5		14.2	
Early School Leaving	No (n=145)	50.0	1.000	22.6	0.787	1.6	0.002	18.9	0.014	8.4	0.256
	Yes (n=71)	49.5		24.8		10.5		32.4		13.3	
Relative Income Poverty	No (n=138)	56.1	0.010	21.7	0.463	2.2	0.023	12.8	<0.001	7.2	0.058
	Yes (n=78)	40.0		26.1		8.7		40.9		14.8	
Deprivation	No (n=155)	48.5	0.529	18.8	0.014	3.0	0.065	12.4	<0.001	8.4	0.196
	Yes (n=61)	53.3		32.6		8.7		48.9		14.1	
Consistent Poverty	No (n=180)	51.7	0.299	21.4	0.211	3.4	0.048	15.5	<0.001	9.7	0.700
	Yes (n=36)	42.9		30.4		10.7		58.9		12.5	
Benefit Entitlement	No (n=115)	52.1	0.484	22.6	0.941	5.5	0.764	16.4	0.005	10.3	1.000
	Yes (n=100)	47.3		23.6		4.1		31.1		10.1	
Medical Card	No (n=112)	56.0	0.055	19.9	0.217	2.1	0.080	12.8	<0.001	7.8	0.274
	Yes (n=104)	44.2		26.6		7.1		33.8		12.3	
Single Adult Family Unit	No (n=146)	51.0	0.651	22.4	0.695	5.6	0.487	20.9	0.147	9.7	0.860
	Yes (n=70)	47.5		25.3		3.0		29.3		11.1	

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 6.7(a) Differences in Health Attitudes according to Selected Socio-economic Indicators

SE Indicator	Status	Poor Self-rated Health		Public Health Services as Information Source		Mass Media as Information Source		Friends & Family as Information Source	
		% Poor	p value	% Yes	p value	% Yes	p value	% Yes	p value
Disadvantage	No (n=63)	5.4	<0.001	58.1	<0.001	81.1	<0.001	41.9	0.923
	Yes (n=153)	31.7		84.6		44.8		43.4	
Social Class	High (n=113)	22.6	0.363	69.0	<0.001	67.1	<0.001	43.2	1.000
	Low (n=103)	27.9		87.9		39.3		42.9	
Socio-economic Group (SEG)	High (n=144)	23.1	0.327	72.9	0.004	61.3	<0.001	42.2	0.769
	Low (n=72)	29.2		88.5		38.5		44.8	
Education	High (n=132)	23.7	0.549	74.0	0.080	61.8	0.003	44.5	0.614
	Low (n=82)	27.5		83.3		43.3		40.8	
Early School Leaving	No (n=145)	21.1	0.045	77.4	0.852	57.9	0.084	43.7	0.863
	Yes (n=71)	32.4		79.0		46.7		41.9	
Relative Income Poverty	No (n=138)	18.3	0.001	71.1	0.001	63.9	<0.001	41.7	0.631
	Yes (n=78)	35.7		88.7		38.3		45.2	
Deprivation	No (n=155)	18.8	<0.001	75.2	0.142	60.4	0.002	39.6	0.086
	Yes (n=61)	39.1		83.7		40.2		51.1	
Consistent Poverty	No (n=180)	21.4	0.004	76.1	0.165	57.1	0.043	41.6	0.321
	Yes (n=36)	41.1		85.7		41.1		50.0	
Benefit Entitlement	No (n=115)	17.1	0.003	73.3	0.080	62.3	0.005	47.9	0.130
	Yes (n=100)	33.1		82.4		45.3		38.5	
Medical Card	No (n=112)	15.6	0.001	68.1	<0.001	64.5	0.001	41.1	0.604
	Yes (n=104)	33.8		87.0		44.2		44.8	
Single Adult Family Unit	No (n=146)	22.4	0.184	73.5	0.013	62.8	<0.001	45.4	0.305
	Yes (n=70)	30.3		86.9		36.4		38.4	

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 6.7(b) Differences in Health Attitudes according to Selected Socio-economic Indicators

6.3.1.3.3. Socio-economic Distribution of Dietary Attitudes

With regard to *dietary* attitudes, significant social gradients are also observed. The socio-economic distribution of dietary attitudes which coincide with poorer dietary patterns and health behaviours is described in Tables 6.8(a) and 6.8(b). For virtually all of the socio-economic indicators, with the exception of deprivation (p=0.118) and consistent poverty (p=0.099), a significantly lower proportion of those in the less affluent grouping make a conscious effort to eat healthily. As seen in Table 6.4, effort to eat healthily is associated with several favourable dietary patterns including higher fruit, vegetable, breakfast cereal, dairy and fish intakes, as well as lower consumption of meat and meat products and potatoes and potato products.

Although it is less pronounced, there is also a socio-economic gradient in the proportion of subjects reporting a conscious effort to limit fat, particularly as defined by markers of social deprivation. Those who are disadvantaged (p=0.001), of low social class (p=0.025) and low socio-economic group (p=0.003) select this option much less frequently than their more advantaged peers, as do medical card holders (p=0.013). The failure to cite this option is predictive of similarly adverse food intake patterns to those seen in the group making no conscious effort to eat healthily.

With regard to dietary stage of change, the pre-contemplation stage appears to be more closely associated with markers of *social* deprivation including disadvantaged locality (p=0.007) and low social class (p=0.017). Apart from medical card entitlement (p=0.023), the measures which are specifically indicative of material disadvantage (relative income poverty (p=0.137), deprivation (p=0.939), consistent poverty (p=1.000), benefit entitlement (p=0.345) are not predictive of dietary pre-contemplation.

Lower prevalence of action and maintenance stages of change is significantly associated with both social and material indices of disadvantage however, including disadvantaged locality ($p<0.001$), low social class ($p<0.001$), low socio-economic group ($p<0.001$), early school leaving ($p=0.027$), relative income poverty ($p=0.002$), deprivation ($p=0.046$) and medical card entitlement ($p<0.001$). As shown in Table 6.4 and 6.5 respectively, the action and maintenance stages of dietary change are potent predictors of healthier dietary habits (higher intakes of fruit, vegetables, fruit and vegetables combined, breakfast cereals, dairy foods and fish, and lower intakes of sweet foods, meat and meat products and potatoes and potato products), as well as more favourable health behaviours (lower prevalence of smoking, lower prevalence of high alcohol consumption, greater participation in vigorous activity and greater supplement use) in this population.

Although belief that the diet is already sufficiently healthy is associated with higher breakfast cereal intakes, no strong socio-economic gradient for this attitudinal trait is apparent.

A lower proportion of subjects in the lower social tiers report their weight to be appropriate for their age, although this difference only reaches statistical significance among those who are disadvantaged ($p<0.001$), those of low social class ($p=0.033$), those who left school early ($p=0.009$) and those experiencing deprivation ($p=0.003$). Belief that weight is appropriate for age was associated with a higher intake of vegetables and breakfast cereals, and with a lower intake of meat and meat products (Table 6.4). It is also predictive of higher rates of participation in vigorous activity, and with lower BMI and waist circumference measurements (Table 6.5).

Examining the potential impediments to healthy eating, there is no significant difference in the selection of taste as a barrier according to any of the socio-economic indicators investigated. This barrier had been associated with lower fruit, vegetable, breakfast cereal and fish consumption in earlier analyses (Table 6.4).

As might be anticipated, price is selected as a barrier more frequently among those in deprivation (p=0.001) and consistent poverty (p=0.017), although it is not an important predictor of differences in food group intake.

Poor self-perceived dietary knowledge however, has been shown to coincide with lower fruit and fruit juice intakes, lower fruit and vegetable (combined) intakes, lower fish intakes and lower dairy food consumption, as well as a tendency towards lower breakfast cereal intake (p=0.082) (Table 6.4). A significantly greater proportion of respondents from the lower social strata, particularly those categorised as disadvantaged by social indices such as low social class (p=0.002), low socio-economic group (p<0.001), low education (p=0.003), early school leaving (p<0.001) and disadvantaged area of residence (p<0.001), cite poor dietary knowledge as a barrier to healthy eating. There is evidence that poor self-perceived dietary knowledge also coincides with some markers of material disadvantage (relative income poverty (p=0.009), medical card entitlement (p=0.017)) however.

Despite its prominence for both groups (~50-60% select this option), there is little socio-economic difference in the identification of (low) willpower as a barrier to healthy eating, nor is this trait a strong predictor of differentials in food group intakes (data not shown).

SE Indicator	Status	Consciously Try to Eat Healthily		Consciously Try to Limit Fat in My Diet		Pre-contemplation Stage of Change		Action/Maintenance Stage of Change		"My Diet is Already Good Enough"	
		% Yes	p value	% Yes	p value	% Yes	p value	% Yes	p value	% Yes	p value
Disadvantage	No (n=63)	90.5	<0.001	84.9	<0.001	1.4	0.007	64.9	<0.001	45.8	0.056
	Yes (n=153)	47.9		59.8		13.2		28.2		32.4	
Social Class	High (n=113)	73.9	<0.001	72.8	0.025	5.8	0.017	51.3	<0.001	41.3	0.053
	Low (n=103)	41.9		59.2		15.0		22.1		29.6	
Socio-economic Group (SEG)	High (n=144)	66.8	<0.001	72.5	0.003	7.6	0.053	46.5	<0.001	38.9	0.152
	Low (n=72)	41.9		53.0		15.6		18.8		29.3	
Education	High (n=132)	70.9	<0.001	69.1	0.385	8.7	0.395	42.4	0.059	39.4	0.207
	Low (n=82)	41.4		63.3		12.5		30.8		31.4	
Early School Leaving	No (n=145)	67.0	<0.001	69.7	0.172	10.1	1.000	42.3	0.027	40.7	0.031
	Yes (n=71)	43.6		60.6		10.5		28.6		27.2	
Relative Income Poverty	No (n=138)	66.9	0.001	68.8	0.367	7.8	0.137	44.7	0.002	34.3	0.588
	Yes (n=78)	45.9		62.6		13.9		26.1		38.2	
Deprivation	No (n=155)	62.3	0.118	70.4	0.078	9.9	0.939	41.6	0.046	39.3	0.102
	Yes (n=61)	51.7		58.5		11.0		28.6		28.4	
Consistent Poverty	No (n=180)	61.5	0.099	68.3	0.325	10.1	1.000	38.8	0.439	36.6	0.707
	Yes (n=36)	48.1		59.6		10.7		32.1		32.7	
Benefit Entitlement	No (n=115)	69.2	<0.001	70.6	0.184	8.2	0.345	43.2	0.064	36.4	0.957
	Yes (n=100)	48.3		62.2		12.2		32.0		35.4	
Medical Card	No (n=112)	76.3	<0.001	74.1	0.013	5.7	0.023	48.9	<0.001	40.1	0.176
	Yes (n=104)	42.7		59.1		14.4		26.8		31.8	
Single Adult Family Unit	No (n=146)	64.4	0.010	67.6	0.704	9.2	0.540	39.3	0.418	38.4	0.238
	Yes (n=70)	48.0		64.4		12.2		33.7		30.5	

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 6.8(a) Differences in Dietary Attitudes according to Selected Socio-economic Indicators

SE Indicator	Status	"My Weight is OK for my Age"		Taste is a Barrier to Healthy Eating		Price is a Barrier to Healthy Eating		Self-perceived Knowledge a Barrier to Healthy Eating		Willpower is a Barrier to Healthy Eating	
		% Yes	**p value**	**% Yes**	**p value**	**% Yes**	**p value**	**% Yes**	**p value**	**% Yes**	**p value**
Disadvantage	No (n=63)	75.3	<0.001	23.0	0.179	20.3	0.607	0.0	<0.001	51.4	0.519
	Yes (n=153)	43.3		32.1		24.1		18.6		56.6	
Social Class	High (n=113)	58.1	0.033	30.3	0.947	21.3	0.515	7.7	0.002	56.8	0.663
	Low (n=103)	44.4		29.3		25.2		20.7		53.6	
Socio-economic Group (SEG)	High (n=144)	54.3	0.289	28.1	0.437	25.1	0.304	7.5	<0.001	56.8	0.525
	Low (n=72)	46.5		33.3		18.9		27.1		52.1	
Education	High (n=132)	56.4	0.097	28.3	0.524	20.8	0.365	8.7	0.003	58.4	0.194
	Low (n=82)	45.5		32.5		26.1		21.7		50.0	
Early School Leaving	No (n=145)	58.0	0.009	28.4	0.563	20.5	0.198	8.4	<0.001	54.2	0.717
	Yes (n=71)	40.8		32.4		27.9		23.8		57.1	
Relative Income Poverty	No (n=138)	53.2	0.644	28.3	0.567	21.7	0.545	9.4	0.009	62.2	0.004
	Yes (n=78)	49.5		32.2		25.4		20.9		44.3	
Deprivation	No (n=155)	58.0	0.003	31.7	0.404	17.3	0.001	12.9	0.544	55.4	0.961
	Yes (n=61)	37.6		26.1		36.3		16.3		54.3	
Consistent Poverty	No (n=180)	52.9	0.467	29.4	0.811	20.2	0.017	12.6	0.249	56.3	0.482
	Yes (n=36)	46.0		32.1		36.4		19.6		50.0	
Benefit Entitlement	No (n=115)	56.1	0.208	27.4	0.415	23.3	0.975	11.6	0.335	56.2	0.805
	Yes (n=100)	47.8		32.4		22.4		16.2		54.1	
Medical Card	No (n=112)	58.1	0.053	26.2	0.245	21.3	0.559	8.5	0.017	56.7	0.709
	Yes (n=104)	45.7		33.1		24.8		18.8		53.9	
Single Adult Family Unit	No (n=146)	55.2	0.146	31.1	0.584	21.4	0.406	11.2	0.091	55.6	0.960
	Yes (n=70)	45.1		27.3		26.5		19.2		54.5	

Disadvantage based on site of recruitment. Low social class defined as social class 4, 5 and 6. Low socio-economic group defined as SE group E, F and G. Low education defined as primary or intermediate education only. Early school leaving defined as 16 years of age or under. Relative income poverty defined as an equivalised income of less than €208.71 per person in that household. Deprivation defined as enforced absence of one or more basic indicators as specified by the ESRI. Consistent poverty defined as the coincident presence of relative income poverty and deprivation. Benefit entitlement refers to receipt of any state benefit payments. Medical card refers to entitlement to a medical card under the General Medical Scheme (GMS). Single adult family unit refers to lone mothers living either independently or with their parents/guardians in the family home.

Table 6.8(b) Differences in Dietary Attitudes according to Selected Socio-economic Indicators

6.3.2. The Qualitative Survey

The qualitative discussion groups raised a number of important themes which may be categorised under the following broad headings:

6.3.2.1. Over-arching Themes

6.3.2.1.1. Future Orientation and Fatalism

Contrary to the findings of the quantitative survey, the women participating in the qualitative demonstrated a low level of future salience.

"I'd go for the moment. You only live once. (Laughter). You'd be worryin for the rest of your life".

(Focus Group One)

Much of this lower future orientation appeared to relate to negative experiences of forward planning in the past.

"When you're trying to plan something out and ye say right, and this is what I'm definitely going to do, and then something gets in your way you're pushed back to where you started off like. The last time I planned such and such it didn't work out, so I'm not fucking going to bother again like, you know?"

(Focus Group Two)

"Sometimes ye kind of try and work out stuff for the future but a lot of the time it doesn't work out like that, (Laughs) and ye end up living day to day".

(Focus Group Three)

Where future planning was discussed, this often related to relatively short-term objectives such as saving up for holidays. Longer term financial objectives were conspicuously absent from such discourse however.

"But like as far as holidays are concerned, saving and all I do that. I plan to do that so that I know it'll work out in the end, but a lot of the time as well I'd live in the moment for what's happening now".

(Focus Group Four)

"Like tonight I might make plans for tomorrow to go somewhere, or for the weekend or book a holiday for next month or ye know what I mean like, yeah"

And what about longer term, eh, would you plan say next year?

"No, it depends, I'd probably, little things like holidays and that but I wouldn't run away with meself like".

(Focus Group Five)

6.3.2.1.2. The Influence of Children

In all of the focus groups, the central role of children in influencing the overall outlook of their mothers was clearly evident. Indeed, this frequently appeared to act as the catalyst for greater future orientation.

And what about the kids, what sort of things do you plan?

"Well I hope they go to college and that. Like something I didn't do. I left school early which I shouldn't have. Not to make the mistakes I made. I just hope to bring them up the right way…… just to give them a better life than we had".

(Focus Group Four)

Despite this greater focus on the future however, satisfying the demands of children was cited as a common source of psychological stress for these women subsisting on an already tight budget.

"It's just more them, cause it's, every new thing that comes out it's 'I want them, can I have them, can you get me them?' (Laughter) Today it'd be Healies or whatever ya call them, tomorrow it'd be the new, the newest bike that they have on the market. You're sitting there goin' oh Jaysus can you not just wait till Christmas and we'll see if you're getting it. If you're good Santy might bring it for ya".

(Focus Group One)

"Yeah, or they want to go off with their friends, ye know they're going 'I wanna go the pictures and then I wanna go….' ……and you're working it out in your head. You've permanently got pound signs in your head, trying to add up and you're like oh no not today (Laughs)".

(Focus Group Three)

6.3.2.1.3. Psychological Stress

The issue of psychological stress arose recurrently throughout the focus group discussions. While satisfying the material demands of children was a key precipitant of this psychological stress, many other contributory factors were also cited, including particularly, a perceived lack of control over their own individual circumstances. As seen previously, this has a significant negative impact on the propensity of these young women to plan for the future.

“Well not when it comes to your own, your house and your…., the, there’s an awful lot in your life that’s outta control”.

(Focus Group Two)

Oh, well just in general do you think that you’ve…… that you’re the one that decides your destiny or…?

“Not really…… Social Welfare have an awful hold over the whole lot of us”.

(Focus Group Two)

“‘Cause if I had control then I would have been able to have everything planned out”.

(Focus Group Five)

Often, this perceived lack of control manifested itself among these women as a feeling of hopelessness or powerlessness to affect their own destiny.

"Yeah, when you've no job……and like, ye haven't got the money there and you're only getting your lone parents and…Ye feel like you're going nowhere…"
"Yeah you're like that. Stuck in a rut.…like what's the point? What's the point in carrying on 'cause you're gonna stay in the same spot. Like it's gonna be like that. And ye know it's the same, nobody wants ye".

(Focus Group Four)

Furthermore, this feeling of powerlessness and lack of control appeared to be exacerbated by several structural, ecological and social factors which prevail among women of low socio-economic status. For example, the provision of local authority accommodation was identified by two of the groups as a major source of psychological hardship.

"I've thirty three points and I was told there last month in the corporation you need over ninety points for priority, so my son'll be old enough to buy his own house by the time you's give me somewhere".

(Focus Group Two)

"….. and try and make something of ourselves, but then you're thinking like, if the corporation aren't going to help ye out, like, how are ye meant to better yourself if somebody is literally standing in your way".

(Focus Group Two)

"They give ye some of your rent if you're on social welfare say, but as soon as you start to work, the money's taken off ye. It's not worth getting a job with them, it's catch twenty two, d'ye know what I mean?"

(Focus Group Two)

"No, the problem is you've to go have a child and go back to them, that's what they said to me".

"That happened to my cousin as well. If ye have children then ye get a place like that".

(Focus Group Four)

"Like for instance I live in a one bedroom with three children… that can be very stressful… like sometimes I feel like throwing me hat in but I don't, just have to get on with it".

(Focus Group Four)

6.3.2.1.4. Social Disorder

Several of the participants also described the profound impact of local crime and social disorder on their lives and their psychological wellbeing.

"Like these could be there or anything, just say in the night at ten o'clock, and they mightn't go home until seven in the morning like. And they could be singing and, and like I'm up on the second, like the second set of stairs and that, and the higher ye go up, the more ye can hear and like I'm only in a one-bedroom so ye can see and hear everything…. so ye mightn't get asleep for the weekend like".

(Focus Group Four)

"…and like they sell drugs at my corner. They do, they sell drugs and the police know about it like, now they do go round on the bike and all, but they just don't move them. An odd time, it depends on what humour they're in, they might say, 'where do yous live?' or 'get away' like. D'ye know what I mean? but like, selling them in front of your eyes like".

(Focus Group Four)

"…. (from) the CCTV ye can only see the road, ye can only see the road like so. Me sister did call the police but they never came. They never came, but like I can't even have a babysitter up now to go out now, I'd be afraid of me life".

(Focus Group Four)

6.3.2.1.5. Financial and Material Hardship

The social and structural stressors described above are invariably superimposed on a backdrop of financial and material hardship, which together conspire to heighten the chronic anxiety experienced by these women.

"I went into Tescos two weeks ago with my young one and ….. (the money) was gone like that, and that was on five DVD's and that's all it was…. and I could've stood there and said to her 'no, you're not having them', but I just says 'ah well, could be worse things she's asking for'…. she could be out doing worse things; at least when she's in watching DVD's I know where she is, so I'd gladly give the hundred quid".

(Focus Group One)

"I only get two hundred euro, two hundred euro, two hundred and twenty euro in a book like. A hundred and forty five to the crèche, then food. It doesn't work out at all. Ye can't win either way".

(Focus Group Two)

6.3.2.2. Health-related Themes

The themes described above graphically illustrate the lived experience of poverty and social disadvantage endured by these young women on a day to day basis. The deleterious impact of these hardships on the attitudes which govern health behaviours including diet will now be described, again with reference to supportive vignettes from the transcribed discourse.

6.3.2.2.1. Health Locus of Control

There is substantial evidence from these focus groups which indicates that the powerlessness and hopelessness which characterises these young women's general outlook, also pervades their perceptions of health and their perceived ability to influence their own health.

While some of the women viewed their own behaviour as a pivotal force in determining their health outcomes, others were much more sceptical in this regard.

"Cancer and heart disease (run) in my family, so it doesn't matter (Laughs) whether I smoke or not".

(Focus Group One)

"I don't have control over my health at all. No, no….."

(Focus Group Two)

"Well when it comes to cancer, I don't think it's really under your own control. I think you either get it or you don't get it. You get it or you don't".

(Focus Group One)

Even though there is a tacit acceptance of the role which diet and other health behaviours play in "health", this often didn't extend to more abstract concepts like the protective effect of these behaviours on *long-term* health.

"Yeah well that's different. I thought ye meant like, if you're eating the wrong things or not exercising… that's down to yourself. But the likes of long-term illness like that, well that's, like, ye can't…."

(Focus Group Five)

This may relate to the generally more functional definitions of health proffered by these women.

"Just, I suppose if you're more healthy you won't be sick and you'll have more time for your children, 'cause if you're sick all the time you won't be able to do those things….won't be able to bring them to school and stuff like that".

(Focus Group One)

"If ye haven't got your health you've nothing".

Ok, why do you say that?

"Ye have to be healthy to do things".

(Focus Group Five)

6.3.2.2.2 Perceived Barriers to Health

The participants in these focus groups cited many perceived barriers to health, including social, structural, material, behavioural and personal factors. While there is some appreciation of the role which health subversive behaviours like smoking, excessive alcohol consumption, lack of exercise and poor diet can play, the factors which underpin these behaviours featured more prominently in the discussions.

"Yeah, being depressed and under stress….. It's a hell of a lot to play with your health, them two, they're big things for me, depression, depressed and stress are very…. what cause an awful lot of my health (problems) …."

(Focus Group Two)

"Money has a lot got to do with how ye eat and how ye look after yourself".

(Focus Group Two)

"If you're stressed or worried, yeah I'd smoke more, yeah".

(Focus Group Five)

"Sometimes ye haven't got time to think about your health. You've to think about the kids all the time".

(Focus Group Four)

"The more and more stressed ye get, ye can become depressed. And it's worse when ye haven't got a job, ten times worse…….. it gives ye a feeling you're looking into a black hole…. every day up at the crack of dawn, nothing to do".

(Focus Group Four)

Low self-efficacy in particular, was viewed as a significant impediment to the adoption of a healthier lifestyle. This was often precipitated by the surrounding socio-cultural environment, which left respondents feeling tired and defeated.

"Yeah, but it's actually getting depressing sometimes, it's the very…. you're saying to yourself 'I should do something about it', but you don't do something about it…. like you know you have to, but you just don't bother".

(Focus Group Two)

"I find right, ye know when I say that I'm going to do things for my health, it's all good saying it, it's actually doing it at the end, d'ye know what I mean? Like I'd say 'I'll exercise more and I'll do stuff', and I bought exercise equipment to exercise and I'll eat healthy, but when you're tired and ye just want to have….. it's easier to just pick up the phone and order something out of the chipper and just sit down because you're tired and you're just after getting everyone up to bed and whatever else and you're able to just relax and ye don't, ye don't want to do the exercise then……. and it's not even laziness or anything, it's just the end of the night where ye just want to sit down and have an hour to yourself and watch the television and relax".

(Focus Group Four)

"…so I'd like just to snap out of it (eating fast food)".

Is it the taste of it that you like?

"Yeah it's just…it's just I'm so used to it now, it's just… habit now, and I just can't get rid of it…"

(Focus Group Five)

One respondent in focus group four provided a particularly illuminating insight into the nature and origins of the low self-efficacy reported by many of the participants, and the value of community training and improved social cohesion in addressing this precipitant of adverse health behaviours.

"I think it's about confidence in yourself….. not about only what ye eat, but the way ye look, the way ye live your life… confidence to do things for yourself like. Make your life better like. Before I started here I'd no confidence".

"Yeah I'd no confidence before I started here as well.

"That happens sitting in doing nothing but, doesn't it?"

"Yeah it does 'cause you're not out mixing with people or anything".

"You've no confidence. Once I started here I got me confidence back. Before I got here, if I got a top in a shop and I went home and that top didn't fit me, I wouldn't have the courage to go to that desk and say 'I want to change that'. I'd keep the top and try and bleeding sell it…and now since I started here, if I buy something I bring it home and it doesn't fit me, I go into that shop and I say 'I don't want it'. D'ye know what I mean?"

(Focus Group Four)

"…… but ye just have a bit more confidence. Ye feel more as though you're out earning a living…. and that makes ye feel better that you're not just getting something for nothing.

…… like I'm not saying you're getting something for nothing on the lone parents like, but ye don't work for it and there's no effort gone into it. At least, and then ye get up and ye try and make yourself look decent going into work….You're somebody like, you're not just sitting in your house".

(Focus Group Four)

In a similar way, the confidence and greater sense of self-esteem and self-efficacy generated by participation in one form of positive health behaviour, was often reported to exert a synergistic effect on other health behaviours. This highlights confidence as a key psychological resource in limiting the inertia which lies at the root of many adverse health behaviours including poor diet.

"I'd love to have an hour, I'd love to have an hour and that'd be grand, ye get great feeling out of it ye know? Ye be real energetic after doing it, ye feel great and it makes ye want to drink more water, makes ye want to eat properly, d'ye know what I mean cos what's the benefit…. like if you're going to the gym and coming home and having a curry or a few cans or something, what's the point in going the gym? It makes ye feel better, it does make ye feel better when ye do the gym".

(Focus Group One)

6.3.2.3. Diet-related Themes

6.3.2.3.1. Barriers to Healthy Eating

Many obstacles to healthy eating were identified by participants. For convenience, these have been divided here into psycho-social factors, structural and environmental factors and personal factors. In reality however, it is likely that these elements interact at a functional level to create a complex "web" of interrelated factors which subverts healthy eating behaviour.

6.3.2.3.1.1. Psycho-social Barriers

Overall, these were the most commonly cited impediments to healthy eating among these disadvantaged women, apparently playing a significantly greater role in their poor dietary habits than the material deficits discussed.

6.3.2.3.1.1.1. Poor Knowledge

The respondents participating in the focus groups provided some eloquent insights into the knowledge-related factors which can militate against healthy dietary patterns among women of low socio-economic status.

Most of the respondents reported that they had a good awareness and knowledge of the fundamental principles of the healthy diet, and for the most part this did appear to be the case. Participants readily identified foods which they considered to be healthy (fruit, vegetables, breakfast cereals), and those which they considered to be unhealthy (take-aways, chocolate, crisps, fizzy drinks etc.).

"Everyone knows what's healthy and what's not, you know what I mean, the knowledge is there, it's just whether you use it or not".

(Focus Group One)

"Food pyramid, ye know what's good for ye and ye know what's bad for ye".

(Focus Group One)

“McDonald’s, burger king, KFC (Laughs), all the deep fried chicken….. sweets, crisps, cake, lemonade, I can name them all off (Laughs)”.

(Focus Group One)

However, in many cases it appears that deficits in knowledge do exist, which could exert a deleterious influence on dietary choice.

“That’s what I want to find out like, what I should be eating proper like I say to meself, ‘I’d love to do up a menu kind of thing’, ye know, ‘of what I should be eating’. I just never got around to doing it”.

“That’s all I want too. See I think ye need, I’d love to have it wrote down for me what…”

“That’s what I said, a menu”.

“Yeah, like a menu”.

(Focus Group Two)

“I mean, what ye have to get sometimes I hate getting, it’s frozen stuff, I hate getting frozen stuff and sometimes you’re just watching what you’re buying and ye have to, you’ve no choice but get frozen… but sometimes buying frozen mixed veg would be cheaper than buying all fresh…”

(Focus Group Three)

“No cause they’re, I mean they’ll say that they’re….. diet coke actually has more sugars and sweeteners in it than the regular coke”.

(Focus Group Three)

"The vitamins that are in that are gonna be less because it's low fat. That's what I'm saying, for your money in the shop 'cause all low fat foods are dearer".

(Focus Group Three)

"Sometimes veg can also be bad for ye. Too much of it, d'ye know what I mean? Ye get constipated from it".

(Focus Group Three)

"There's so many confusing things that would… like if ye read one thing it'll tell ye this, if ye read another thing it'll tell ye this, if ye listen to this person they'll tell ye this….. like ye can't win sometimes with them and ye feel like just pulling out your hair. Somebody tell me which, which is the right way to do it and which is good ye know, instead of just going right yeah, that's grand and then two weeks later going no, no ye shouldn't do that".

(Focus Group Three)

"But there's certain foods that ye know like, ye can be taught, like ye can find out if ye look into it, that certain foods help ye with certain things, and there's a lot of things now that em, that pure, pure chocolate n all is good for cancer and all this, ye always hear things like, on telly and all, and a lot of people listen to that and change their diets accordin to it".

(Focus Group Three)

"Drink eight pints of water a day…"

"It's glasses".

"Two litres of water you're supposed to drink a day".

"One litre".

"Two isn't it?"

(Focus Group Four)

Several of the focus groups identified a pivotal role for social and inter-generational learning in improving healthy eating knowledge and related skills and behaviours. As described below, this is often found to be lacking in low socio-economic environments.

"What's good and what's not. They learn from you and they practically mimic you, ye know, when you're doing the dinner they're beside ye and they're watching this, and they're watching that, and ye get them to cut the carrots up and ye get them involved. That's how ye get them learned about being healthy and …."

(Focus Group Three)

"See, my sister doesn't eat fruit or veg or anything like that, and she doesn't give them to her kids, and my ma says 'why don't you not give that?'….. 'ah they wont eat that'…. well they won't eat it because they don't see you eating it".

(Focus Group Two)

"I go to the shop at night time when there's a film on or something, and I'll say I'll pick up a big bag of sweets, loads of crisps and I'll just sit there and I'll eat; and they're watching me do it so they're going to automatically do it, so I think more what they'd, what I want them to eat".

(Focus Group Two)

"See that's where I'm coming from. My ma doesn't eat anything like that, my ma eats grease as well all the time and now all, we've…. like there's ten of us in the house and not one of us, only the big fella, the big young fella eats healthy. We all just eat chips and curries and sausages and that like. All grease, so I've just after been looking at me ma like".

(Focus Group Four)

“Yeah she’s a bit picky but she loves healthy food because I think that was the creche that she went to, they used to have organic stuff every day with all their meals, but ‘em last summer I had me friend and her young fella up to my house and I was having a barbeque out the back garden and my little one wouldn’t eat any of the barbeque stuff. I had to go in and make her pasta”.

(Focus Group Four)

“(They get) fruit when they go to school now..….. Yeah the school gives them fruit”.
“Yeah, my young one gets fruit every morning. And then they have like, they have breakfasts before school starts”.

(Focus Group Four)

In addition to deficits in healthy eating knowledge, the priority afforded to the nutritional quality of food in dietary selection often appears to remain subservient to other considerations such as taste preferences.

“Yeah but if it was something healthy that was on the table and I liked it I’d say, ‘now I like that, I’ll eat that’, but if somebody put a cream cake and a packet of king (crisps) in front of me I’d go, ‘go on take that, I don’t want that now, I’ll have them’”.

(Focus Group One)

6.3.2.3.1.1.2. Time

Time constraints were frequently identified as a barrier to healthy eating, and these often arose as a result of child-minding responsibilities.

"It probably is more down to time as well, do you know what I mean, cause if you haven't got time to be, d'you know what I mean, cutting the vegetables and you know, preparing them and…… steaming them and all that. Do you know what I mean, ye just say 'right here, fuck it put on some chips', or do ye know what I mean, 'stick on a burger or something', do you know what I mean. Something that's quick, that'll only take twenty minutes to cook. Bang everything into the deep fat fryer".

(Focus Group One)

"I have time to cook for me son but I haven't time to cook for meself, cause I wouldn't eat what he'd eat, d'you know what I mean, cause he'd eat all healthy".

(Focus Group One)

"When you're on the run with children…… just on the go all the time, ye just don't have time to have a healthy diet".

(Focus Group Two)

Often, these limitations on time led respondents to buy their meals already cooked from local take-aways and chip shops.

"The chipper only takes ten minutes to deliver".

(Focus Group One)

"Because ye can go to the drive thru in McDonalds and they hand ye out a meal, d'ye know what I mean, that the kids will love and they'll eat, instead of going home and peeling potatoes and boiling potatoes and boiling vegetables and roasting a bit of meat and washing all them pots, putting them away and cleaning the cooker".

(Focus Group Five)

6.3.2.3.1.1.3. Psycho-social Stress

Psycho-social stress appeared to constitute a considerable barrier to healthy eating among these women. Indeed, taken together, these factors were probably the most prominent of all obstacles to healthy eating discussed over the five focus groups, in that they actively stimulated the participants to eat energy-dense foods which are low in micronutrients.

"Yeah, comfort eating yeah, cause I lost me job a couple of years, well two years ago before I started this, and I was off work from January to July and I lashed on two stone. I lashed on two stone in the space of….. that length of time. It was just because I was sending him to school, me fella was bringing him to school and I was staying in bed late, just sitting there pigging out and me neighbour was bringing me young fella home. So it was just comfort eating really".

(Focus Group One)

"Depression…. and ye just eat. I found that now over the last six months. My boyfriend died six months ago, my partner, me child's father died six months ago, and I found that I just eat now, just sitting on me own in the house and I'd be….. I'll eat and eat and eat. No bother, I'd eat a six packet of crisps, packet of monster munch before the weekend, not a bother to me, and it'd be just out of loneliness I think".

(Focus Group Two)

Many of the psychological issues previously identified as barriers to health such as stress and depression are again cited as barriers to healthy eating, and these are often amplified by environmental and social factors which propagate adverse dietary behaviours. A good example of this is food shopping with young children, a task which frequently elicits a significant stress response in these women, at the very time when they are most exposed to advertising messages marketing poorly nutritious foods both inside and outside the supermarket.

“Fuckin’ hate shopping…. standing there for an hour before you’re seen to (Laughs). They stick the sweets right beside the till. The kids are going, ‘but ma, look, can I have that’ and ‘I want that, ma, ma’, that’s constant….. that’s all ye hear, ‘ma, ma, ma, ma’”.

(Focus Group One)

“If ye do buy them, ye know it’ll be a treat and all but it’s just to shut them up and just to get out of the shop quicker, ye buy these things just to get out of it cause you’re stressed out. Just wanna get out of the shop, and if they don’t get it they’ll throw a tantrum in the middle of Dunnes shopping. Ye be scarlet (Laughs)”.

(Focus Group One)

“Yeah but they know their way round the supermarkets as well, with their barney crisps and their bear in the big blue house and the kids run straight for them. You’re saying no. The kids are crying looking at them, looking at ye buying a trolley full of shopping saying why can’t I have that then? Ye feel like ye have to get them something, d’ye know what I mean?”

(Focus Group Four)

“Yeah, especially when you’re in Dunnes and like ye just come out, whether you’re hungry or not ye come out of Dunnes and ye say ‘just for a minute, just for a sit down…. come on in and I’ll buy ye a McDonald’s’ and ah sure I may as well. Big battered sausage and then I’ll probably get nuggets as well just to go with it. But eh, I think it is, whether you’re hungry or not, ye still go into McDonald’s and have a bite to eat”.

(Focus Group One)

“It’s more the shops like… what gets me when I’m passing McDonald’s is just the red and the yellow. I think it’s a psychological thing, when ye see the red and the yellow. Ye don’t want a McDonald’s and it‘s drawing ye, ye just go into it”.

(Focus Group One)

While the example above neatly illustrates the point, the use of food as a means of self-comfort or pleasure in response to chronic stress was frequently reported in other contexts. For example, many of the women described taking high fat, high sugar foods as a kind of reward, after the children had been put to bed and they had some quite time alone. In this way, it may be viewed as a coping mechanism which attenuates the chronic anxiety experienced by these women.

“Yeah, wait til he’s gone to bed. Have a nice curry (Laughs)”.
“Yeah, that’s the same with me, cause if she sees me eating it…. she’d want it. Yeah, so, ye wait until they’re, and then you’re eating late at night, which is, it’s not healthful either, lying in your stomach when you’re going to bed”.

(Focus Group One)

“I, cause I love like sitting down when I get the baby to bed and having something to eat, ye know, relax and just having something to eat and it’s not caught in your throat…that’s what I do”.
“I do as well, jumping into bed with a big bag of crisps and sweet buns and all”.

(Focus Group Two)

The notion of these foods as a coping mechanism is strengthened by the observation that their consumption often coincides with other adverse health behaviours from which sensory pleasure is derived.

“…….. and you’re sitting there like and the babby’s in bed at nine o’ clock, and it’s the weekend and you’re having a can and you’re saying, ‘lovely right, d’ye know what we’ll order, fish and chips’, or we’ll order a bleeding curry or something or a pizza”.

(Focus Group One)

“Makes me sick, I hate the thoughts that I do smoke. It’s a disgusting habit, but when I sit down at night and I‘ve everything done I like to relax and have a cigarette. It‘s just the way it is I know…”

(Focus Group Five)

6.3.2.3.1.2. Structural and Environmental Barriers

6.3.2.3.1.2.1. Availability

Another key factor which militates against healthy eating habits is the perceived lack of availability of healthy foods due to cost, preparation time, perishability etc.

"….. d'ye know what I mean? Like I go up and get me shopping and put it all away and the fridge would be full and you'd eat the best part of it kind of, but the other day I threw out like every second thing, things gone out of date…"

(Focus Group Five)

"Yeah, healthy food is dear. If you're on a tight budget you're not gonna go splashing out on all the healthy food".

(Focus Group Two)

"Like I'd buy a whole bowl of fruit and put it on the table and it'd go off like…and after buying the thing…… it just goes off and I have to throw it fuckin' out and that's fifteen euro gone in the bin.… and I spent fifteen euro on it, so it just puts me off buying…"
"Yeah, true that's, good girl, that's a good point".

(Focus Group Two)

"But the only hard bit about it is money-wise, it's affording the healthy stuff, d'ye know what I mean, cause it might be easier just to buy something that's not that healthy, it's cheaper".

(Focus Group Three)

The perceived cost barrier is often exacerbated by misconceptions regarding the nutritional quality of generic food products in comparison to their recognised brand-name equivalents.

“But I think the brand name, I think the better the brand the better the quality”.

(Focus Group One)

“When ye look like, I’d often compare them just to see. There’s more saturated fat than, there’d probably be less carbs or less calories but there’d be more saturated fat in the cheaper brand. I noticed that with a few things now maybe it’s just me but…”

(Focus Group Five)

The perceived lack of access to healthy foods is frequently coupled with an ease of access to cheap, energy-dense, nutrient dilute foods in these communities.

“All the take aways, fast food (Laughter)….. All the ones that are easy to get, ye don’t have to go to much effort”.

(Focus Group Three)

Right yeah, are the Burger Kings and McDonald’s near you?

“Yeah. On the Malahide Road. Two of them only a stones throw (Laughs). And they’ve both got a drive thru now which is even handier (Laughs). If you’re driving ye don’t have to stop and get the kids out and the whole lot”.

(Focus Group Three)

Indeed, some of the participants had sufficient insight to enable them to explicitly identify this ready access to less nutritious foods as a barrier to healthy eating.

Overall then, considering everything that we spoke about, what do you think would allow you to eat a healthier diet?

"If they took away all the chippers and the Chinese's".

(Focus Group Four)

6.3.2.3.1.2.2. Food Labels

Respondents also reported difficulty in interpreting food labels, a factor which further impeded their ability to make healthy dietary choices.

"If ye could understand them properly though, ye know all the… the first thing I go for is the word fat….. and the calories….. Yeah that's it".

(Focus Group Four)

"….. and kids with allergies, allergic to nuts or anything ye can't, ye can't make out, ye'd wanna have, have one of them foreign language things……to decipher what it says….. and even at that ye'd probably still get it wrong".

(Focus Group Three)

Some participants even described a social stigma or embarrassment attached to reading food labels.

"Imagine standing in the middle of Dunnes, the north-side, checking the health…. imagine someone ye knew…….. 'cos I'd be afraid of what people'd say to me.

(Focus Group Two)

6.3.2.3.1.3. Personal Barriers

6.3.2.3.1.3.1. Taste

Taste was a commonly mentioned barrier to healthy eating, with many participants describing healthy foods as unpalatable. There also appeared to be a distinct reticence among some of the participants to even try "healthier" foods to which they were unaccustomed, raising the issue of food neophobia.

"I wouldn't eat any of those. Don't like it unless it was laced in sugar and then I still wouldn't like it (Laughs)".

(Focus Group One)

"Wouldn't like the taste of potatoes or anything like, I would never taste it. Everything that's good for you is horrible".

(Focus Group Four)

"I never in me life tasted anything healthy. Never".

"She only lives on grease".

You don't like the healthy food at all?

"Never tasted it, don't even like the look of it".

(Focus Group Four)

Which ones in particular do you not like?

"Salads and apples and oranges and bananas. Hate them. I'd rather a bar of chocolate like".

(Focus Group Four)

6.3.2.3.1.3.2. Cooking Skills

Poor cooking skills did not seem to be a major barrier to healthy eating for these young women, although it was forwarded as a common obstacle among their peers.

“Education is, can improve health, especially like ye know, just the healthy food course and all. A lot of people don’t know how to cook”.

(Focus Group Three)

The “Healthy Food Made Easy” course run locally was viewed as a particularly useful intervention to improve practical cooking skills in these communities.

Of the other attitudinal characteristics which might impinge on healthy eating behaviour, optimistic bias did not appear to be an important factor, with many of the respondents openly discussing their negative dietary traits and recognising that these behaviours deviated significantly from the ideal. It is unclear however, whether these women had a firm appreciation of the long-term deleterious health consequences which these poor dietary behaviours could elicit. Weight considerations were mentioned only fleetingly by just one of the focus groups, indicating that these may act as less of a stimulus towards healthy eating than might be anticipated for a group of young women.

6.3.2.4. Physical Activity-related Themes

6.3.2.4.1. Time

Time constraints were cited by all of the groups as a significant barrier to physical activity. These time constraints arose primarily as a result of child-minding duties, but were also related to work requirements.

“You haven’t really got time for exercising. I have a child, I haven’t really got time to be exercising”.

(Focus Group Two)

“I used to go to the Darndale gym but em, with work and minding the kids and all the rest of it, I just haven’t got the time anymore”.

(Focus Group Three)

“…young kids and, d’ye know what I mean? Schools, back, forwards, in here, go, d’ye know what I mean? It is, ye kind of lose track of yourself. Really I should have went on a walk, but I jump in the car and drive to the shop ‘cause I can be rushing, d’ye know what I mean? ‘Cause if I’d more time like I’d walk up”.

(Focus Group Five)

6.3.2.4.2. Facilities

Lack of facilities did not appear to be a significant barrier to physical activity among these women. While some complained of expensive fees at some private gyms, there was general consensus that most of the local amenities were accessible and reasonably priced.

"There's no problem there's a gym across the road, there's a gym down there, there's a gym up the other side of Coolock. There's no problems. There's gyms around".

(Focus Group Two)

"There's a gym around there and it's reasonable. It is reasonable, a tenner a week, ye can pay by the week".

(Focus Group Three)

However, the local built environment was not considered conducive to outdoor physical activities due to a lack of appropriate green space and playing areas, and to poor planning.

"They're just using up all the green space. Now, everywhere ye look now it's just buildings going up".

(Focus Group Three)

"They have it (the new park) right beside where Wallace's is, where a gear, em, a drugs unit is…. now lets put a park a kids park beside a drug unit. They all go into the park at night drinking and then they smash their bottles in it….. No, but in a few weeks it'll be back to the same as it was, full of glass and needles and everything. A lovely, a lovely park out there, gone to waste cause ye can't use it".

(Focus Group Three)

6.3.2.4.3. Cost

Despite the local amenities being reasonably priced, cost became a significant issue for those seeking facilities of superior quality to those available locally.

“There’s one down the road in Balbriggan that has a lovely swimming pool and all, but if I was to use that right, it’s sixteen euro for the hour right, but I’ve to bring the kids with me, throw them into the crèche….. it’s seven euro for them to go in there while you’re in there for the hour, ye know what I mean?”

(Focus Group Three)

6.3.2.4.4. Weather

Poor weather was also mentioned as a potential barrier to physical activity.

“It is to do with the weather as well like, even if you were going to the gym and it’s… the heavens just opened. You’re not going to go out in the rain. By the time ye get to the gym you’re bleeding drowned in anyway, d’ye know what I mean? Go on the machines and …”

(Focus Group One)

6.3.2.4.5. Low Willpower, Low Self-efficacy and Lack of Confidence

While the issues discussed above are undoubtedly important factors influencing physical activity behaviour among these women, as was the case for dietary behaviour, psycho-social barriers appeared to be a much greater hindrance to the pursuit of an active lifestyle.

The loss of self-confidence borne out of material and social deprivation itself, and a perceived inability to extricate oneself from these circumstances, loomed large in many of the discussions concerning physical activity.

"It's getting that get up and go. Once you're out it's great, and when ye come home you've so much energy and all, but it's getting up to go".

(Focus Group Five)

Lack of companionship was also cited as a barrier, although much less frequently.

"I wouldn't go on me own though. Only if someone was coming with me (Laughs)".

(Focus Group One)

"I used to do a lot of walking but no-one will come with me anymore and I won't go walking on me own".

(Focus Group Four)

Willpower is viewed as a key requirement in enabling respondents to sustain good physical activity habits. Yet even when good levels of self-efficacy with regard to exercise are achieved, the psycho-social environment continues to threaten the good habits which have been initiated.

"When I was in the gym before, I had loads of willpower. It was great. Went to the gym three times a week. It was great, eating healthy and all. And then I just, lost me job and all that, and it just, just goes outta ye, ye do need willpower to do these things though as well".

(Focus Group One)

“Yeah, I suppose….’are ye going the gym?’, and you’re like ‘yeah’, and then like another four people ring ye up saying ‘are ye going the pub, such and such is going?’…. who’re ye gonna go with, the gym or the pub?”

(Focus Group One)

“……. and just sit down because you’re tired and you’re just after getting everyone up to bed and whatever else and you’re able to just relax and ye don’t, you don’t want to do the exercise then……. and it’s not even laziness or anything, it’s just the end of the night where ye just want to sit down and have an hour to yourself and watch the television and relax”.

(Focus Group Four)

6.4. Discussion

6.4.1. Introduction

The Theory of Reasoned Action (Ajzen & Fishbein, 1980) posits that attitudes are significant determinants of behaviour. This psycho-social model has been further refined and extended to yield the Theory of Planned Behaviour (TBP) (Ajzen, 1985) which seeks to elucidate the various psycho-social factors which mediate intention and ultimately behaviour. The TBP cites personal attitudes, subjective norms and perceived control over volitional actions as the prime determinants of intention and behavioural outcome as depicted in the schematic below.

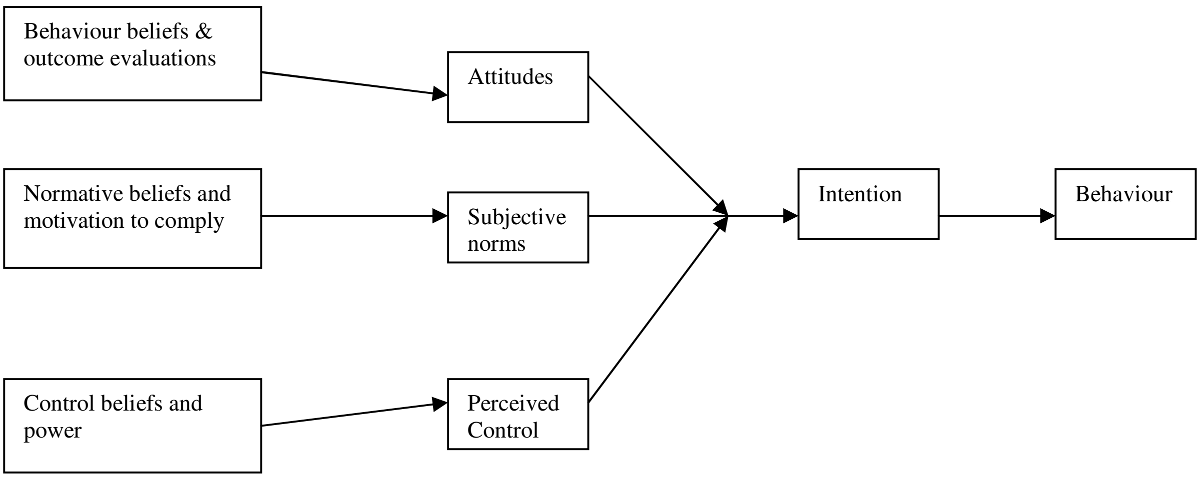

Figure 6.1 The Theory of Planned Behaviour (TPB) (Ajzen, 1985)

This theoretical model is particularly salient to the examination of dietary choice and health behaviours as it considers not just the attitudes and beliefs of the individual regarding the activity in question, but also the broader psychological factors and cultural influences which impinge on behavioural outcomes. The inclusion of such elements is critically important in the examination of health-related behaviours among low SES women as there is extensive research which suggests that "imposed limitations" such as health subversive subjective norms and perceived lack of control are propagated by disadvantaged environments.

For example, one UK study associated less favourable norms including lower future salience (the degree to which respondents think about their future), lower health consciousness and poorer locus of health control with lower socio-economic status (Wardle & Steptoe, 2003). These attitudinal characteristics were in turn associated with deleterious health behaviours and dietary habits in the lower SES groups. These findings suggest that these adverse belief systems are culturally promulgated, and that their pervasive presence has a significant impact on health-related behaviours among low SES groups.

If this were true, it would help to explain the considerable co-occurrence of health-damaging behaviours including poor diet, smoking, and physical inactivity, as well as the absence of healthier behaviours like dietary supplement use among women of low SES in the current study. The coincidence of such health-subversive behaviours is widely cited in the literature (Steptoe *et al.*, 1997; Trudeau *et al.*, 1998; Hearty *et al.*, 2007), and is indicative of psycho-social and cultural processes which impact non-specifically upon a range of different behaviours among disadvantaged groups.

6.4.2. The Quantitative Study

6.4.2.1. Socio-economic Variation in Health and Dietary Attitudes

Perceived influences on health vary considerably between the disadvantaged and advantaged respondents in the current study. The significantly lower selection of diet ($p<0.001$) and physical activity ($p=0.044$) as influences on health by the disadvantaged women may partly explain their less favourable habits in this regard. The greater proportion of disadvantaged women selecting bodyweight as an influence on health (16% vs. 4%) ($p=0.017$) may reflect the greater prevalence of overweight and obesity among this group. The considerably greater proportion of these women citing stress (22% vs. 11%), smoking (21% vs. 14%), alcohol (6% vs. 3%) and the environment (5% vs. 1%) as influences on health may possibly reflect the greater prominence of these factors in disadvantaged environments, although these trends do not reach statistical significance.

Previous research has indicated that among adults in the then-15 EU member states that smoking (41%), diet (38%), stress (33%), physical activity (18%) and bodyweight (13%) were the top perceived influences on health (Margetts *et al.*, 1999). Subsequent analysis of the Irish participants (n=1001) in this pan-EU database revealed the top six perceived influences on health to be smoking (45%), diet (32%), physical activity (31%), stress (31%), bodyweight (19%) and alcohol (15%). Although methodological differences between this study and the current study preclude direct comparison of these percentage figures, they do further emphasise the unusually high priority given to stress and bodyweight, and the unusually low awareness of both diet and physical activity as health influences among disadvantaged women in the current study. This lower awareness of the influence of diet and exercise on health may be a significant contributor to the poorer patterns observed in these behaviours among the disadvantaged women. Interestingly, a significantly greater proportion of the disadvantaged (7.3%) than the advantaged (0.0%) population stated that they did not know which factors influenced health (p=0.036), again suggesting a significant knowledge deficit in this regard among these women. Deficits in nutritional knowledge have previously been shown to strongly predict poorer dietary behaviour (Van Duyn *et al.*, 2001; Clarke *et al.*, 2007).

With regard to perceptions of healthy eating, the socio-economic differences are less pronounced. While a significantly lower proportion of disadvantaged respondents (31%) than advantaged respondents (73%) select "balance and variety" (p<0.001), the percentage among the disadvantaged group is more similar to that previously reported for the wider Irish population (28%) (Margetts *et al.*, 1997). The high proportion of disadvantaged group who identify "more fruit and vegetables" (78%), and the significantly greater proportion of this group citing "less fat" (p=0.022) and "less alcohol" (p=0.024) suggests that they do have some sound knowledge of basic healthy eating guidelines. While the significantly lower identification of "more fibre" (p<0.001) and the greater identification of "less bread, potatoes and pasta" (p=0.010) among the disadvantaged women indicates that some "technical" knowledge deficits do exist in this group, it is possible that a lack of practical knowledge and skills to implement these guidelines may be a more potent barrier to their implementation.

Previous analysis of Irish data (*n*=1009) from the Pan-EU Survey of Consumer Attitudes to Food, Nutrition & Health has indicated that, as in the current study, significantly lower proportions of women in the lower educational strata (p=0.036) and in the lower social classes ($p<0.001$) selected "balance and variety" to define the healthy diet, possibly indicating their limited ability to understand such abstract dietary terms. Women in the lower social classes in that dataset were also less likely to select reduced meat and meat products ($p=0.010$) and more likely to select reduced sugar intake ($p=0.010$) than their more affluent peers. The preferential identification of reduced sugar consumption by women of low SES is echoed in the current study, although this trend just fails to reach statistical significance ($p=0.075$).

Regarding perceived barriers to healthy eating, significant differences again emerge. Time-related barriers are selected much less frequently by the disadvantaged group. For example, long work hours (17% vs. 54%) ($p<0.001$) and busy lifestyle (41% vs. 61%) ($p=0.005$) are much less commonly cited among the disadvantaged women, indicating that time constraints may constitute a considerably less important barrier among this group. Conversely, self-perceived lack of healthy eating knowledge (18.6% vs. 0.0%) ($p<0.001$) and "experts keep changing their minds" (15.8% vs. 0.0%) ($p=0.001$) are selected significantly more frequently among the disadvantaged group, reflecting a greater overall confusion regarding healthy eating among these disadvantaged women.

The greater importance of irregular work hours as a barrier to healthy eating among more educated Irish adults has previously been demonstrated (Lappalainen *et al.*, 1997). Subsequent analysis of Irish *women* in the same pan-EU database revealed that those in the higher social classes ($p=0.025$), and especially those in the higher educational strata ($p<0.001$) were significantly more likely to cite either "irregular work hours" or "busy lifestyle" as obstacles to health.

6.4.2.2. Attitudes Predicting Dietary Behaviours

Many previous studies have described significant associations between general, health and dietary attitudinal traits and dietary behaviour. For example, Lindmark *et al.*, (2005) identified "sense of coherence" (self-efficacy) as a potent predictor of more favourable food group choices and nutrient intakes among their cohort of almost 5,000 Swedish adults. More favourable dietary attitudes have been consistently associated with more health conducive dietary patterns (Pollard *et al.*, 1998; Trudeau *et al.*, 1998; Van Duyn *et al.*, 2001; Pollard *et al.*, 2002), particularly with increased intake of fruit and vegetables.

The analyses described in this chapter similarly demonstrate the existence of clear associations between various attitudinal traits, and dietary behaviours. They also demonstrate that the attitudinal traits which predispose to deleterious dietary behaviours are not distributed evenly across the social spectrum, but rather that they occur with disproportionately high frequency among those in the lower socio-economic strata. These findings are largely in accordance with the literature in this respect. Several studies have demonstrated a preponderance of negative dietary attitudes among respondents of low SES (Margetts *et al.*, 1998; Kearney *et al.*, 2000), while these poorer attitudinal traits have also been associated with poorer dietary habits among lower SES respondents (Hearty *et al.*, 2007). The latter study examined data from the NSIFCS, revealing that those with more favourable attitudes displayed significantly more health conducive dietary and nutrient intake patterns than their peers.

Among the putative attitudinal predictors of dietary behaviour examined in the current study are stage of dietary change (Prochaska & DiClemente, 1983), health locus of control

(Walston *et al*., 1976) and future salience. These investigations have been supplemented by questions which are specific to dietary attitudes and behaviours, such as conscious pursuit of a healthy diet and suggested barriers to healthy eating.

The prominence of both chance and external locus of control as predictors of adverse dietary patterns (lower fruit, vegetable, combined fruit and vegetable, breakfast cereal and fish intakes) is indicative of a degree of fatalism in the selection of these food patterns. This finding is supported by previous work demonstrating a significant inverse association between internal locus of control and poor dietary habits (Callaghan, 1998; Martikainen *et al.*, 2003). The fact that the chance and external loci occur with a disproportionately high frequency among those of lower status for virtually all of the socio-economic indicators tested, suggests a preponderance of such fatalism among the low SES respondents. Again such findings are supported in the literature (Lachman & Weaver, 1998; Wardle & Steptoe, 2003), and describe phenomena which may be instrumental in effecting poorer dietary patterns among these disadvantaged groups.

Closely aligned with these observations concerning locus of health control, are the profound differences in dietary stage of change illuminated by the current analyses. Dietary stage of change is often employed as an indicator of overall health consciousness. There is much previous evidence that action and maintenance stages of dietary change associate with more favourable dietary patterns, particularly greater intakes of fruit and vegetables (Brug *et al.*, 1997; Trudeau *et al.*, 1998; Pollard *et al.*, 2002; Lea *et al.*, 2006). As might be expected, those in the action and maintenance stages of change in the current study (i.e. those who have actively set out to change their diet and those who sustain such changes) show fruit and vegetable intakes which are significantly greater than those of their peers.

However, they also demonstrate significantly higher intakes of other foods which are associated with healthy eating including breakfast cereals, fish and dairy foods, as well as lower consumption of sweet foods, meat and meat products and potatoes and potato products.

The respondents who cite these “active” stages of change are heavily concentrated in the higher socio-economic strata, as designated by indices of both *social* advantage (e.g. high social class, high socio-economic group, longer education etc.) and *material* advantage (not in relative income poverty, not deprived, no medical card entitlement), indicating the importance of both social learning and more favourable cultural norms as well as material resources in the propagation of such “can-do” dietary attitudes. The preponderance of “active” stage of change respondents in the higher SES group is consistent with the findings of earlier work (de Graaf *et al.*, 1997), and is also supported by research which has identified a greater resistance to healthy dietary change among those of low SES (Lappalainen *et al.*, 1997; Margetts *et al.*, 1998; Kearney & McElhone, 1999). Similarly, analysis of Irish data from the pan-EU Survey of Consumer Attitudes to Food, Nutrition & Health (1997) has indicated a lower prevalence of active stages of dietary change among women of low educational status (p=0.021) (McCartney *et al.,* 2006) (see Appendix XV).

The co-segregation of health-conducive dietary patterns with the active stages of dietary change elucidates more than just differences in dietary self-efficacy however. It also vividly illustrates that those who actively seek to improve their diets generally adopt the correct dietary practices to achieve this objective, at least in the higher social echelons. This viewpoint is strongly supported by the considerably more health-conducive dietary habits observed among those who “make a conscious effort to eat healthily” and those who “make a conscious effort to limit fat in their diet". Previous studies across the EU (Kearney & McElhone, 1999) and the UK (Dibsdall *et al.*, 2003), have demonstrated a significant degree of optimistic bias in respondents' evaluation of their own diets. However, data from the NSIFCS (Kearney *et al.*, 2001; Hearty *et al.*, 2007) have indicated that Irish adults appear to be relatively adept at interpreting the healthiness of their diets. The latter study in particular demonstrated significantly higher carbohydrate, dietary fibre and fruit and vegetable intakes and significantly lower fat and saturated fat intakes among those who "make conscious efforts to try to eat a healthy diet" and those who "try to keep the amount of fat I eat to a healthy amount".

In the current study population, all of the attitudinal traits cited previously which indicate active pursuit of a healthy diet occur with significantly greater frequency in the higher social tiers. The socio-cultural parameters used to define disadvantage such as high social class, high socio-economic group, high education and affluent area of residence, appear to be particularly predictive for these attitudes. Previous research among over 15,000 adults across the EU has similarly demonstrated a greater emphasis on healthy eating as education level increases (Lennernas *et al.*, 1997), while examination of Irish data from the same database indicated a significantly lower selection of "healthy eating" as an influence on food choice among adults of both lower social class ($p<0.001$) and education ($p<0.001$) (McCartney *et al.,* 2006) (see Appendix XV).

The co-occurrence of these more favourable dietary attitudes with more health-conducive dietary behaviours among the higher social echelons in the current study population reiterates the greater motivation of these respondents to eat healthily, and is supported by prior research findings in this area (Havas *et al.,* 1998, Johansson *et al.,* 1999).

However, the more favourable dietary habits of this group cannot be solely attributed to more positive dietary attitudes, as they may also perhaps reflect the superior ability of these more affluent respondents to implement such changes (e.g. greater nutritional knowledge, greater material resources).

The significantly greater selection of poor self-perceived dietary knowledge as a barrier to healthy eating among the lower groups, particularly those identified as disadvantaged by indicators of social deprivation (low social class, low socio-economic group, low education, poor area of residence), indicates that these groups may lack the technical wherewithal to implement positive dietary changes, even if they were motivated to do so. The prominence of *social* deprivation in predicting this knowledge barrier, again emphasises the critical role of social learning and cohesion in fostering healthy dietary habits. In this way, the respondents in the current study may be highlighting a dual barrier to healthy eating commonly encountered among disadvantaged groups – a lack of formal and cultural education about how to achieve a healthy diet in practical terms (and the reasons for doing so), superimposed on a socially endemic fatalism and lack of health consciousness which undermines any nascent motivation to pursue such an end. Many previous studies have highlighted the crucial importance of education and nutrition and health knowledge in enabling individuals to pursue a healthy diet (Lea *et al.*, 2005; Petrovici & Ritson, 2006), and lack of nutritional knowledge has been frequently forwarded as a critical precipitant of poorer dietary habits in low SES groups (Turrell & Kavanagh, 2006). It has also been argued that interventions which increase participants' nutritional and health knowledge represent an effective means of improving dietary habits among the general population (Van Duyn *et al.*, 2001) and low SES groups in particular (Dibsdall *et al.*, 2003; Beydoun & Wang, 2008).

Examining the other perceived barriers to health and healthy eating, taste (lower fruit and fruit juice (p=0.015), lower vegetable (p=0.001), lower fruit and vegetables combined (p=0.003), lower breakfast cereal (p=0.004) and lower fish intakes (p=0.009)) appears to be the strongest barrier to healthy eating. There is no social gradient in the identification of taste as a barrier however, limiting its potential role as an effector of poor dietary habits among these low SES women, despite the prominence of food neophobia as a socio-economic barrier to healthy eating in the literature (Baxter *et al.*, 1999). Willpower (data not shown), and crucially, the price of healthy food, do not appear to be perceived as important barriers to healthy eating in this population. While it might be argued that this finding dispels the notion of cost as an impediment to healthy eating, it should be noted that this outcome merely describes the difficulty which respondents encounter in consuming foods which *they perceive to be healthy*.

The idea of a culturally mediated disinterest and lack of motivation to improve diet and health practices among women of low socio-economic status gains credence when the sources of health information used by these women are explored. The more affluent women report a significantly greater use of the mass media including television, radio, magazines and the internet (i.e. discretionary sources of health information) than their less advantaged peers, a finding echoed by a previous Spanish study which identified a greater reliance on TV and radio for healthy eating information among those in the higher social classes (Lopez-Azpiazu *et al.*, 2001).

The use of mass media sources, which may be indicative of greater general interest in health and diet, is indeed associated with more favourable dietary patterns in the current study (higher fruit (p<0.001), vegetable (p<0.001), combined fruit and vegetable (<0.001), breakfast cereal (<0.001) and fish (p=0.003) intakes, and lower intakes of meat and meat products (p=0.036), and potatoes and potato products (p=0.001)). Previous work has suggested a significant reliance on the mass media for healthy eating information among the general Irish adult population (de Almeida *et al.*, 1997). This study revealed the most widely used sources of health information among Irish adults were TV and radio (cited by 23%), newspapers (cited by 23%), magazines (cited by 20%), health professionals (cited by 18%) and relatives and friends (cited by 16%).

In contrast to the general population and the more affluent women in the current study, a significantly greater proportion of the disadvantaged women use public health providers (GPs, public health nurses and community clinics) as sources of health information (p<0.001) (data not shown). Because much of this contact is likely to relate to pregnancy and childcare, it might be considered less discretionary in nature than use of the mass media (i.e. users do not have to seek out this health information). Despite the use of these statutory sources of health information however, the disadvantaged women in this study have manifestly poorer dietary behaviours, as well as poorer self-reported dietary knowledge which they cite as an important barrier to healthy eating.

These findings raise a number of important issues. Firstly, although healthy eating messages relayed via the mass media are readily accessible by the general population, disadvantaged young women may be less easily reached through these channels, possibly due to lack of resources (e.g. lack of internet access), or due to poor cultural reinforcement of such health information-seeking behaviour. In this way, mass media communication might be considered to be one of the societal norms from which these disadvantaged groups are excluded as discussed in Chapter 1.

Secondly, the co-occurrence of adverse diet and health behaviours and anthropometrical status among low SES women using statutory sources of health information highlights a failure to exploit this contact between community health professionals and these women to its fullest potential, particularly in light of their greater identification of poor knowledge and low motivation as barriers to health and healthy eating.

Regarding the issue of optimistic bias, there is some difference in the belief that "my diet is already good enough and does not require change" between the higher and lower strata, with those in the higher strata generally citing this option more often than their less advantaged peers. This is in keeping with the demonstration of significantly more favourable dietary and nutrient intake patterns among the former group. However, when analyses are performed to see whether this belief itself is actually predictive of more healthy food intake patterns, only a very limited association is apparent, indicating that many of those who believe their diet to be sufficiently healthy hold this view erroneously. Also of considerable concern in this respect, is the very high proportion of all respondents (36%) who feel that they do not need to make dietary changes for health reasons. Kearney *et al.*, (1997) identified a similarly pervasive optimistic bias for healthy eating among European adults, while others have cited this factor as a major impediment to dietary improvement among low SES adults in the UK (Dibsdall *et al.*, 2003).

Finally, although psychological stress has been associated with a shift from low fat, low sugar foods to higher fat, higher sugar alternatives, particularly among women (Oliver *et al.*, 2000; Zellner *et al.*, 2006), no such trend is observed in the current *quantitative* study. In fact, psychological stress does not correlate with differences in consumption of any of the food groups examined.

6.4.2.3. Attitudes Predicting Health Behaviours

If the findings described above sound as though they may be more indicative of a wider socio-cultural malaise which has the potential to subvert health-seeking behaviours apart from diet, then the current data would seem to support this.

Chance and external loci of health control between them, are associated with higher smoking prevalence, lower rates of participation in vigorous activity, lower use of dietary supplements and higher BMI and waist circumference measurements. Previous studies have also demonstrated associations between diminished locus of health control or reduced health consciousness and deleterious health behaviours in women including smoking (Manfredi *et al.*, 2007), non-use of dietary supplements (Conner *et al.*, 2001; Conner *et al.*, 2003) and non-participation in physical activity (Jewson *et al.*, 2007). Other research has also indicated more successful weight loss among young mothers with a greater belief in the health benefits of weight reduction (Clarke *et al.*, 2007). The chance and external loci of health control described above occur with significantly greater frequency among the disadvantaged respondents in the current study, again perhaps indicating a degree of fatalism which may mediate some of the socio-economic disparities in health behaviour.

In contrast to the chance and external loci of health control, the action and maintenance stages of dietary change in the current study are associated with lower prevalence of smoking ($p=0.001$), higher prevalence of vigorous physical activity ($p<0.001$), lower prevalence of alcohol over-consumption ($p=0.028$) and a greater prevalence of dietary supplement use ($p<0.001$).

The predictive value of more favourable dietary attitudes for dietary supplement use has recently been demonstrated among older adults (Sebastian *et al.*, 2007). Although the coincidence of deleterious health behaviours including smoking, high alcohol consumption and low physical activity has also been described in the literature (Steptoe *et al.*, 1997; Hyland *et al.*, 2004; Tsai *et al.*, 2007), the segregation of such behaviours with less favourable *dietary* attitudes in the current study requires further explanation.

While the co-segregation of sub-optimal food group intakes with negative dietary attitudes might be explained through purely functional relationships (e.g. declining fruit intake and rising sweet food consumption with negative attitudes), the coincidence of other health subversive practices with these attitudinal traits, may describe a socio-cultural phenomenon which goes beyond diet and health behaviours. It may, indeed, be more useful to consider these behaviours the mere signs or symptoms of deep-rooted sociological processes which pervade disadvantaged communities, and which embrace elements of hopelessness, fatalism, psycho-social stress and subverted self-reward behaviour, similar to those described by other authors (Copeland, 2003). In this way, active dietary stage of change might even be employed as an indicator of overall health consciousness which is predictive of more favourable health behaviours.

Contrary to expectation, lack of future orientation predicts neither poorer dietary patterns nor adverse health behaviours among the current quantitative study population. This is at variance with the findings of several studies (Wardle & Steptoe, 2003), which have identified these adverse practices as the downstream outcomes of a poorer overall capacity for abstract thought regarding future health.

Indeed, it has been suggested that a lower capacity for abstract thought in general may prevail among lower socio-economic groups, possibly mediated by lower formal education, a deficit which impairs risk-reward comprehension and elicits more hazardous behaviours of all types (Layte & Whelan, 2004).

Psycho-social stress has also been proposed as a potential trigger for adverse health behaviours (McKinzie *et al.*, 2006; Siegrist & Rodel, 2006). Of the health behaviours investigated however, self-reported stress is predictive only of increased smoking prevalence ($p=0.003$), an association which nonetheless concurs with much previous work in this area (Layte & Whelan, 2004; Manfredi *et al.*, 2007). Some proportion of this association between stress and smoking may be attributable to poor family support, which also shows a significant social gradient and which is also predictive of increased smoking prevalence ($p=0.044$).

The psycho-biological phenomena which coincide with chronic psychological stress however, mean that its damaging effects may not be confined to its impact on diet and health behaviours, but may also be mediated by the creation of a deleterious metabolic milieu in which these behavioural insults are amplified (Rosmond & Bjorntorp, 2000; Goodman *et al.*, 2007). This is particularly pertinent to the disadvantaged subjects in the current study, who show a much greater prevalence of elevated stress levels; especially those subjects experiencing material disadvantage as defined by relative income poverty ($p=0.006$), deprivation ($p<0.001$), consistent poverty ($p<0.001$) and benefit entitlement ($p=0.001$) and medical card entitlement ($p<0.001$).

With reference to barriers to health, cost is cited significantly more frequently among those in the lower social groupings, particularly as defined by measures of *material* deprivation (e.g. relative income poverty ($p<0.001$), deprivation ($p<0.001$), consistent poverty ($p<0.001$), benefit entitlement ($p=0.005$) and medical card entitlement ($p<0.001$)). As was the case for price of healthy food however, this cost barrier is not strongly predictive of adverse health behaviours, limiting its role as a potential mediator of socio-economic differences in these behaviours. Perceived lack of safe recreational areas is a further potential structural/material barrier which in keeping with previous research (Balanda & Wilde, 2003), shows a distinct socio-economic gradient, but which nonetheless does not meaningfully associate with poorer health behaviours. Perceived lack of facilities or environmental amenities associates with neither poorer health behaviours or with lower SES, and is therefore unlikely to be a significant barrier to healthy lifestyle among the less advantaged women in this cohort.

Hence, although elements such as perceived neighbourhood safety (Ball *et al.*, 2006b), a conducive built environment (Brownson *et al.*, 2001) and economic prosperity (Kaleta & Jegier, 2007) have been proposed to encourage physical activity and other healthy behaviours, it appears that these material factors may not be as important as socially contextual barriers to health behaviours and healthy eating (fatalism, low motivation towards health-seeking behaviours, poor knowledge) in the current population.

Overall, this population shows a good level of insight into the appropriateness of not just their diet, but also their weight status and perceived health. Those who feel that their weight is appropriate for their age have a lower mean BMI ($p<0.001$) and a lower mean waist circumference ($p<0.001$), both of which are well within the recommended guidelines.

Those who feel that their health is good are clustered within the higher SES groupings, and have a lower prevalence of smoking (p=0.017), a higher prevalence of vigorous activity (p=0.037), and significantly lower mean BMI (p=0.001) and waist circumference (p<0.001) than their peers. In keeping with these findings, perceived health status has previously been shown to be better among Irish adults who are employed (p<0.0001), of higher education (p<0.0001), higher social class (p=0.0045) and higher income (p<0.0001). This better perceived health status is predictive of better actual health behavioural indices including lower prevalence of smoking (p<0.0001), lower prevalence of excess alcohol consumption (p<0.0001), greater physical activity (p<0.0001) and lower BMI (p<0.0001) (Balanda & Wilde, 2003). In the current study, those who believe that they do not require any changes in lifestyle to improve their health also display several more health-conducive characteristics, including a greater participation in vigorous activity (p=0.040), and lower BMI (p=0.014) and waist circumference measurements (p=0.012).

As would be expected, positive responses to the attitudinal questions concerning weight and overall health behaviours and status are concentrated within the advantaged respondents, whose more favourable characteristics they more accurately depict. These findings suggest that optimistic bias is not an attitudinal effector of adverse health behaviours among disadvantaged groups specifically. Notwithstanding this fact however, disconcertingly large proportions of the *overall population* state that they do not need to make any lifestyle changes to improve their health (11%), and that they do not need to take more exercise (30%), indicating that optimistic bias may be a significant impediment to behavioural improvement among all social groupings in the current study population.

Finally, those who report the use of mass media as sources of health information display several more favourable health behaviours including a lower prevalence of smoking ($p<0.001$) and a higher prevalence of vigorous activity ($p=0.024$), as well as having a significantly lower mean waist circumference ($p=0.026$). The use of these information sources is significantly less prevalent among those experiencing both social and material disadvantage however, perhaps indicating that this may be one means by which the more affluent groups derive their greater health knowledge and motivation. Again, the significantly greater use of public health agencies and practitioners among the disadvantaged women coincides with poorer health behaviours in this group, highlighting the potential usefulness of such channels for communicating health messages to women, perhaps most effectively at the antenatal and postnatal stages.

6.4.2.4. Summary

Overall, the psycho-social barriers discussed at the beginning of this section (chance and external locus (fatalism), low dietary stage of change (low motivation), failure to actively pursue healthy behaviours and less strongly, poor knowledge) which show a strong social gradient and which have significant predictive value for adverse health behaviours, appear to be much more likely mediators of poor diet and health-subversive practices among low SES women than the material and structural barriers discussed (cost, price of healthy food, lack of facilities, etc.).

Optimistic bias regarding the appropriateness of their diet does not seem to be a significant barrier to the adoption of healthier diet and lifestyle patterns by the disadvantaged women in particular – they have a similar insight into the nutritional value of their diet, the appropriateness of their current weight and their overall health status as their more advantaged peers, and at least some appreciation of the degree to which these deviate from the ideal. What they do not appear to have however, is the capacity firstly to appreciate the hazard of such adverse dietary behaviours and anthropometric indices, and secondly the motivation and ability to address the nascent health threats posed by these factors. Hence their optimistic bias relates more to the long-term health impact of their poor diet and health behaviours.

The real challenge therefore, is that of creating a culture which values health and healthy lifestyles including optimum diet, and which emphasises the personal relevance, feasibility and value which the adoption of such behaviours can have for disadvantaged individuals and communities. This will require provision of not just technical nutrition and health education, but also more importantly, social and personal development education to ensure that individuals have the psychosocial resources to put this technical knowledge into action.

6.4.3. The Qualitative Study

The findings of the qualitative study further emphasise many of the themes highlighted in the quantitative study, as well as providing additional insights into the nature and origins of the adverse diet and health behaviours observed in these young, disadvantaged women.

While the quantitative study did not identify any significant social gradient in future salience, the qualitative study does reveal a conspicuously low level of future orientation among its disadvantaged participants, consistent with the quantitative findings of Wardle & Steptoe (2003) in the UK.

There is evidence that the effects of this low future salience are attenuated by the arrival of children for many of these disadvantaged women, and this supports the findings of previous work which has identified motherhood as a predictor of dietary change among women (Lagstrom *et al.*, 1999; Rasanen *et al.*, 2003). One focus group participant reported a decline in alcohol consumption at weekends because she had to take her son to football training on Sunday mornings. Hence, although this attitudinal predisposition towards high alcohol intake may persist, it is now being masked by changes in circumstance.

Psycho-social stress occupies a prominent position in all of the focus group discussions, and is readily recognised as a significant correlate of poor dietary behaviour and low physical activity. The precipitants of this psycho-social stress are manifold, but principle among these may be an overwhelming sense of powerlessness and lack of control over one's own destiny, particularly following setbacks such as unexpected loss of work or bereavement. Lack of social support (Birkett *et al.*, 2004), accommodation difficulties (Dunn, 2002) and social disorder and crime (Brummett *et al.*, 2005) are further environmental stressors which exacerbate these feelings of vulnerability, and have again been previously cited as mediators of poorer diet and health status.

While these phenomena and their interrelationships are all very difficult to elucidate by quantitative means, the focus group format of the qualitative study allows them to be articulated quite clearly. Several of the participants describe a sense of hopelessness and disempowerment, which in turn is reported to give rise to chronic feelings of stress and depression. Apart from their potential deleterious impact on the endocrine milieu (Wardle & Steptoe, 2003), these psychological traits constitute the key determinants of adverse dietary behaviours among the current population of disadvantaged women, and may therefore be viewed as effectors of social inequalities in diet and health behaviours at the proximal level. The corollary of this effect is also effectively captured by these focus group discussions, where respondents describe their increased sense of purpose and self-esteem after beginning their community training scheme, and the synergistic impact which this has had on their health behaviours and diet.

It is also clear from these focus group discussions that diet may be one of the limited sources of self-reward or pleasure which is readily available to these disadvantaged women, and that many engage in "comfort eating" as a coping mechanism in response to their stressful living circumstances. As seen in the quantitative study, the adverse dietary behaviours reported coincide with other deleterious "coping" practices which yield sensory pleasure such as smoking and alcohol consumption, providing further support for this theory. Previous qualitative research has also indicated the deleterious impact of inadequate social support on health seeking behaviours among low SES women (Birkett *et al.,* 2004).

Apart from these issues, the focus group discussions also elucidate significant deficits in dietary and health knowledge, features which are again difficult to capture comprehensively by exclusively quantitative means. While many of the respondents purport to have a good knowledge of healthy eating guidelines, identifying key elements such as more fruit and vegetables and breakfast cereals and less fried foods, other definitions proffered by participants (e.g. avoidance of frozen foods, vegetables, diet minerals and reduced fat products, preferential selection of branded products) indicate considerable shortcomings in dietary knowledge. Such deficits in nutritional knowledge have been shown to predict deleterious dietary patterns in previous qualitative studies (Lea *et al.*, 2005), and particularly among lower SES groups (Coveney, 2005).

Apart from their demonstrably poorer dietary and health knowledge, the fact that many respondents recognise that their dietary, physical activity and other health behavioural patterns are poor also highlights another key issue, namely that these women do not fully appreciate the personal ramifications of such adverse health practices. This could relate to a reduced capacity for abstract thought, and there is evidence that such a deficit may well prevail among these women, as exemplified by their highly *functional* definitions of health. Previous literature has also described a preponderance of such functional health definitions among low SES groups (Giskes *et al.*, 2002), and these perceptions could conceivably encourage the perpetuation of adverse diet and other health behaviours, as they are associated with no tangible or discernable impact on health.

It is likely however, that failure to improve recognised negative health behaviours including poor diet, also arises from the low social value placed on more positive health behaviours in these communities. The greater prevalence and acceptance of poor dietary patterns (high intake of fried foods, take-aways, fizzy drinks, sweet foods and lower fruit and vegetable intakes), low physical activity, high alcohol consumption, smoking and obesity as pervasive cultural norms, means that these women, who are already demonstrating low levels of self-confidence and self-efficacy, are highly unlikely to adopt healthier habits which deviate from those of their peer group. Indeed, there is clear evidence from several of the respondents that peer pressure and peer support respectively, can exert strong and opposing influences on health-related behaviours such as label reading and physical activity. Previous research has also asserted that peer affiliation, an important social imperative in disadvantaged communities, may be enhanced by the adoption of adverse health behaviours among low SES groups from early life (Van Lenthe *et al.*, 2001), a phenomenon that is likely to push these women towards such deleterious health practices.

Apart from the critical importance of psychosocial factors in eliciting poor dietary and health practices, the focus groups also highlight the importance of structural factors as important predictors of adverse dietary patterns, and support the findings of previous Irish work in this regard (Friel *et al.*, 2005). The cost of healthy food was cited as a barrier to healthy eating by several of the focus group participants and is consistent with previous research in this area (Darmon *et al.*, 2002). This finding is in contrast to those of the quantitative study however, which did not identify price as a significant predictor of poorer eating patterns despite the preponderance of this barrier among the lower social strata.

The qualitative study also highlights the built environment as an important influence on diet and physical activity patterns. Several respondents described the diminution of green spaces and recreational areas, while the provision of local leisure amenities like parks beside areas frequented by drug users essentially precluded their use by the public. Previous qualitative work carried out among socially disadvantaged women in Australia (Ball *et al.*, 2006a) and the US (Eyler *et al.*, 2002) has also highlighted lack of community facilitation as a barrier to physical activity among low SES women. (Giles-Corti & Donovan, 2002) concluded that the creation of supportive environments, particularly the provision of accessible pavements in attractive neighbourhoods and attractive public open spaces, had the potential to increase both walking and vigorous physical activity among such low SES groups.

Among the current discussants, there was also common mention of the ease with which less healthy foods could be accessed within these communities. The proliferation of fast food outlets, including drive-through facilities has seemingly occurred without impediment from local planning authorities, mirroring patterns described among poorer districts of the Greater Washington area (Drewnowski *et al.*, 2007).

The provision of delivery services by these fast food outlets at affordable prices is reported to further propagate their use by participants in the qualitative study. The respondents also describe the inadequate provision of affordable child-care facilities in these localities as a further stressor which inhibits healthy diet and physical activity, by limiting the time and financial resources available for these activities, and by significantly increasing psychological stress levels.

6.5. Conclusions

Both the attitudinal component of the quantitative study and the qualitative study have clearly demonstrated a preponderance of less health-conducive attitudes and beliefs among the women of low SES when compared with their more affluent peers. Unlike their advantaged reference group, these disadvantaged women experience not just a greater prevalence of "push" factors (psychosocial stress, low self-efficacy, social affiliation, health-subversive built environment etc.), which predispose them to poorer dietary and health behaviours, but also a lower preponderance of "pull" factors (health–conducive social norms and social re-enforcement of healthy behaviours) which might draw them away from such deleterious practices.

Profound differences in diet and health behaviours across the socio-economic spectrum have been demonstrated in Chapters 4 and 5. The fact that these health damaging behaviours coincide with one another, and with poorer general, health and dietary attitudes among women in the low SES cohort is strongly suggestive of a socio-cultural system which propagates such health subversive attitudes and their down-stream behavioural outcomes in these disadvantaged communities.

Chapter 7 will gather together the findings of the current quantitative attitudinal and qualitative investigations in the context of the preceding dietary and health behavioural data from previous chapters. Having done so, it will begin to suggest intervention strategies by which the impact of these social, cultural, structural and economic barriers to healthy diet and lifestyle may be overcome or attenuated among young, urbanised women of low SES.

6.6. References

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Chapter 7

Conclusions, Recommendations & Further Work

7.1. Introduction

Chapter 1 has described the ways in which poverty is measured in Ireland and the evolution of poverty trends over recent years. While deprivation and consistent poverty, both good measures of absolute standards of living, have improved considerably over the past twenty years, there is also evidence that social inequality, as measured by relative income poverty and a widening poverty gap, has also increased over this period (Nolan & Smeeding, 2005). This is particularly pertinent in the current context, as health inequalities are thought to relate more to societal disparities in living conditions than to absolute standards of living in economically developed countries like Ireland (Steptoe & Marmot, 2003). The primacy of social inequality in this regard is amply demonstrated by the significantly higher rates of premature death from cardiovascular disease, cancer and respiratory disease among the lower socio-economic groups in Ireland when compared with their more advantaged peers (Balanda & Wilde, 2001).

The current study aims to elucidate the socio-economic differences in dietary habits, nutrient intakes, health-related behaviours (smoking, alcohol consumption, dietary supplement use, physical activity etc.) and anthropometric status which prevail among a cohort of 295 urbanised women aged 18-35 years. It also attempts to provide insights into the material, structural, social and attitudinal precipitants of these socio-economic differences in diet and health behaviours by both qualitative and quantitative methods, with a view to formulating effective intervention strategies to address these issues.

7.1.1. The Quantitative Study

The quantitative study employed a multi-dimensional socio-economic sampling frame to identify small areas across Dublin which have a high concentration of low SES residents. Twenty sites in total, located in North, South, West and Inner City Dublin were selected from the lowest quintile of areas, in order to generate representative findings which would be unaffected by geographical bias. Sampling of both the disadvantaged and advantaged respondents took place over a period of more than ten months to adjust for the influence of seasonal bias on food intake and health behaviours. Shopping vouchers were offered to respondents to incentivise participation, and to limit selection bias related to subjects' baseline interest in health and nutrition.

In terms of data collection, power calculations were performed to estimate the minimum sample size required for the reference advantaged population, as a primary focus of this work was to describe the habits of the disadvantaged group themselves, in addition to comparative analyses between these women and their more affluent peers. Questionnaires were administered by means of a standardised interviewer-assisted protocol, after the receipt of explicit informed consent from respondents. Three methods of dietary assessment were employed, and internal and external "validation" studies subsequently performed (see Chapter 3) to ascertain which of these yielded the most reliable dietary intake data. Anthropometric measurements were taken according to standardised protocols as described in the literature (McCarthy *et al.*, 2001). Data relating to material and social indices of disadvantage were also collected, to elucidate their relative associations with poor diet and health behaviours.

The group interview sessions were arranged by local group leaders, and were conducted in a settings-based environment to optimise respondents' comfort with the process. Written and verbal reassurances were given to participants regarding anonymity and the confidentiality of all data collected, again in order to encourage open and truthful responses.

In terms of data processing and management, all socio-demographic, health, attitudinal and anthropometric data (see Appendix I) were entered to a single database. Dietary intake data from each of the 295 participants were entered into separate spreadsheets, and these data were subsequently entered into a nutrient analysis package (WISP v. 3.0, © Tinuviel Software Ltd., 2005). The output files from these nutrient analyses were checked for error before being appended to the corresponding "lifestyle" data to yield a relational database which included socio-demographic, local environment, attitudinal, health status, health behavioural, anthropometric, socio-economic, food group and nutrient intake data from each respondent. The contents of this original database were again checked for error before further manipulation of data to create variables for statistical analyses.

After checking data for normality of distribution, univariate analyses (independent t-tests, Mann-Whitney U tests, crosstabulation with Chisquare analysis) were conducted to establish associations between food group intakes, nutrient intakes and health behaviours, and the socio-economic and attitudinal factors thought to influence these behaviours. Statistical significance was reported at the $p<0.05$ level in each case.

7.1.2. The Qualitative Study

Due to the formative or exploratory nature of this research, a qualitative study was also carried out (Strolla *et al.*, 2006) to further elaborate on themes from the quantitative study, and also to elucidate any further unanticipated factors which might mediate an adverse effect on diet and health behaviours among the low SES women. Five focus groups of five to eight respondents each were conducted by a facilitator (DMC) and a rapporteur (BW) according to best practice guidelines described in the literature (Krueger & Casey, 2000; Kitzinger, 1995). The data from these semi-structured group interviews were transcribed and analysed using an inductive grounded theory approach (Strauss & Corbin, 1998) which allows the generation and evolution of cohesive theory from the *post-hoc* analysis of data collected (Fade, 2003).

Overall, the methodological rigour applied in both the quantitative and qualitative studies described above, aimed to strengthen the integrity of the data and to increase the reliability and utility of findings from this study.

7.2.1. Dietary and Nutritional Findings

Chapter 3 describes the comparability and reliability of dietary intake data collected by three different methods (diet history, FFQ and 24-hour diet recall), and the selection of the diet history method as the protocol of choice based on the findings of these investigations. This process enabled the identification of 79 diet records of suspect validity among the population of 295 respondents, and these records were removed prior to statistical analyses relating to food group and nutrient intakes to further enhance the integrity of findings from the study.

Chapter 4 describes pronounced differences in food group and nutrient intakes across the socio-economic spectrum, consistent with previous research in this field (James *et al.*, 1997; Andrieu *et al.*, 2006). The disadvantaged respondents demonstrate significantly lower intakes of low energy, micronutrient-dense food groups including fruit ($p<0.001$), vegetables ($p<0.001$), breakfast cereals ($p<0.001$), fish ($p<0.001$) and dairy produce ($p=0.001$), as well as significantly higher intakes of energy-dense food groups including meat and meat products ($p<0.001$) and potatoes and potato products ($p<0.001$). The differences observed in vegetable, dairy food, meat and meat product and potato and potato product intakes between the disadvantaged and advantaged respondents appear to relate specifically to differences in the frequency of consumption of these foods (assuming roughly equal portion sizes across the socio-economic spectrum). The lower intakes of fruit, breakfast cereals and fish observed among the disadvantaged women however, relate to a *lower proportion of consumers* of these foods among the disadvantaged group, in addition to *lower levels of consumption* among disadvantaged consumers when compared with their more advantaged peers.

Upon univariate analyses, many of the food groups cited above are found to associate with both macronutrient and micronutrient intakes in this population. While this does not necessarily infer causality, as high and low intakes of some food groups are thought to co-segregate with one another, it is unsurprising that the food group patterns of the disadvantaged group described above, are found to coincide with significant differences in fibre, macronutrient, vitamin and mineral intakes between the disadvantaged and the advantaged women.

Those in the disadvantaged group are significantly less likely to comply with several macronutrient intake guidelines including those for total carbohydrate (p=0.017), non-milk extrinsic sugars (p<0.001), fat (p<0.001), saturated fat (p<0.001) and cholesterol (p<0.001), than their advantaged peers. The disadvantaged respondents also display significantly lower dietary fibre (p<0.001), total carbohydrate (p<0.001) and protein (p<0.001) intakes, and significantly higher total energy (p<0.001), fat (p<0.001), saturated fat (p<0.001), cholesterol (p,0.001) and non-milk extrinsic sugar (p<0.001) intakes than their more affluent peers, and these differences persist even after the exclusion of energy from alcohol.

With regard to vitamin intakes, the disadvantaged women are significantly less likely than their advantaged counterparts to achieve the estimated average requirement (EAR) for several critically important vitamins including folate (p=0.050), vitamin C (p<0.001) and vitamin D (p=0.047).

Significant differences are also observed between the disadvantaged and advantaged cohorts in terms of absolute vitamin intakes.

Here, the disadvantaged women have significantly lower riboflavin ($p=0.021$), niacin ($p<0.001$), pantothenate ($p=0.028$), pyridoxine ($p=0.007$), folate ($p=0.001$), vitamin C ($p<0.001$), carotene ($p<0.001$), vitamin D ($p=0.030$) and vitamin E ($p=0.008$) intakes than those in the advantaged group. While some of these differences are reduced or abolished upon removal of dietary supplement intakes, the disadvantaged group continue to show significantly lower niacin ($p=0.001$), vitamin C ($p<0.001$) and carotene intakes ($p<0.001$), as well as a tendency towards lower folate intakes ($p=0.060$) than their advantaged counterparts. In addition to these findings, the disadvantaged group also show significantly lower nutrient density per MJ of energy for virtually all of the vitamins examined, with dietary supplements both included and excluded.

Regarding mineral intakes, the differences between the disadvantaged and advantaged groups are less pronounced. The disadvantaged group are significantly less likely to achieve the EAR for calcium ($p=0.019$) than their more affluent peers, while a very high proportion of both groups fail to achieve the EAR for iron (60% of disadvantaged women and 49% of advantaged women when dietary supplements are excluded). Sodium intakes are also significantly higher among the disadvantaged group ($p<0.001$), possibly reflecting their greater intake of processed meats and processed potato products, while magnesium intakes are significantly lower with supplements both included and excluded ($p=0.013$ and 0.035 respectively). Although median *total* iron intakes do not differ between the two groups, mean iron intakes do become significantly lower among the disadvantaged women when the contribution from supplements is discounted ($p=0.011$), reflecting the higher prevalence of iron supplementation among the disadvantaged cohort. With the exception of sodium and copper, the disadvantaged group demonstrate significantly lower micronutrient density for virtually all of the minerals examined, with supplements both included and excluded.

These findings reveal considerable socio-economic gradients in food group, energy, dietary fibre, macronutrient and micronutrient intakes among this cohort of young women. Examination of the dimensions of poverty and disadvantage which most strongly predict these less favourable patterns uncovers several interesting findings. While material deprivation (e.g. relative income poverty, consistent poverty) in particular appears to associate with high intake of sweet foods, supporting the findings of previous research in this regard (Drewnowski, 2007), other negative patterns such as low dairy intake associate more with markers of structural and social deprivation (e.g. low social class, low education). Other deleterious patterns such as low fruit intake, low vegetable intake, low breakfast cereal intake, low fish intake coincide with both material *and* structural/social indices of disadvantage. These findings suggest that although these less favourable food group intakes predominate among the disadvantaged women, the specific dimensions of poverty which yield these differences may differ in each case.

7.2.2. Health Behavioural & Anthropometric Findings

In addition to the pronounced differences in food group, energy, fibre, macronutrient and micronutrient intakes described above, this study also describes significantly less favourable health behavioural patterns among the disadvantaged sample, and indeed confirms the clustering of such deleterious behaviours among the low SES respondents.

More than four times as many disadvantaged than advantaged women are classified as current smokers (61% vs. 14%) ($p<0.001$), and there is evidence that these differences arise as a consequence of both increased initiation rates and decreased cessation rates among these poorer women. Overall, roughly three times as many women in the disadvantaged group are categorised as "ever smokers" indicating much higher initiation rates among this group ($p<0.001$). However, they are also roughly three times less likely to quite smoking than the women of higher socio-economic status ($p<0.013$), and among the current smokers, smoke significantly more cigarettes per day ($p=0.001$).

Their earlier initiation and greater smoking intensity both contribute to a significantly greater lifelong tobacco exposure (pack years) among the disadvantaged smokers ($p=0.013$), even at this relatively early age. While current smoking coincides with low status for all of the socio-economic parameters examined, it appears that the sociological indicators of disadvantage (deprived locality ($p=0.009$), low social class ($p<0.025$), low socio-economic group ($p<0.001$)) may be particularly predictive of earlier smoking initiation.

The disadvantaged women also display significantly less favourable alcohol consumption patterns than their more affluent peers. Not only is their estimated median weekly intake of alcohol units ~20% greater than their peers' (11.4 units/week vs. 9.2 units in the advantaged group) (p=0.029), but they also show a significantly greater mean intake per drinking occasion (p<0.001), highlighting the considerable hazard posed by binge alcohol consumption among this group.

In terms of compliance with recommended limits for alcohol consumption, a significantly greater proportion of disadvantaged drinkers exceed both the total weekly intake guideline (42% % vs. 28% of advantaged respondents) (p=0.050) and the binge consumption guideline of <6 units per drinking occasion (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2004) (82% vs. 64%) (p=0.012).

These data illustrate that excessive alcohol consumption occurs with very high frequency among young women in Dublin, but presents a particular public health problem for those in the lower social strata. There is a trend towards cheaper alcoholic beverages among the disadvantaged women. For example, 30% of disadvantaged drinkers consume alcopops vs. 10% of advantaged drinkers (p=0.001), while 55% of disadvantaged drinkers consume beer vs. 41% of advantaged drinkers (p=0.181). This suggests that diminished price elasticity may, as previously suggested (Steptoe & Marmot, 2003), constitute a viable target for statutory intervention in this regard.

While the prevalence of high alcohol consumption (estimated intake >14 units per week) tends to be greater among those of low status for most of the socio-economic indices, this greater prevalence of excessive consumption reaches statistical significance only for those of low social class (p=0.041).

With regard to dietary supplement use, only 32% of the disadvantaged women report regular use of these vitamin and mineral preparations, compared with 52% of their more advantaged peers (p=0.004). The greater contribution of these preparations to the overall micronutrient intake of the advantaged women is also noteworthy. Hence, while supplementation might be considered a pragmatic measure to alleviate some of the nutritional impact of these women's poorer quality diets, it appears that this occurs much less frequently among the low SES women who might benefit from it most.

Such patterns have previously been described in the literature (McNaughton *et al.*, 2005), and may reflect the presence of both socio-cultural and economic barriers to these behaviours. While the NSIFCS (Kiely *et al.*, 2001) did not reveal significant educational or social class gradients in dietary supplement use, the larger SLAN Survey (Kelleher *et al.*, 2002) reported significant decreases in supplementation as social class declined. Women aged 18-35 years in the NSIFCS were the least likely demographic group to use dietary supplements (Kiely *et al.*, 2001), further highlighting the challenges which exist in augmenting the micronutrient intake of low SES women by this means.

By far the most widely used supplements among both groups are multivitamins, followed by cod liver oil, omega-3 fish oil preparations and vitamin C. Iron supplementation is more common among the disadvantaged (2.3%) than the advantaged (1.4%) women, possibly arising from a greater use of prescribed iron supplements in the former group, and has a considerable impact on *mean* iron intakes among this disadvantaged cohort. Lower overall supplement use is predicted particularly by markers of *social* disadvantage (disadvantaged locality (p=0.004), low social class (p=0.001), low SEG (p=0.002), low education (p=0.054)), perhaps highlighting the importance of peer learning and sociological conditioning in this regard.

Although the parameters employed to estimate physical activity levels in this population were, by necessity, relatively crude, they do provide some insight into differences in exercise behaviour from the socio-economic perspective. Women in the disadvantaged sample have considerably lower mean estimated daily vigorous activity levels (8.8 minutes vs. 21.5 minutes). These differences in mean vigorous activity are found to relate primarily to significantly higher rates of vigorous activity participation among the advantaged respondents. Fifty percent of this group habitually engage in some form of strenuous exercise, compared with just 28% of the disadvantaged women ($p=0.001$).

Evidence from the literature also suggests that lower physical activity levels are particularly common among young females of low SES, and that these patterns may have their origins in early adolescence (Inchley *et al.*, 2005; Brodersen *et al.*, 2007). Although women in the disadvantaged group also report significantly lower median estimated daily sitting times than their more affluent peers (210 minutes per day vs. 321 minutes per day ($p<0.001$)), these differences may not sufficiently compensate for the shortfall in vigorous activity participation among this group.

Irrespective of the socio-economic differences in physical activity which exist in this population, the data strongly suggest that a substantial majority of the full cohort fail to achieve the recommended 30 minutes of moderate exercise on five days per week or 20 minutes of vigorous intensity exercise on three days per week (Haskell *et al.*, 2007). The mean estimated daily sitting time is over 4 hours, while the mean estimated daily participation in strenuous exercise is <11 minutes. There is also evidence that this strenuous physical activity level is disproportionately elevated by a small number of "exercisers", with a median level of 0 minutes per day for the full population, 0 minutes per day for the disadvantaged group and 1.1 minutes per day for the advantaged group.

Eighty-two percent of all respondents partake in an average of less than 10 minutes vigorous exercise per day, with two thirds of these women not participating in any strenuous physical activity at all. These activity levels fall below those reported for US women over recent years, where levels of sedentarism (no recreational exercise in the past month) declined from 32% to 28% between 1989 and 2002 (CDC, 2004), and prevalence of regular physical activity continues to rise among the adult female population (CDC, 2007).

While low participation in vigorous activity is predicted by all of the indices of socio-economic disadvantage in the current study, increased sitting time associates with measures of material *advantage*, perhaps reflecting the greater occupational sedentarism of economically active women in the more affluent group.

Breastfeeding patterns among the current population also demonstrate considerable socio-economic gradients. Among women who were aware of how they were fed as infants (n=256, 87% of the full population), a significantly lower proportion of the disadvantaged group (18%) than the advantaged group (49%) were breastfed ($p<0.001$). The low proportion of advantaged women with children (n=7) precludes meaningful comparative analyses of maternal breastfeeding practices between the disadvantaged and advantaged groups. However, those in the disadvantaged group report breastfeeding rates (26%) which are largely comparable with those of the lowest occupational social class in the most recent National Perinatal Statistics (20%), and which are substantially lower than the overall national average breastfeeding rate (41%) from the same study (Bonham, 2007). All of the seven advantaged mothers reported breastfeeding their children.

The low mean primiparous age of the disadvantaged women in the current study (21.0 years) versus the national average (30.6 years) (Bonham, 2007), and that of their advantaged counterparts (30.1 years), highlights a further potential risk to long-term health among these women (e.g. reduced peak bone mass in adolescent mothers). While not being breastfed as a child associates with measures of both material disadvantage (e.g. relative income poverty, $p=0.009$) and (particularly) social deprivation (e.g. low social class, $p<0.001$), lower tendency to breastfeed among the women themselves appears to be primarily associated with indices of social disadvantage (disadvantaged locality ($p<0.001$), single parenthood ($p=0.005$) and especially low education ($p=0.030$)). This finding re-emphasises the importance of socio-cultural normative values, support and facilitation in this regard (Yngve & Sjostrom, 2001).

In anthropometric terms, the disadvantaged women have significantly greater mean BMI measurements (25.3kg/m^2 (SD 5.5) vs. 22.9kg/m^2 (SD 3.66), $p=0.001$) and significantly greater mean waist circumference measurements (87.9cm (SD 13.9) vs. 79.7cm (SD 7.9), $p<0.001$) than their more affluent reference group. Critically, mean measurements among the advantaged group approximate to ideal recommended levels, while those of the disadvantaged group approach or exceed recommended upper limits. 45% of the disadvantaged women are classified as overweight or obese (BMI $\geq$25.0 kg/m^2), compared with 24% of the advantaged women ($p=0.003$). Ominously, the disadvantaged women also demonstrate a particularly high prevalence of abdominal obesity (45%) in comparison to their more affluent peers (18%) ($p<0.001$). While some of these differences may relate to differences in parity between the two groups, at least some proportion of this variation is likely to arise from the adverse dietary and other health behaviours which prevail among this group.

Many international studies have identified low SES women as a population group at particularly high risk of obesity (Wardle *et al.*, 2002; James *et al.*, 2006; Baltrus *et al.*, 2007) with further research implicating physical inactivity, breakfast skipping and high consumption of sugar sweetened beverages in particular, as precipitants of obesity in low SES groups (Miech *et al.*, 2006). All of these features occur with high frequency among the disadvantaged women in this study. Additionally, some of the dietary characteristics which associate significantly with high BMI and waist circumference in the current study (e.g. low intake of breakfast cereals ($p=0.004$) and dairy foods ($p=0.016$), high intake of meat and meat products ($p<0.001$)) occur with greater frequency among the disadvantaged women.

Apart from their higher BMI and waist circumference measurements, the disadvantaged respondents are also of significantly shorter stature (1.63m, SD 0.06) than the advantaged women (1.65m, SD 0.07) ($p=0.004$), although it is difficult to assess the contribution of environmental factors to this disparity. Greater BMI and waist circumference measurements are predicted by both social and material disadvantage, providing further evidence of the multi-factorial origins of overweight and obesity among disadvantaged urban communities.

While the anthropometric data for the disadvantaged group are particularly worrying, even among the advantaged respondents, an appreciably greater proportion (18%) exceed the waist circumference guideline of 88cm than was reported for women of the same age in the NSIFCS (15%). These findings may reveal a secular rise in obesity prevalence since the NSIFCS data were collected in 1997-1999 (National Task Force on Obesity, 2005). They also highlight the urgent need for coherent strategies to prevent obesity among young women of all socio-economic backgrounds in Dublin.

As was the case for the less health conducive dietary patterns observed among the low SES women, there is evidence which demonstrates that the adverse health behaviours described previously do not associate equally with all of the indices of disadvantage. For example, while smoking and low participation in vigorous physical activity are predicted by virtually all of these indices of disadvantage, non-use of dietary supplements associates primarily with markers of social deprivation (e.g. low social class (p=0.001), low socio-economic group (p=0.002)). Similarly, breastfeeding also associates with markers of social deprivation (e.g. low education (p=0.030). These findings suggest the primacy of social disadvantage (e.g. deficits in socio-cultural and formal education) in determining low supplementation and breastfeeding rates among the low SES women.

7.2.3. General, Health & Dietary Attitudes

Chapter 4 and Chapter 5 have described significantly less favourable dietary habits, nutrient intakes, health behaviours and anthropometric status among women of low socio-economic status. Chapter 6 aimed to illuminate the attitudinal and psychosocial mediators of these socio-economic differences in behaviour by both quantitative and qualitative means.

7.2.3.1. Attitudes and Diet

The disadvantaged group report a significantly poorer appreciation of the importance of both diet ($p<0.001$) and exercise ($p=0.044$) to health. As in previous studies, this highlights the considerable difficulties to be overcome in eliciting behavioural improvements in such groups, as well as the wider population (Kearney & McElhone, 1999; Dibsdall *et al.*, 2003).

These women did however, cite the health importance of bodyweight ($p=0.017$), stress ($p=0.061$), and non-significantly, smoking ($p=0.207$) and alcohol consumption ($p=0.509$), more often than their peers, perhaps reflecting their greater familiarity and experience with these issues. Although the disadvantaged women are able to identify some core fundamentals of the healthy diet (e.g. “more fruit and vegetables”), they are less likely to use abstract concepts (e.g. “balance and variety”) for this purpose. Reduction of sugar ($p=0.075$) and reduction of alcohol ($p=0.024$) are more frequently selected as important elements of the healthy diet by the disadvantaged women, again perhaps accurately reflecting the greater problems which exist with these food groups in their disadvantaged communities.

Regarding the perceived barriers to healthy eating, the disadvantaged women are significantly more likely to cite perceived knowledge barriers (poor self-perceived healthy eating knowledge ($p<0.001$), experts keep changing their minds ($p=0.001$)) than the advantaged respondents. Previous work (Van Duyn *et al.*, 2001; Clarke *et al.*, 2007), has emphasised the importance of knowledge deficits in poorer eating behaviour among the general population and young low-income mothers respectively, and it seems that such issues may be important impediments to healthy eating among the current group of disadvantaged women. Although this effect was initially masked in the qualitative study by participants' contention that their dietary knowledge was good, further discussion soon revealed this confidence to be misplaced. This highlights the critical importance of nutritional education among low SES women, to address not just their theoretical (e.g. poor food composition knowledge) and applied knowledge (e.g. poor cooking and shopping skills) deficits, but also to highlight the existence of such deficits and to stress the personal relevance and potential benefits of healthy eating to these women.

In contrast to the knowledge barriers cited by the disadvantaged respondents, the advantaged group cite time barriers (busy lifestyle ($p=0.005$), irregular/long working hours ($p<0.001$) significantly more frequently than their disadvantaged counterparts, again concurring with previous work in this area (Lappalainen *et al.*, 1997).

Resistance barriers to dietary change ("don't like healthy foods", "taste", "requires me to eat strange or unusual foods", "too great a change from my current diet", "don't want to change") are all cited more frequently by the disadvantaged group, although perhaps due to low overall respondent selection, differences in these variables between the two groups only approach statistical significance for "don't like healthy foods" ($p=0.089$).

These resistance barriers in the low SES women are superimposed on the ubiquitous identification of low willpower as the primary barrier to healthy eating in the overall population (>50% of all subjects). In simple terms, these findings suggest that a high proportion of all women have difficulty motivating themselves towards a healthy diet, but in the case of disadvantaged women who may also experience sensory impediments (e.g. food neophobia), knowledge deficits and cultural barriers to healthy dietary selection, these motivational barriers may be considerably more difficult to overcome.

Although cost of healthy food and particularly lack of facilities and lack of availability of healthy food were conspicuously absent as perceived barriers to healthy eating among the disadvantaged women in the quantitative study, these barriers did emerge more strongly in the qualitative study, although they probably remained subservient to other obstacles such as psychological stress, in determining poor dietary behaviour. Many previous studies have described the primary role of financial constraint in poor dietary behaviour (Darmon *et al.*, 2002; Drewnowski, 2004; Drewnowski *et al.*, 2007b). However, it appears that in the current context, the cost of healthy food may occupy a less prominent barrier to healthy diet among young women of low SES, than other psycho-social factors.

In examining the attitudinal and psychosocial variables which associate with poorer dietary habits (and, by inference, sub-optimal nutrient intakes) (see Table 6.4), several coherent themes emerge. The traits shown to be most strongly predictive of more favourable dietary habits were action and maintenance stages of dietary change, conscious effort to eat a healthy diet and conscious effort to limit fat in the diet.

These findings demonstrate that respondents who actively pursue a healthy diet, are generally adept at achieving this objective, although this may also reflect features of their generally higher socio-economic status. Conversely, chance locus of health control, and to a lesser extent, pre-contemplation of dietary change, associate with generally poorer dietary habits. The findings relating chance locus of health control to poorer dietary behaviour are consistent with existing literature in this area (Martikainen *et al.*, 2003), while the action and maintenance stages of dietary change have been associated with more favourable dietary behaviour in several studies (Pollard *et al.*, 2002; Lea *et al.*, 2006). Chance locus occurs significantly more frequently among those in the lower strata for virtually all of the socio-economic parameters examined, while action and maintenance stage of change, conscious effort to eat healthily and conscious effort to limit dietary fat are all reported to a considerably lesser extent by those in the lower groupings. These findings concur with the literature in this regard (de Graaf *et al.*, 1997; Wardle & Steptoe, 2003), and highlight the prominence of fatalism and poor motivation as key proximal effectors of poor diet among these low SES women.

The qualitative study helps to elucidate some of the issues which underlie these health subversive attitudes, including depression and particularly psychological stress. Many of the women report “comfort eating” and binge eating as a coping mechanism. This often occurs in response to environmental stressors such as childcare duties, accommodation difficulties, financial hardship, unemployment and time constraints. Hence, although self-rated psychological stress itself did not associate significantly with poorer eating habits in the quantitative survey, the qualitative findings leave little doubt that this is one of the key stimuli of less favourable dietary patterns among these low SES women.

Contrary to expectation, lack of future orientation predicts neither poorer dietary patterns nor adverse health behaviours among the quantitative study population. This is at variance with the findings of several studies (Wardle & Steptoe, 2003), which have identified these adverse practices as the downstream outcomes of a poorer overall capacity for abstract thought regarding future health. Although the qualitative study indicates that these women do have some level of future orientation, it also suggests that these considerations may relate more to the short to medium term and may not equate to those of their more socially advantaged peers. The methodological differences between the quantitative and qualitative studies, particularly the selection of ten year future salience in isolation for the quantitative study, may account for their variant outcomes.

With regard to sources of health information, those who use the mass media (TV, radio, magazines and the internet) for this purpose show significantly better dietary and lifestyle habits than their peers. The greater use of these mass media by the advantaged respondents may indicate that this is one way in which they derive knowledge to facilitate their healthier diet and lifestyle practices. A greater proportion of disadvantaged respondents (84.6%) than advantaged respondents (58.1%) refer to public health practitioners (GPs, nurses etc.) for health information ($p<0.001$) raising a number of issues. Firstly, given the significant nutrition and health knowledge deficits which characterise these low SES women, it demonstrates a failure to adequately exploit these communication channels to improve dietary knowledge and behaviour among young disadvantaged women. Secondly, it highlights the need to adequately train GPs, public health nurses and other community health practitioners to deliver coherent and reliable dietary advice to such women which takes cognisance of their specific barriers to healthy eating, as well highlighting the need for targeted expansion of specialised community dietetic services within these disadvantaged communities.

Finally, of the barriers to healthy eating discussed previously, taste and dietary knowledge associated most strongly with poorer dietary habits. While the resistance factors including taste were collectively cited more frequently as barriers to healthy diet among the disadvantaged group, taste itself was not significantly over-represented as a barrier among the low SES women. Hence, any possible preponderance of food neophobia as an impediment to healthy diet among low SES women requires further clarification.

With regard to poor self-perceived dietary knowledge however, this is strongly predictive of several less favourable dietary habits including lower fruit and vegetable (p=0.020), fish (p=0.015) and dairy (p=0.021) intakes, as well as a tendency towards lower breakfast cereal consumption (p=0.082). The significantly greater preponderance of poor self-perceived dietary knowledge as a healthy eating barrier among the low SES women, particularly as defined by *social* measures of deprivation (e.g. low social class, p=0.002), underscores this issue as a key priority for intervention among such groups.

Interestingly, although the identification of price as a barrier to healthy diet occurs more frequently among those who are experiencing material deprivation (p=0.001) and consistent poverty (p=0.017), selection of this barrier is not predictive of less favourable dietary habits in the quantitative study. The qualitative study however, suggests that the affordability of healthy food presents a significant barrier to healthy eating among these disadvantaged women, and this fact is vividly illustrated in some of the focus groups.

7.2.3.2. Attitudes and Health Behaviours

A greater proportion of disadvantaged (15.6%) than advantaged (4.1%) women consider obesity to be an influence on health than their more advantaged peers ($p=0.017$). Paradoxically, this coincides with a significantly greater prevalence of overweight and central obesity among these low SES women (see Chapter 5).

Examination of the attitudinal trends which predict adverse health behaviours (see Table 6.5) reveals that many of the psychometric traits which previously coincided with differences in food group consumption, are also predictive of differences in these health behaviours. For example, chance locus of health control is associated with increased smoking prevalence ($p=0.010$) and lower participation in vigorous activity ($p<0.001$), while in addition to these behaviours, external locus of control coincides with lower supplement use ($p=0.031$) and higher BMI ($p=0.016$) and waist circumference ($p=0.006$). For dietary stage of change too, the action and maintenance stages are predictive of healthier behavioural patterns (lower smoking rates ($p=0.001$), greater vigorous activity participation ($p<0.001$), less excessive alcohol intake ($p=0.028$), greater supplementation ($p<0.001$)), although no real functional relationship would be anticipated between these variables. With regard to sources of health information, those who use the mass media for this purpose again display more favourable health behavioural patterns including lower smoking rates ($p<0.001$), greater participation in vigorous activity ($p=0.024$) and greater supplementation ($p=0.021$), as well as lower waist circumference ($p=0.026$), indicating that they seek out other healthy behaviours in addition to their healthier diet.

7.3. Conclusions

What actually emerges therefore, is in essence, an overall "health pursuit" attitude which embraces elements of greater health consciousness and education, greater health motivation, greater health information seeking and reduced health fatalism. As discussed previously, these attitudinal characteristics are significantly underrepresented among the low SES women in this study. It is the combination of these attitudinal and psycho-social traits, along with socio-cultural, structural and material barriers, which appears to elicit the poorer dietary and health behaviours observed among these women. These deleterious behaviours can thus be considered the non-specific consequences or outcomes of wider sociological and cultural phenomena which pervade life in the lower socio-economic strata.

7.4. Intervention

Both the attitudinal component of the quantitative survey and the qualitative study provide an insight into the factors underpinning adverse dietary and health practices among these disadvantaged young women. These findings are important as they elucidate some of the issues to be addressed in seeking to improve these behavioural patterns towards those of their more advantaged peers, with the ultimate objective of reducing their related health inequalities.

It is clear from both the quantitative and qualitative studies that poorer dietary and health knowledge play at least some part in the adverse behaviours of these disadvantaged women. While this points to education as a key element of any cohesive intervention programme, it is crucial that this education be tailored to its intended audience. This should ideally involve a collaborative approach (Sahay *et al.*, 2006; Bhargava & Amialchuk, 2007), which would enable these women to express their requirements for the pursuit of a healthier diet and health-related behaviours. The objective in formulating the nutrition intervention in this way, is to improve not just participants' technical knowledge and practical skills (Hartman *et al.*, 1994), but also to enhance their sense of ownership and active participation in the programme. It will also ensure that measures to address the most pertinent barriers to healthy diet in these groups are included in the intervention.

Simple, mechanistic explanations of the *long-term* hazards of poor diet and health behaviours, beyond immediate effects on functional indices, should also enhance the personal relevance of such interventions. Diminished capacity for such abstract concepts of health has been highlighted among lower SES groups (Giskes *et al.*, 2002; Coveney, 2005), and may compromise their motivation to improve health behaviours.

It is also important that these nutrition and health education programmes should include childhood interventions to prevent the establishment of deleterious behavioural patterns (e.g. smoking, excessive alcohol intake, fast food consumption) in early life. Early exposure to the taste of healthy foods such as fruit, vegetables, breakfast cereals and fish as part of these childhood interventions may also reduce the sensory barriers to the consumption of these foods which seem to prevail across all socio-economic strata.

Low motivation and fatalism have been identified as important antecedents of poor diet and health behaviours among the disadvantaged women. As health may not be a priority for many of these women in dietary and health behavioural decisions, interventions may need to rely on other "motivational triggers" to make healthy diet and lifestyle "high involvement" pursuits among these low SES women. In simple terms, this might mean emphasising the aesthetic benefits of healthy diet and exercise (e.g. high dairy intake, low sugar intake, increased breakfast cereal consumption, smoking cessation), or stressing the importance of these factors in their children's long-term health (e.g. breakfast cereal and fish consumption, modeling physical activity). Family mealtimes and food provision from the home should be encouraged and facilitated in this context, to limit recourse to fast food and snack food outlets.

The practical achievability of making appropriate changes should also be emphasised to overcome the pervasive lack of self-confidence which predominates among these women. To this end, these schemes might incorporate practical courses in food preparation. Such courses have been well received among young women of low SES in the past (Symon & Wrieden, 2003), and might also compensate for the deficits in social learning which often inhibit the development of these skills among disadvantaged communities (e.g. Healthy Food Made Easy). An emphasis on easily prepared, convenient foods and recipes would be of particular benefit here, given the frequent identification of time constraints as a barrier to healthy eating by both the disadvantaged and advantaged women. By introducing participants to unaccustomed "healthy" foods in a formalised setting, these practical sessions might also help to overcome the food neophobia which is thought to inhibit the spontaneous selection of unfamiliar foods among these groups. As gate-keepers in terms of family food supply (Gibson *et al.*, 1998), this would yield benefits not only for the women themselves, but also for their children, who might consequently experience less sensory barriers to the consumption of these foods in later life.

In terms of content, these nutrition education programmes should focus on the food groups of greatest nutritional value and those whose low intakes have been shown to associate with sub-optimal nutrient intake among disadvantaged women in this study. Greater intakes of fruit and vegetables, breakfast cereals, fish, and low fat dairy products should be emphasised, while reduced intakes of processed meats and processed potato products should also be stressed. Dairy foods should be particularly encouraged among those who are *socially* deprived (e.g. low social class, low education), while sweet, sugary foods and drinks should be specifically discouraged among those experiencing *material* deprivation (e.g. relative income poverty, consistent poverty). Particular emphasis should be placed upon the exclusion of sugar-sweetened (non-diet) beverages, as these are significant contributors to overall NMES among the low SES women, and may also significantly predispose to weight gain (Miech *et al.*, 2006). The frequency of sugary food consumption should ideally be reduced by displacement with fruit (Wansink *et al.*, 2006), while portion sizes of these sweet, sugary foods should also be moderated to limit overall intake levels. At the structural level, the affordability and availability of nutrient-dense, energy-dilute foods could be enhanced by legislative subsidies which would "make the healthier choice, the easier choice", in accordance with best practice models in public health (WHO, 1987).

One of the challenges of eliciting such dietary change is the poor perceived taste of these healthier foods among many people (Lappalainen *et al.*, 1997), and indeed, there is some indication that these resistance barriers (including taste) occur with disproportionate frequency among the current sample of disadvantaged women. Therefore, simple, practical, economical and *palatable* dishes and recipes based on the food groups cited above should form the basis of such nutrition education programmes.

These settings-based interventions should be widely available to all young women in disadvantaged communities, and active participation strongly encouraged, to increase not just the amounts of nutrient dense, energy dilute foods taken by consumers, but also to increase *the proportion* of disadvantaged women consuming these foods. Specific targets in this regard would include fruit, breakfast cereals and fish, all of which are consumed by a lower percentage of disadvantaged women in the current study. Apart from the inclusion of food related information in these courses, they might also include instructive elements concerning other health behaviours like smoking, alcohol and low physical activity, as the pronounced co-segregation of these adverse patterns with poorer dietary practices among low SES groups (as observed in the current study) has been observed to develop from adolescence onwards (Van Lenthe *et al.*, 2001). Smokers might even be targeted as a specific group for healthy eating interventions, given the common coincidence of tobacco use and poor diet.

Excessive alcohol consumption and physical inactivity appear to be endemic among these young women, irrespective of socio-economic status, and these issues will need to be prioritised by broader-based public health intervention strategies, in addition to targeted interventions for disadvantaged women. “Point of purchase” health warnings for alcohol, and “decision point” interventions for physical activity (e.g. notices on public stairs and elevators) might yield benefits with regard to these behaviours.

The origins of the psycho-social traits which are predictive of poor habits must also be addressed as a key priority. This will require the provision of adequate mental health facilities and services in the community to effectively tackle the endemic psychological stress and depression which precipitate adverse health behaviours in these communities.

The utility of locally-based, structured programmes or workshops designed to build confidence, self-efficacy and self-esteem, perhaps within the context of existing community training schemes should also be further explored. Attendance at such programmes has been identified as a potent precipitant of greater dietary and health-related self-efficacy and behavioural improvement in the qualitative focus groups. Alternative coping mechanisms could also be recommended at these sessions (e.g. structured exercise groups), to counter the frequent recourse to comfort eating, alcohol consumption and smoking as stress-relief measures among women of low SES. Such group based interventions could also help to eradicate some of the socio-cultural barriers associated with health-seeking behaviours in these communities, while at the same time fostering peer-encouragement for these healthier practices. By "re-orientating" peer pressure away from health-damaging behaviours and towards health-conducive behaviours in this way, social support for the pursuit of healthy diet and lifestyle among these women might be significantly enhanced.

The precipitants of the psycho-social stressors which lead to adverse food intake and physical activity patterns also need to be addressed at a fundamental socio-cultural level however. While the targeted expansion of specialised *remedial* mental health services for low SES women may alleviate some of the *impact* of these psycho-social stressors, measures to address their underlying causes will also be required. Statutory intervention should include measures to address structural issues such as the price and availability of healthy food and alcohol, the advertisement of energy-dense, nutrient-dilute foods and especially beverages, the formulation of legislative guidelines for coherent food labeling, and the disproportionate location of fast food outlets (Drewnowski *et al.*, 2007a) and off-license premises in these localities.

Tax incentives and subsidies might also be offered to convenience food outlets providing nutrient-dense, low energy foods within these communities.

At the wider societal level, social inequalities including those related to the equitable provision of housing and accommodation, affordable childcare facilities, appropriate leisure amenities and recreational space, and adequate social welfare payments will need to be addressed. Crime and social disorder will also need to be tackled in a substantive way which creates safe localities which are supportive to the pursuit of healthy lifestyles.

Finally, the use of community healthcare services as channels for health information to disadvantaged women needs to be more effectively exploited. Because these public health agencies and personnel are widely used sources of health information among these groups, they should be used to deliver clear, concise, practical and realistic guidelines to these women about the best ways to safeguard their long term health. This will require further training in nutrition for non-dietetic clinicians (GPs, public health nurses) in the community, expansion of existing specialised dietetic services in disadvantaged communities, and the development of specialised methods for communicating diet- and health-related messages to these low SES groups.

Antenatal and post-natal contacts would appear to provide good opportunities for such intervention with these women. Antenatal appointments particularly, would provide a forum for incentivising healthy diet and lifestyle in the context of their children's long-term health, as this has been cited as a significant behavioural influence in the current qualitative study.

Improving disadvantaged women's access to health messages transmitted through the general mass media may also prove beneficial, as use of these channels for health information has been strongly associated with more favourable dietary and health behaviours among this study population. The increased exploitation of these media by statutory agencies, as social marketing tools for healthy diet and lifestyle should also be explored. In this way, they could be used to reduce the widespread perception of healthy diet as an onerous or unpleasant "task" among young women of all social backgrounds.

7.5. Future Work

This study has provided a detailed insight into the poorer dietary habits and health behaviours of disadvantaged young women across Dublin. It has also helped to illuminate some of the material, structural, social and cultural indices of disadvantage which coincide with these poorer behaviours. The attitudinal and psycho-social traits which associate with these behaviours have been described by both quantitative and qualitative methods, and their prevalence among the low SES women investigated to ascertain whether they might be considered proximal effectors of health subversive behaviours which lie at an intermediate point of the causal pathway between poverty, poor diet and health behaviours and ill-health.

The practical challenges of diet and health surveillance work with such groups should not be underestimated. These respondents are difficult to recruit, requiring the co-operation and assistance of community agencies and leaders as a critical element in the process.

It is important to strengthen and foster these community links to facilitate further work in this area, and this requires that these personnel and agencies be involved in not just the data collection phase of the work, but also that the outcomes of such work be relayed back to the community for use in evidence-based interventions.

Financial inducement in the form of shopping vouchers to incentivise participation in this study also proved critical to its success. From a pragmatic perspective preliminary pilot work and liaison with community leaders had indicated that response rates would be insufficient to yield any meaningful outcome, without such provision. From a methodological perspective, these inducements also helped to adjust for the inherent selection bias which can confound findings from such self-selected cohorts. With regard to the survey administration, comprehension and literacy difficulties among respondents complicated the data collection process, and the facilitation of these sessions by more than one fieldworker was an important factor in overcoming these difficulties.

While many of the potential limitations of this study were overcome by measures such as those described above, other challenges were more difficult to surmount. Although three different dietary assessment methods were used and tested against one another, it is unlikely that any method will yield absolutely accurate dietary intake data. While this is an inherent problem in all such dietary assessment studies, it is particularly pertinent in the current context where respondent burden, low literacy, poor comprehension and cultural barriers to participation are all more prominent considerations. Also pertinent in this context is the issue of respondent confusion regarding the precise *brand* of dietary supplements taken. Occasionally this necessitated the estimation of associated micronutrient intakes from commonly used preparations of similar *type,* highlighting the need for subjects to bring along any such products used, on the day of data collection.

The detailed dietary, socio-economic, health behavioural and attitudinal information required in this study precluded the collection of detailed data relating to physical activity. While this is regrettable, it highlights this area as a priority for future research among young women, given the ubiquitous low levels of physical activity suggested by preliminary data from this study. Excessive alcohol consumption among these young women, particularly those in the disadvantaged group, highlights this issue as a further priority for future research, given the dearth of robust domestic data in this regard, and the continued and increasing prominence of epidemiological trends which are indicative of high intake levels. With regard to smoking data, exact age of commencement and precise number of cigarettes smoked per day were estimated from indicative ranges, and could arguably have been measured more precisely, although these behaviours were not the primary focus of the study.

Pilot work suggested significant resistance to more precise measurement of respondents' weekly incomes, and these were therefore, by necessity, estimated from a series of ranges. While strenuous efforts were made to capture as many dimensions of disadvantage as possible, it is difficult to say whether these parameters adequately articulate the full "lived experience" of poverty experienced by the disadvantaged women. In the context of health behavioural research however, these parameters merely constitute *empirical markers* for the more complex socio-cultural processes which actually impact upon these behaviours. With this in mind, future research should focus less on *whether* poorer diet and health behaviours exist among young, disadvantaged women in comparison to their more affluent peers, and more on *why* these behavioural differences exist.

This will require examination of not just the socio-economic indices which are used to define poverty and which give relevance to such work in the policy context, but also the proximate "effectors" of behaviour which coincide with these socio-economic indices. Such work has already been carried out to elucidate the mediators of the educational gradient in smoking prevalence observed among Irish adults (Layte & Whelan, 2004).

It is also important that future work in this area focus not just on the behavioural correlates of health including diet and other health behaviours, but that such data be collected alongside biochemical data which can confirm the patho-physiological impact of these deleterious behaviours. While it is interesting to note the ubiquitously low intakes of vitamin D, folate, iron and other important nutrients among particularly low SES women in the current study, simultaneous confirmation of endemic *low status* for these nutrients by bio-marker analysis, would immeasurably enhance the merit and utility of the work. Similarly, measurement of stress-induced inflammatory markers might help to demonstrate the patho-physiological impact of poverty, beyond the burden imposed by poor health behaviours.

Regarding the relational database generated by this study, further research might extend the dietary assessment method validation to the full 295 respondents. Multivariate analyses should also be carried out to elucidate the unconfounded proportionate strength of the associations which exist between the various socio-economic and attitudinal parameters, and the diet and health behavioural indices under examination.

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Appendix I - Lifestyle Questionnaire

Demographic Details

Name: ______________________________ **Reference No.** ☐

Location: ______________________________ **Date** ☐

Date of Birth: ______________________________

Phone no. ______________________________

Marital Status: (*please tick one*)

- **Single** ☐
- **Married or living with partner** ☐
- **Widowed** ☐
- **Separated** ☐
- **Divorced** ☐

Accommodation: (*please tick one*) **Private** ☐ **Local authority** ☐ **Homeless** ☐

Do you have a medical card?

Yes ☐ **No** ☐

No. in Household: **Adults** ☐ **Children (under 14 years of age)** ☐

Thank you for completing this questionnaire

Local Environment

1. Where do you get most of your food? (***please tick one***)

Corner/small/local shop ☐

Supermarket ☐

Other (please specify below) ☐

____

2. How does the person who shops usually travel to the food shop?
(please tick one)

Walks ☐

Drives (own car) ☐

Takes a bus ☐

Cycles ☐

Gets a taxi ☐

Other (*please specify below*) ☐

____

3. Who prepares and cooks *<u>most</u>* of the food that you eat at home?

Myself ☐ **My partner or spouse** ☐ **My parents/guardians** ☐

Other *(please specify below)* ☐

____

4. Are the playing fields, playgrounds or parks near your home safe to use for walking, and other activities?
(*please tick one*)

Yes ☐ **No** ☐

5. **If you answered *No* to question 4, please state why you consider these areas to be unsafe: (*please tick all relevant options*)**

Pollution ☐

Crime ☐

Dangerous amenities (e.g. playground equipment) ☐

Bullying☐

Other ☐ ***(please specify below)***

____

6. **How would you rate your local healthcare services (GPs, clinics etc.)? (*please tick one*)**

Very good	
Good	
Fair	
Poor	
Very poor	

7. **The following may all be used as sources of health information. Please select the 3 options below which *you* feel are the most important sources of health information *(please rank your choices from 1-3 in order of importance, where 1 is the most important).***

	Rank of Importance
Magazines	
GP	
Television	
Radio	
Community health services	
Public Health Nurse	
Internet	
Friends	
Family	
Books	

Thank you for completing this questionnaire

Views and Attitudes

1. **How often do you think about what will be happening in your life:**
   (please tick one box in each case)

i) In 1 month's time?

Rarely	Not very often	Fairly often	Very often

ii) In 6 month's time?

Rarely	Not very often	Fairly often	Very often

iii) In 1 year's time?

Rarely	Not very often	Fairly often	Very often

iv) In 10 year's time?

Rarely	Not very often	Fairly often	Very often

2. **Which one of the following list do you feel has the greatest effect on health?**

Genes/heredity	
Body weight	
The environment	
Smoking	
Food/diet	
Stress	
Alcohol intake	
Physical activity/exercise	
Support from family and friends	
None of these	
Don't know	

3. **For the following statements, please place a tick in the box which best reflects your view.**

I. **Good health is mainly determined by chance, and there is not much that I can do to influence my long term health.**

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don't know

II. **My health is mainly controlled by outside influences over which I have little or no control.**

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don't know

III. **My health is under my own control, and I can improve my long term health by adopting a healthy lifestyle.**

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don't know

4. **What currently stops you from improving your health?**
(please tick any that you feel are important)

Poor healthcare facilities	
Lack of money	
Lack of time	
Poor support from family and friends	
Poor health knowledge	
Not interested	
Poor reading ability	
Hazardous environment (e.g. crime, pollution)	
Inadequate leisure facilities (sports halls, playing fields etc.)	
Willpower	
Don't need to improve my health as it's already good enough	

5. **In general, would you say that your health is?**
(please tick one box)

Excellent	
Very good	
Good	
Fair	
Poor	

6. **From the following list, please select the 3 options, which <u>you</u> consider best describe a healthy diet.**

Less sugar and sweet foods	
More fruit and vegetables	
Balance and variety	
Less fat and fatty foods	
Fresh or natural foods	
No chemicals, additives or fertilisers	
Less red meat / more white meat and fish	
Less salt	
More fibre/wholemeal foods	
Less dairy products	
Less bread, potatoes and pasta	
More dairy products	
Less alcohol	
More lean meat	
Plenty of nutrients (protein, vitamins, minerals)	

7. **Which of the following statements best describes how you feel about your diet?**
(Please tick one box)

"I have not made any changes to my diet, nor have I given healthy eating any thought"	
"I am beginning to consider making changes to my diet"	
"I am determined to change my diet but have not got around to doing it yet"	
"I have made changes to my diet to make it healthier within the last 6 months"	
"A good while ago I made changes to my diet to make it healthier and I am sticking with it"	
"In the past I made changes to my diet to make it healthier, but I have given that up now"	

8. **Many things can stop us following a healthy diet.**
   From the list below, please tick any of the following which make it more difficult for *you* to eat a healthy diet.

Irregular work hours	
Don't like healthy foods	
Poor cooking skills	
Busy lifestyle	
Makes me stand out from the crowd	
Limited choice when eating out	
Taste preferences of family/friends	
Too great a change from my current diet	
Healthy food is not available in shop, canteen, home	
Don't want to give up favourite foods	
Requires me to eat strange or unusual foods	
Price of healthy foods	
Healthy foods are more awkward to carry home from the shops	
Healthy foods go off more quickly	
I don't know enough about healthy eating	
Healthy food isn't as filling	
Healthy food takes longer to prepare	
Experts keep changing their minds about healthy diet	
Willpower	
Inadequate storage facilities	
Limited cooking facilities	
Don't want to change	
Other (*please give details*)	

9. **For the following statements, please place a tick in the box which best reflects your view.**

I. I make a conscious effort to eat a healthy diet
(please tick one)

Always	Most of the time	Quite often	Now and again	Hardly ever	Don't know

II. Most of my friends follow a healthy diet
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don't know

III. I don’t need to make changes to my diet as it is healthy enough
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

IV. I try to keep the amount of fat that I eat to a healthy amount
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

V. I eat enough fruit and vegetables in my diet
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

VI. My weight is fine for my age
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

VII. I do not need to do more physical activity/exercise than I already do
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

VIII. Most of my friends take plenty of physical activity/exercise
(please tick one)

Strongly Agree	Tend to agree	Tend to disagree	Strongly disagree	Don’t know

Thank you for completing this questionnaire

Health Status

1) Weight ☐ **kg**

2) Height ☐ **M**

3) Waist circumference ☐ **cm**

4) Hip circumference ☐ **cm**

5) Birth weight (if known) ☐ **lbs**

6) Were you breast fed as a baby?

Yes ☐ **No** ☐ **Don't Know** ☐

7) How often (if ever) do you feel under emotional or psychological stress?
(please tick one)

Most of the time	
Twice each day	
Once each day	
2-3 days per week	
Once per week	
Once per fortnight	
Once per month	
Once every 3 months	
Once every 6 months	
Once per year or less	
Never	

8) Have you had any children?

Yes ☐ **No** ☐

9) If you have had children, please indicate:

i) What age were you when your first child was born? ☐ **years old.**

ii) How many children have you had in total? ☐

iii) Did you breast feed your children? **Yes** ☐ **No** ☐

iv) If you breast fed your children, how long was this for? ☐ **weeks.**

Thank you for completing this questionnaire

Other Factors

Date ☐ **Location** ☐ **Ref. No.** ☐

1) Are you currently employed in a paid job?

Yes ☐ **No** ☐

2) If you do have a paid job, what do you do in this job?

____

3) If you do not have a paid job, how would you describe yourself from the choices below?
(please tick one box only)

Working in the home ☐
Unemployed ☐
Student ☐
Government/employment training scheme (e.g. FAS) ☐
Unable to work due to permanent sickness/disability ☐
Other (please specify below) ☐

____

4) If you are not working now but have worked before:

What did you do in your most recent job?

____

5) If you have a partner, do they have a paid job at present?

Yes ☐ **No** ☐ **No partner** ☐

6) **If your partner does have a paid job at present, what do they do in this job?**

____

7) **Do you currently receive any state benefits?**

Yes ☐ **No** ☐

8) **If you answered Yes to Question 7, please state which type of benefit you receive?**

____

9) **What would you estimate your *total household net weekly income* (including wages and all benefits) at:**
(please tick one box only)

Less than 120 Euros ☐
Between 121 and 154 Euros ☐
Between 155 and 184 Euros ☐
Between 185 and 214 Euros ☐
Between 215 and 249 Euros ☐
Between 250 and 299 Euros ☐
Between 300 and 349 Euros ☐
Between 350 and 399 Euros ☐
Between 400 and 449 Euros ☐
Between 450 and 499 Euros ☐
Between 500 and 549 Euros ☐
Between 550 and 599 Euros ☐
Between 600 and 699 Euros ☐
Between 700 and 799 Euros ☐
Between 800 and 899 Euros ☐
Between 900 and 999 Euros ☐
Over 1000 Euros ☐

10) A) Please indicate which (if any) of the following items you have been forced to do without over the last year, because of lack of money *(tick the boxes as appropriate)*.

New (not second-hand) clothes	
A meal with meat, chicken or fish every second day	
A warm waterproof overcoat	
Two pairs of strong shoes	
A roast or its equivalent once per week	
A week's annual holiday away from home	
To be able to save some of my income regularly	
A daily newspaper	
A telephone	
A hobby or leisure activity	
Central heating	
Presents for family and friends once a year	
A car	
A bath or shower	
An indoor toilet	
A washing machine	
A refrigerator	
A colour TV	
A dry, damp-free home	

B) Please indicate which (if any) of the following you have experienced because of lack of money in the recent past *(tick the boxes as appropriate)*

Had a day in the last 2 weeks without a substantial meal	
Had to go without central heating in the last year through lack of money	
Was not able to afford an afternoon or evening out in the previous 2 weeks	
Experienced debt problems arising from ordinary living expenses or availed of charity	

11) Are you experiencing debt problems at the present time?
(tick one of the boxes)

Yes ☐ **No** ☐

12) If you answered Yes to Question 11 above, what is the size of this debt?
(tick one of the boxes)

Less than 50 Euros	
50-99 Euros	
100-249 Euros	
250-499 Euros	
500-999 Euros	
1000-1999 Euros	
2000-4999 Euros	
More than 5000 Euros	

13) Do you have any savings at the present time?
(tick one of the boxes)

Yes ☐ **No** ☐

14) How old were you when you left school?

☐ **years**

15) How would you rate your reading and writing ability?

Very good	**Good**	**Average**	**Poor**	**Very poor**

16) How would you rate your counting and mathematical ability?

Very good	**Good**	**Average**	**Poor**	**Very poor**

17) **Do you have any of the following qualifications?**
(please tick all of the boxes that apply)

Primary Schooling	
Group/Intermediate/Junior Certificate	
Leaving Certificate	
University Degree/Diploma	

18) **Did you gain any further qualifications after you left school?**

Yes ☐ **No** ☐

19) **If you did gain further qualifications/training after you left school, what were they?**

____

20) **How would you describe yourself from the following options?**
(please tick one box)

White / Caucasian	
Black, Afro-Caribbean	
Black, other (e.g. Black African)	
Indian	
Pakistani	
Bangladeshi	
Chinese	
Traveller	
Eastern European	

Thank you for completing this questionnaire

Other Health Behaviours

1) a) Do you drink alcohol?

Yes ☐ **No** ☐

b) On how many days *per week* do you usually drink alcohol?
Please circle your answer below (F stands for once per fortnight, M stands for once per month and R stands for rarely or never).

1 2 3 4 5 6 7 F M R

c) What type of alcohol do you usually drink?
(please tick any that you would take regularly)

Beer ☐ Spirits ☐ Wine ☐ Alcopops ☐

d) How much of each type of alcohol would you drink in a <u>typical week</u>?

Type of Alcohol	**Typical amount per week**
Beer	___________ Half pints
Spirits	___________ Pub measures
Wine	___________ Average size glasses
Alcopops	___________ Bottles

2) a) How often do you take *<u>light</u>* exercise (e.g. walking, slow cycling etc.)?

Type of Exercise	**No. of times/week**	**Time spent**

b) In total, how much time do you spend walking in a typical day?

☐ **minutes**

c) How often do you take *__intense/strenuous__* exercise (e.g. keep fit/gym, running, swimming, fast cycling, other sports etc.)?

Type of Exercise	No. of times/week	Time spent

3) a) Please estimate the time you spend sitting down (e.g. working at a desk, reading, studying, watching TV, speaking on the phone, listening to music etc.) on a typical day?

(please tick one box each for weekdays and weekend)

	Weekdays	Weekend
0-30mins		
30-60 mins		
60-90 mins		
90-120 mins		
2-3 hours		
3-4 hours		
4-5 hours		
5-6 hours		
6-7 hours		
7-8 hours		
8-9 hours		
9-10 hours		
> 10 hours		

4) a) Do you smoke?

Yes ☐ **No** ☐ **Ex-Smoker** ☐

b) At what age did you start smoking?

Less than 8 years	
8-10 years	
10-12 years	
12-14 years	
14-16 years	
16-18 years	
18-20 years	
Over 20 years	
Never started	

c) How many cigarettes do you smoke each day?

None	
1- 5	
5-10	
10-20	
20-30	
30-40	
40-60	
More than 60	

5) a) Do you currently take any nutritional supplements (e.g. vitamins, minerals etc.)?

Yes ☐ **No** ☐

b) If you do take supplements, what type of supplements are these?

____.

Thank you for completing this questionnaire

Appendix II - Diet History Protocol

The following questions aim to determine the respondent's habitual dietary intake. This information should be as detailed as possible and should describe the food and liquid that the respondent eats or drinks in a typical week. It should include:

- ***I. The amount (portion size) of each food or drink taken using the portion sizes illustrated in the food atlas.***
- ***II. The type and brand of food or drink taken.***
- ***III. The method used to prepare and cook the food (e.g. frying, boiling etc.)***
- ***IV. The frequency with which meals and snacks are prepared at home should be stated.***

Name: ______________________________

Location: ______________________________

Ref. No. ______________________________

Date of Birth: ______________________________

Date: ______________________________

Interviewer: ______________________________

Consented: ______________________________

1) Breakfast

a) On how many days per week do you take a breakfast in the morning?

Meal/Snack	How Often? (days per week)
Breakfast	1 2 3 4 5 6 7 F M R

b) At what time is this food and drink usually taken?

Weekdays	Weekend

c) What do you usually take at this time?

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Breakfast Cereal? Sugar added? Milk used?	1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R			
Bread/Toast? Spread used? Jam? Marmalade? Other?	1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Cooked Breakfast **Fry?** **Grill?**	 **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Sausages? Rashers? Eggs? Black pudding? White pudding? Tomato? Onion? Mushrooms? Potato Bread? Soda Bread?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**	Cooking methods etc.		
Beverages	**1 2 3 4 5 6 7 F M R**			
Tea/Coffee? Milk? Fruit juices? Minerals? Water?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**	Sugar added? Type of milk?		
Other foods or drinks?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

d) On how many days is the breakfast prepared at home?

2) Mid-morning

a) On how many days per week do you take something to eat or drink in the mid-morning?

Meal/Snack	**How Often? (days per week)**
Mid-morning	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	**Weekend**

c) What do you usually take at this time?

Meal/Snack	**How Often? (days per week)**	**Type & Brand?**	**Amount Taken?**	
Biscuits	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Scones	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Fruit	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Chocolate	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Yoghurt	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Crisps	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Popcorn	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Sandwich	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Beverages	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Other foods	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

3) Lunchtime

a) On how many days per week do you take something to eat or drink at lunchtime?

Meal/Snack	How Often? (days per week)
Lunchtime	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	Weekend

c) What do you usually take at this time?

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Sandwich	**1 2 3 4 5 6 7 F M R**			
Bread				
Brown?	**1 2 3 4 5 6 7 F M R**			
White?	**1 2 3 4 5 6 7 F M R**			
Fillings				
Cheese?	**1 2 3 4 5 6 7 F M R**			
Chicken?	**1 2 3 4 5 6 7 F M R**			
Ham?	**1 2 3 4 5 6 7 F M R**			
Beef?	**1 2 3 4 5 6 7 F M R**			
Fish?	**1 2 3 4 5 6 7 F M R**			
Eggs?	**1 2 3 4 5 6 7 F M R**			
Beans?	**1 2 3 4 5 6 7 F M R**			
Other?	**1 2 3 4 5 6 7 F M R**			
Salad included	**1 2 3 4 5 6 7 F M R**			
Dressings				
Mayonnaise?	**1 2 3 4 5 6 7 F M R**			
Spread/butter?	**1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Take away/Fast food Beef burgers? Other processed meats (sausages, chickenballs)? Chips? Curry? Chinese? Boiled/Fried rice?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Salad Chicken? Meat? Fish? Bread Brown? White? Dressings Mayonnaise? Salad cream? Others?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Eggs Cooking Method Fried? Boiled/poached? Scrambled? Bread/toast Brown? White?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Soup Creamy? Clear? Bread/toast Brown? White?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Other foods	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Desserts/Confectionery Chocolate? Sweets? Cream/ice-cream? Fruit?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Beverages	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

d) How often is this food prepared at home?

4) Mid-afternoon

a) On how many days per week do you take something to eat or drink in the mid-afternoon?

Meal/Snack	How Often? (days per week)
Mid-afternoon	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	Weekend

c) What do you usually take at this time?

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Biscuits	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Scones	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Fruit	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Chocolate	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Yoghurt	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Crisps	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Popcorn	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Sandwich	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Beverages	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Other foods	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

5) Evening Meal/Dinner

a) On how many days per week do you take an evening meal or dinner?

Meal/Snack	How Often? (days per week)
Evening Meal/Dinner	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	**Weekend**

c) What do you usually take at this time?

Meal/Snack	**How Often? (days per week)**	**Type & Brand?**	**Amount Taken?**	
Meat/Chicken/ Fish/Vegetarian	**1 2 3 4 5 6 7 F M R**	**Packaged, tinned, fresh, etc.**		
Roast Beef?	**1 2 3 4 5 6 7 F M R**			
Minced beef?	**1 2 3 4 5 6 7 F M R**			
Lamb/mutton?	**1 2 3 4 5 6 7 F M R**			
Pork?	**1 2 3 4 5 6 7 F M R**			
Ham?	**1 2 3 4 5 6 7 F M R**			
Burgers?	**1 2 3 4 5 6 7 F M R**			
Sausages?	**1 2 3 4 5 6 7 F M R**			
Lasagne?	**1 2 3 4 5 6 7 F M R**			
Pies?	**1 2 3 4 5 6 7 F M R**			
Coddle?	**1 2 3 4 5 6 7 F M R**			
Casserole/Stew?	**1 2 3 4 5 6 7 F M R**			
Chicken?	**1 2 3 4 5 6 7 F M R**			
Turkey?	**1 2 3 4 5 6 7 F M R**			
White fish?	**1 2 3 4 5 6 7 F M R**			
Oily fish?	**1 2 3 4 5 6 7 F M R**			
Vegetarian?	**1 2 3 4 5 6 7 F M R**			
Other?	**1 2 3 4 5 6 7 F M R**			
Cooking Method				
Fried?	**1 2 3 4 5 6 7 F M R**			
Other?	**1 2 3 4 5 6 7 F M R**			
Fat/skin				
Removed?	**1 2 3 4 5 6 7 F M R**			
Eaten?	**1 2 3 4 5 6 7 F M R**			
Stuffing	**1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Starchy Carbohydrates	**1 2 3 4 5 6 7 F M R**	**Butter, spread etc. added?**		
Potatoes?	**1 2 3 4 5 6 7 F M R**			
Rice?	**1 2 3 4 5 6 7 F M R**			
Pasta?	**1 2 3 4 5 6 7 F M R**			
Noodles?	**1 2 3 4 5 6 7 F M R**			
Bread?	**1 2 3 4 5 6 7 F M R**			
Chips?	**1 2 3 4 5 6 7 F M R**			
Roast Potatoes?	**1 2 3 4 5 6 7 F M R**			
Other?	**1 2 3 4 5 6 7 F M R**			
Vegetables	**1 2 3 4 5 6 7 F M R**	**Tinned, frozen, fresh etc.**		
Carrots?	**1 2 3 4 5 6 7 F M R**			
Peas?	**1 2 3 4 5 6 7 F M R**			
Green beans?	**1 2 3 4 5 6 7 F M R**			
Sweetcorn?	**1 2 3 4 5 6 7 F M R**			
Turnip	**1 2 3 4 5 6 7 F M R**			
Cabbage?	**1 2 3 4 5 6 7 F M R**			
Cauliflower?	**1 2 3 4 5 6 7 F M R**			
Lettuce?	**1 2 3 4 5 6 7 F M R**			
Onion?	**1 2 3 4 5 6 7 F M R**			
Peppers?	**1 2 3 4 5 6 7 F M R**			
Parsnips?	**1 2 3 4 5 6 7 F M R**			
Other?	**1 2 3 4 5 6 7 F M R**			
Sauces/Gravies	**1 2 3 4 5 6 7 F M R**			
Creamy sauce?	**1 2 3 4 5 6 7 F M R**			
Thin sauce?	**1 2 3 4 5 6 7 F M R**			
Gravy on water?	**1 2 3 4 5 6 7 F M R**			
Gravy on meat juice?	**1 2 3 4 5 6 7 F M R**			
Other sauces or dressings?	**1 2 3 4 5 6 7 F M R**			
Other foods	**1 2 3 4 5 6 7 F M R**			
	1 2 3 4 5 6 7 F M R			
	1 2 3 4 5 6 7 F M R			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Desserts? Cake? Custard? Fruit? Trifle? Meringue? Cheesecake? Danish pastry? Jelly? Mousse? Ice cream? Cream? Other?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Beverages?	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

d) On how many evenings is this meal prepared at home?

6) Evening

a) On how many days per week do you take something to eat or drink over the late evening?

Meal/Snack	How Often? (days per week)
Late evening	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	Weekend

c) What do you usually take at this time?

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Biscuits	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Scones	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Fruit	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Chocolate	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Yoghurt	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Crisps	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Popcorn	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Nuts	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

Meal/Snack	How Often? (days per week)	Type & Brand?	Amount Taken?	
Sandwich	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Beverages	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			
Other foods	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

7) Supper

a) On how many days per week do you take something to eat or drink before bedtime?

Meal/Snack	How Often? (days per week)
Supper	**1 2 3 4 5 6 7 F M R**

b) At what time is this food and drink usually taken?

Weekdays	Weekend

c) What do you usually take at this time?

8) Alcohol

a) On how many days per week do you usually drink alcohol?

1	2	3	4	5	6	7	F	M	R

b) What do you drink?

Beer/Stout	Wine	Spirits	Alcopops	Other

c) How many drinks would you have on a typical evening?

Beer/Stout	Wine	Spirits	Alcopops	Other

d) Where do you take this alcohol (pub/home etc.)

Pub	Home	Outside	Friends' homes	Other

9) Exercise

a) How often do you take light exercise (walking, light housework etc.)?

Exercise	Frequency	Duration	Weekly total	Daily average
Walking	**1 2 3 4 5 6 7 F M R**			
Housework	**1 2 3 4 5 6 7 F M R**			
Shopping	**1 2 3 4 5 6 7 F M R**			
Other	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

b) How often do you take vigorous/intense exercise (running, gym etc.)?

Exercise	Frequency	Duration	Weekly total	Daily average
Running	**1 2 3 4 5 6 7 F M R**			
Jogging	**1 2 3 4 5 6 7 F M R**			
Gym	**1 2 3 4 5 6 7 F M R**			
Swimming	**1 2 3 4 5 6 7 F M R**			
Cycling	**1 2 3 4 5 6 7 F M R**			
Field sports (camogie, football etc.)	**1 2 3 4 5 6 7 F M R**			
Racquet sports	**1 2 3 4 5 6 7 F M R**			
Other	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**			

10) Dietary Supplements

a) Do you take any vitamin or mineral supplements?

Yes	No

b) How often would you take these supplements?

Supplement	Days per week	Brand	Daily dose	Avg. Daily dose
Multivitamin	**1 2 3 4 5 6 7 F M R**			
Cod liver oil	**1 2 3 4 5 6 7 F M R**			

Supplement	**Days per week**	**Brand**	**Daily dose**	**Avg. Daily dose**
Vitamin C	**1 2 3 4 5 6 7 F M R**			
Brewer's Yeast	**1 2 3 4 5 6 7 F M R**			
B complex	**1 2 3 4 5 6 7 F M R**			
Vitamin C	**1 2 3 4 5 6 7 F M R**			
Evening Primrose Oil	**1 2 3 4 5 6 7 F M R**			
Iron	**1 2 3 4 5 6 7 F M R**			
Calcium	**1 2 3 4 5 6 7 F M R**			
Vitamin D	**1 2 3 4 5 6 7 F M R**			
Other	**1 2 3 4 5 6 7 F M R**			

Thank you for completing this questionnaire

Appendix III - Food Frequency Questionnaire (FFQ)

For each of the foods listed below please write:

- ***How often you would take that food (the no. of days per week should be circled under the "how often" column). In this column, F stands for once per fortnight, M stands for once per month and R stands for rarely or never***
- ***How much of that food you would usually eat each time you have it (e.g. 3 biscuits, 1 orange, 1 chicken breast, 1 cupful of cooked porridge etc.)***
- ***What type of that food it is (e.g. Jacob's digestive biscuits, Tesco cola, low fat milk, Weetabix, Donegal catch, Denny sausages etc.).***

Food	How Often? (days per week)	Amount Taken?	Type & Brand?
Crisps	1 2 3 4 5 6 7 F M R	__________ bags	
Green Vegetables (frozen, fresh, tinned)	1 2 3 4 5 6 7 F M R	_______ tablespoons	
Other Vegetables (frozen, fresh, tinned)	1 2 3 4 5 6 7 F M R	_______ tablespoons	
Chips (home cooked)	1 2 3 4 5 6 7 F M R	_________ cupfuls	
Fruit juice	1 2 3 4 5 6 7 F M R	_________ half pint glasses	
Chipper	1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R	________ single portions of chips ________ others (please specify which)	
Take-away (Chinese, Indian etc.)	1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R	_________ cupfuls (rice, noodles, pasta, chips etc.) _________ cupfuls (curry, tikka, etc.)	

Food	How Often? (days per week)	Amount Taken?	Type & Brand?
Milk (including milk in tea & coffee)	**1 2 3 4 5 6 7 F M R**	**_________ pints**	
Red meat (from pig/sheep/cow) e.g. beef, lamb, pork, bacon, ham, mutton, veal.	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**	**_________ chops** **_________ cups cooked mince** **_________ ozs. steak**	
Other meats (burgers, sausages etc.)	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**	**_________ burgers** **_________ sausages** **_________ others (please specify which)**	
Oily fish (e.g. herring, mackerel, salmon, trout, tinned fish)	**1 2 3 4 5 6 7 F M R** **1 2 3 4 5 6 7 F M R**	**_________ 130 gram tins** **_________ Medium sized fish**	
Biscuits	**1 2 3 4 5 6 7 F M R**	**_________ biscuits**	
Chocolate	**1 2 3 4 5 6 7 F M R**	**_________ bars**	
Sweets (jellies, toffees, hard sweets etc.)	**1 2 3 4 5 6 7 F M R**	**_________ sweets**	
Yoghurt	**1 2 3 4 5 6 7 F M R**	**_________ tubs**	
Wholemeal or Wholegrain Bread	**1 2 3 4 5 6 7 F M R**	**_________ slices**	
Butter/spread	**1 2 3 4 5 6 7 F M R**	**_________ teaspoons**	
Cakes	**1 2 3 4 5 6 7 F M R**	**_________ Buns/slices of cake**	

Food	How Often? (days per week)	Amount Taken?	Type & Brand?
Porridge	1 2 3 4 5 6 7 F M R	_________ cupfuls of cooked porridge	
High Fibre Breakfast Cereal (Branflakes, All bran, Shredded Wheat, Shreddies, Special K, Weetabix)	1 2 3 4 5 6 7 F M R 1 2 3 4 5 6 7 F M R	_________ cupfuls _________ biscuits	
Other Breakfast Cereals (Cornflakes, Rice Krispies, Sugar Puffs, Cheerios, Cocopops etc.)	1 2 3 4 5 6 7 F M R	_________ cupfuls	
Jams/marmalade	1 2 3 4 5 6 7 F M R	_________ teaspoons	
Cheese	1 2 3 4 5 6 7 F M R	_________ matchbox sizes	
Fruit	1 2 3 4 5 6 7 F M R	_________ pieces	
Fizzy drinks (diet, regular etc.)	1 2 3 4 5 6 7 F M R	_________ half pint glasses	
Sugar	1 2 3 4 5 6 7 F M R	_________ teaspoons	

Food	How Often? (days per week)	Amount Taken?	Type & Brand?
Chicken/Turkey	1 2 3 4 5 6 7 F M R	_________ medium breasts _________ medium legs	
White Fish (e.g. cod, whiting, haddock, hake, sole)	1 2 3 4 5 6 7 F M R	_________ medium sized fish	
Pasta (e.g. spaghetti, lasagna macaroni, ravioli)	1 2 3 4 5 6 7 F M R	_________ cupfuls of cooked pasta	
White Bread	1 2 3 4 5 6 7 F M R	_________ slices	
Cooking oils/fats	1 2 3 4 5 6 7 F M R	_______ tablespoons	
Potatoes	1 2 3 4 5 6 7 F M R	_________ medium potatoes	
Rice	1 2 3 4 5 6 7 F M R	_________ cupfuls of cooked rice	
Bread Rolls	1 2 3 4 5 6 7 F M R	_________ rolls	

Thank you for completing this questionnaire

Appendix IV 24 Hour Diet Recall

Please write out below everything that you ate or drank yesterday. This information should be as detailed as possible and should describe only the food and liquid that you actually ate or drank. It should include:
I. The amount (portion size) of each food or drink taken using typical household measures (e.g. a cupful, a small bowl, medium potatoes, a handful etc.).
II. The type and brand of food or drink taken.
III. The method used to cook the food (e.g. frying, boiling etc.)
The place that food was prepared should be ticked as home (H) or outside the home (O)

Yesterday

Subject Name	Date	Day of the Week

Breakfast: What was the first thing you had to eat or drink yesterday morning after you got up?

H	O

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……………………………………………………………………………………………………
……………………………………………………………………………………………………
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Mid morning: Did you have anything to eat or drink during the morning?

H	O

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……………………………………………………………………………………………………
……………………………………………………………………………………………………

Lunchtime:

H	O

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……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Mid afternoon: Did you have anything to eat or drink during the afternoon, between lunchtime and your evening meal?
H / O …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… ……………………………………………………………………………………
Evening meal/dinner:
H / O …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… ……………………………………………………………………………………
Evening/night time snack: Did you have anything to eat or drink after your dinner or before you went to bed last night?
H / O …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… …………………………………………………………………………………… ……………………………………………………………………………………

Do you feel that this was a typical day's diet?

Yes ☐ **No** ☐

Does it represent how you eat on most days?

Yes ☐ **No** ☐

Are there any snacks, drinks, alcohol etc. that you may have had over the day but have forgotten to mention?

Yes ☐ **No** ☐

Appendix V – Quantitative Study Introductory Letter

DUBLIN INSTITUTE OF TECHNOLOGY
Institiúid Teicneolíochta Bhaile Átha Cliath

DIT Kevin Street, Dublin 8, Ireland
DIT Shráid Caoimhín, Baile Átha Cliath 8, Éire
Tel: 353 – 1 – 402 3000
Fax: 353 – 1 – 402 4999

Dear Volunteer,

The purpose of this letter is to tell you about a new study which will look at lifestyles in different communities across Dublin. It is being done by researchers at DIT Kevin Street in cooperation with the XXXX Centre.

The survey will ask about a range of issues. The information that you give in these questionnaires will tell us some of the things that can affect lifestyle badly (e.g. money worries etc.) in your day to day life. We can then use this information to tell decision makers what things are needed to improve lifestyles in your community. In other words, the study will allow **you** to give **your view** on what needs to be done to improve the quality of life in your community.

All of the questions which appear in the questionnaires are important. The information given is **highly confidential**. The answers given will not be seen by anyone but me, and the information from the questionnaires will be held **anonymously** on a secure database.

I thank you in advance for your kindness in completing the questionnaires and in helping with this important work.

With best regards.

Yours sincerely,

Daniel McCartney, DIT Researcher.

Appendix VI - Recruitment Sites for Quantitative & Qualitative Fieldwork

1. Arran Quay GATEWAY Project, Arran Quay, Dublin 7.
2. Mercy family Centre, St. Teresa's Gardens, Dublin 8.
3. An Cosan Women's Resource Centre, Tallaght, Dublin 24.
4. Finglas FAS Training Centre, Finglas, Dublin 11.
5. Ballyfermot FAS Training Centre, Ballyfermot, Dublin 20.
6. Dun Laoghaire FAS Centre, Dun Laoghaire, Co. Dublin.
7. Rowlagh Youth Training Scheme, Rowlagh, Dublin 20.
8. Blanchardstown Area Partnership, Blanchardstown, Dublin 15.
9. Pleasant's Street FAS Training Centre, Pleasant's Street, Dublin 8.
10. Ballymun Health Centre, Ballymun, Dublin 11.
11. Warrenmount CED Centre, Blackpitts, Dublin 8.
12. Finglas Traveller Support Group.
13. Cherry Orchard Equine Centre, Cherry Orchard, Dublin 20.
14. Corduff Community Resource Centre, Corduff, Dublin 15.
15. Darndale Discovery Centre, Village Centre, Darndale, Dublin 17.
16. DIT Kevin Street, Kevin St., Dublin 8.
17. DIT Aungier Street, Aungier St., Dublin 8.
18. KPMG Limited, Harbourmaster Place, IFSC, Dublin 1.
19. Vodafone Ireland Ltd., Mountainview, Leopardstown, Dublin 18.
20. Lucan Book Club, Lucan, Co. Dublin.

Appendix VII – Standardised Data Collection Protocols

Introduction

- Purpose explained as "lifestyle survey" asking about food, exercise, and some other behaviours, and opinions regarding these.
- Questionnaires to be filled in as completely as possible.
- Reassurance provided regarding anonymisation, aggregation and storage of data.
- Respondents to sign front of questionnaire to indicate consent to participate.
- Vouchers for participation explained to respondents.
- Respondents to seek assistance from a fieldworker if they have any difficulty or confusion regarding completion of the questionnaires.

Screening

- Check that respondents are not pregnant or lactating/breastfeeding, and that they are within the designated 18-35 year age group.

SES Data Collection

- Respondents to indicate *net weekly income* for the *full household.*
- Respondents to list *all* members of household, and all children under 14 years.
- If respondents are not working and have not worked before, they should state the occupation of the head of household.
- Respondents to indicate all markers of deprivation which apply to them in past year.
- Respondents to indicate all levels of education which they have successfully completed.

Dietary Data Collection

- Diet history, FFQ and 24 hour diet recall to be administered in that order.
- Format of diet history to be explained – frequency, amounts, types of food.
- FFQ to be explained – frequency, amount and type of foods.
- 24 hour diet recall to be explained – amount and type of food, typical day?
- Where required respondents to be assisted in estimation of portion size – refer to typical household measures first, followed by food atlas portion sizes if required.
- All drinks to be included on dietary assessment sheets.

Anthropometry

Weight

- Scales placed on firm, even surface.
- Scales re-zeroed prior to each respondent.
- Pockets emptied, shoes removed, light clothing only.

- Respondent standing still, upright and looking straight ahead with feet slightly apart so that weight is evenly distributed.
- Respondent to remain on platform until readout steady.
- All weights to be documented immediately.

Height

- Stadiometer placed on firm, even surface.
- Shoes removed, light clothing only.
- Headgear removed, hair flattened.
- Respondent standing still, looking straight ahead with head in Frankfort position and line of vision perpendicular to body.
- Head, back, buttocks and back of heels in contact with backboard.
- Both arms hanging relaxed by sides.
- Respondent to inhale deeply while maintaining this position.
- All heights to be documented immediately.

Waist circumference

- Circumference measuring tape used for all measurements.
- Measurements to be taken from left hand side.
- Respondent to stand upright, looking straight ahead, with feet roughly shoulder width apart (~30cm between feet).
- Highest point on hip bone (iliac crest) located.
- Lowest point on rib cage located.
- Midpoint between these two points marked on the mid-axillary line.
- Tape placed snugly around respondent's waist at this point in contact with skin.
- Respondent to breathe out gently and position of tape against skin to be checked before measurement taken (i.e. no twists in tape, no gaping etc.).
- All waist measurements to be documented immediately.

Others

- Physical activity – all types of structured PA and their frequency and duration to be estimated. *Total* sitting time per day (work and leisure) required.
- Alcohol – types, amounts and frequency for each type estimated for a *typical* week.
- Breastfeeding – this refers to any breastfeeding (respondents to estimate duration in terms of weeks).
- Supplements – this refers to *current* use, *types and brands* to be provided if possible.

Appendix VIII – Initial Qualitative Topic List for Focus Groups

Do you think that you live more "for the moment" or more "for the future"?

Do you think that your health is mainly:

- Under the control of others?
- Down to chance?
- Under your own control?

Do you think that diet, smoking, exercise or dietary supplement use really can influence health?

What does a healthy diet mean to you? What foods would this include/exclude?
(ref fruit & veg, sweets, fizzy drinks, proc foods, breakfast cereals, meat, starchy foods)

Are there any factors which stop you from having a healthy diet and lifestyle?
(ref price, knowledge, transport, taste, family, cooking skills, media, lack of time, anxiety/depression, diet is already good enough)

Describe your typical experience of food shopping.

- Are you alone or accompanied by e.g. children?
- When, how often and where do you shop? Why?
- What influences what type of food you buy (price, habit, taste, availability, family preferences, packaging, health, convenience of preparation etc.)?
- Is healthy eating an important factor in deciding what food to buy?
- Do you read food labels?

What does health mean to you?

What do poverty and wealth mean to you?

Give me an examples of people who you feel are poor/wealthy?

How do you view yourself with regard to these issues?

Do you ever feel a sense of hopelessness, stress or lack of control over your own life? (do you feel that this ever influences you diet or other health behaviours?)

Do you ever experience problems with debt?

What would you require to make your life easier in general?

What would you require to allow you to eat more healthily?

Are there any factors which prevent you from exercising more (e.g. don’t need to, poor/inaccessible facilities, low willpower, lack of time, bad weather, etc.)?

What would you require to allow you exercise more?

Appendix IX – Final Qualitative Topic List for Focus Groups

1. Do you think that you live more “for the moment” or more “for the future”? “Do you plan ahead? Why?”

Specific reference to:

- Children
- Money issues (saving up, debt etc.)
- Health

2. Do you feel that you have control over your health?

3. What does health mean to you? (“What is health?”)

Ref looking after yourself, living longer, looking and feeling better from previous groups

4. What do you feel are the main things that influence/affect health? Specifically:

- What are the main things that can damage health?
- What are the main things that can improve health?

(Cue diet if not mentioned here. Also ref stress, smoking, alcohol, lack of money, depression, peer pressure, sleep, poor motivation)

5. What does a healthy diet mean to you? What foods would this include/exclude? (ref fruit & veg, sweets, fizzy drinks, proc foods, breakfast cereals, meat, starchy foods)

- What foods are healthy foods?
- What foods are unhealthy foods? Why? (Ref weight control)
- Are more expensive food brands better? (Do you “get what you pay for”?)

6. Are there any factors that stop you from having a healthy diet? (ref price, knowledge, transport, taste, family, cooking skills, media, lack of time, anxiety, depression, diet is already good enough)

Replace with:

"What causes you to eat unhealthy foods?"
(Ref kids, taste, price, convenience, time, availability, advertising of junk foods etc as above)

Kids coming first may be NB here (associated with better self-esteem previously)

Comfort eating, depression, stress and loneliness should be raised here.

7. What influences the type of food you buy (price, habit, taste, availability, family preferences, packaging, health, labels, convenience of preparation etc.)?

Ref especially kids, taste, health labels and convenience of preparation.

8. Do you often cook at home or do you order in? Why?

9. What would you need to allow you to eat more healthily?

Ref Written information? Better cooking skills and knowledge? More money? More time?

10. Do you enjoy exercise?

11. Are there any factors which prevent you from exercising more (e.g. don't need to, poor/inaccessible facilities, low willpower, lack of time, bad weather, etc.)?

Can be rephrased as: "What stops you from exercising more?"

Ref time and willpower especially.

How many think they already exercise enough?

How much exercise should we take?

12. What would you need to allow you exercise more?

13. Do you ever feel a lack of control over your own life? (do you feel that this ever influences you diet or other health behaviours?)

Ref welfare system, stress, family and kids

14. What are the things that stress you out?

Ref accommodation worries, kids, work, family, crime, money, debt, illness, “the system” (welfare system) etc.

15. Do you ever experience problems with money or debt?

Ref childcare costs, welfare allowances, accommodation/rent costs.

“If you’re on a tight budget, how do you save money?”

Appendix X Qualitative Study Introductory Letter

DUBLIN INSTITUTE OF TECHNOLOGY
Institúid Teicneolíochta Bhaile Átha Cliath

DIT Kevin Street, Dublin 8, Ireland
DIT Shráid Caoimhín, Baile Átha Cliath 8, Éire
Tel: 353 – 1 – 402 3000
Fax: 353 – 1 – 402 4999

Dear Volunteer,

Many thanks for agreeing to take part in this study.

This study will look at lifestyles in different communities across Dublin and is sponsored by the Food Safety Promotion Board (FSPB).

The information that you give in these sessions will tell us some of the things that can affect lifestyle badly (e.g. money worries etc.) in your day to day life. We can then use this information to tell decision makers what things are needed to improve lifestyles in your community. In other words, the study will allow **you** to give **your view** on what needs to be done to improve the quality of life in your community.

The information given in these sessions is **highly confidential**. None of the opinions or views expressed by individuals at the meeting will ever be identifiable to those individual persons. The information from the study will be held **anonymously** on a secure database.

I thank you in advance for your kindness in taking part and in helping with this important work.

With best regards.

Yours sincerely,

Daniel McCartney, DIT Researcher.

Appendix XI - Informed Consent Declaration for Qualitative Study Respondents

Attitudes and Beliefs of Young Dublin Women regarding Health, Diet and Related Issues

Principle Researcher: Daniel McCartney

Project Supervisor: Dr. John Kearney

DECLARATION

I ____________________________________ agree that the purpose of this study has been explained to me in detail.

I understand that the information given by me is **completely confidential** and that **my name or other identifying details will never be used by the researchers**.

I understand that even though the collective results of the survey may published in a report, thesis or article, **I will never be personally identified or be recognisable** from any published material.

I understand that the collected data from this study will be destroyed in 10 years from the end of the study.

I ____________________________________ agree to take part in this survey about health- and diet-related attitudes conducted by Daniel McCartney, School of Biological Sciences, DIT.

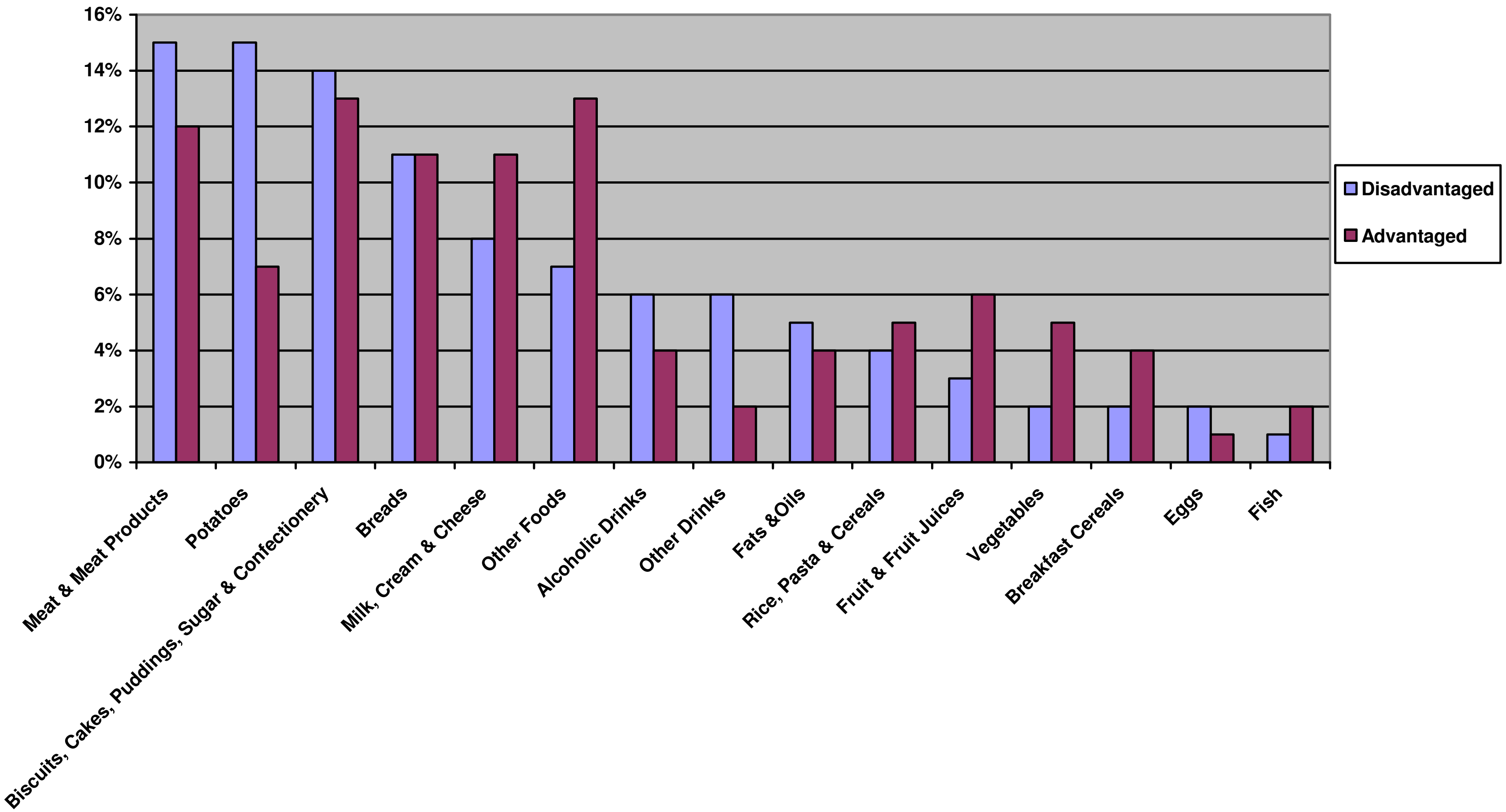
____

(Printed Name)

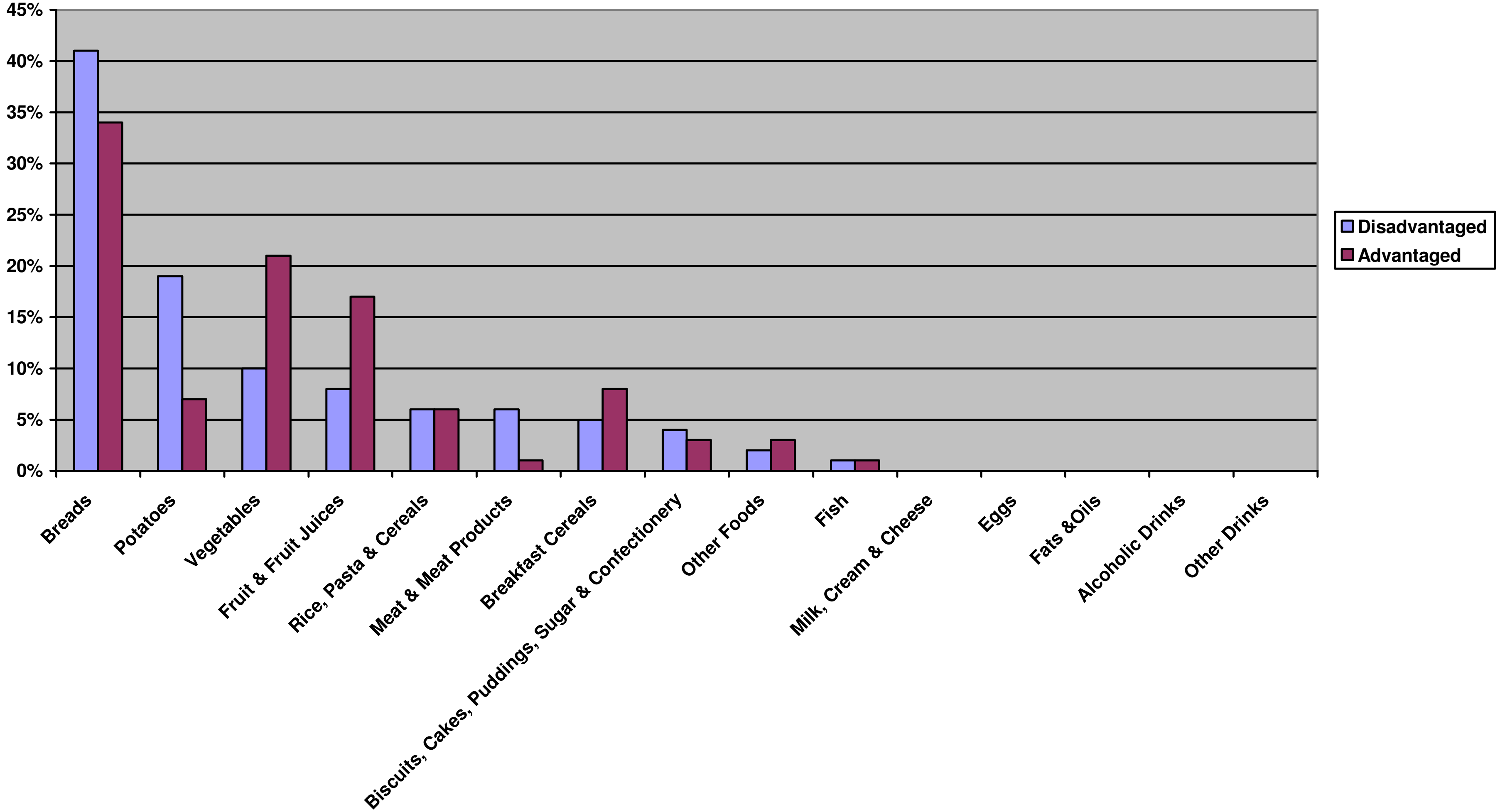
____

(Signature)

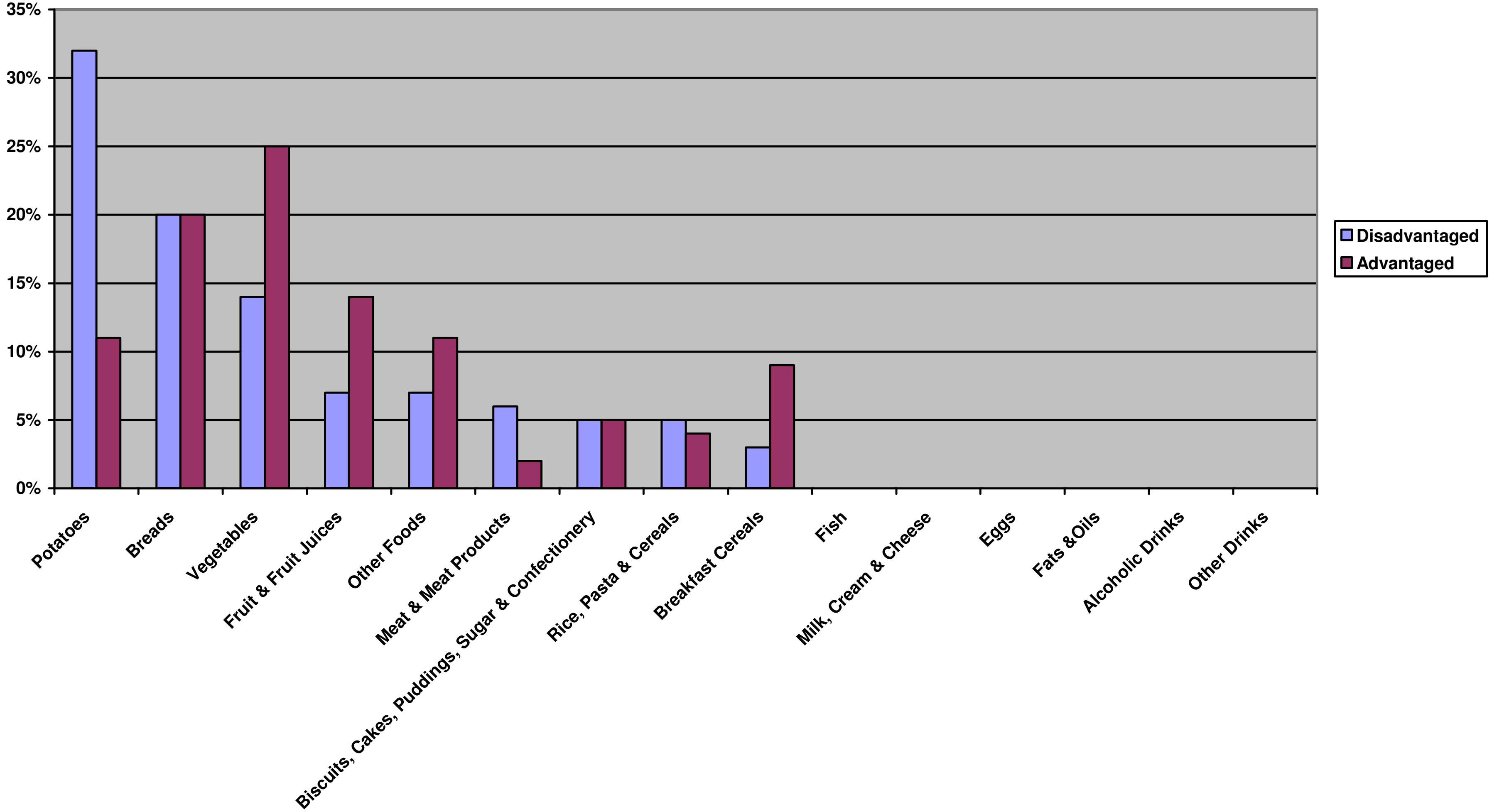
Appendix XII - Food Group Contributors to Energy, Dietary Fibre and Macronutrient Intakes



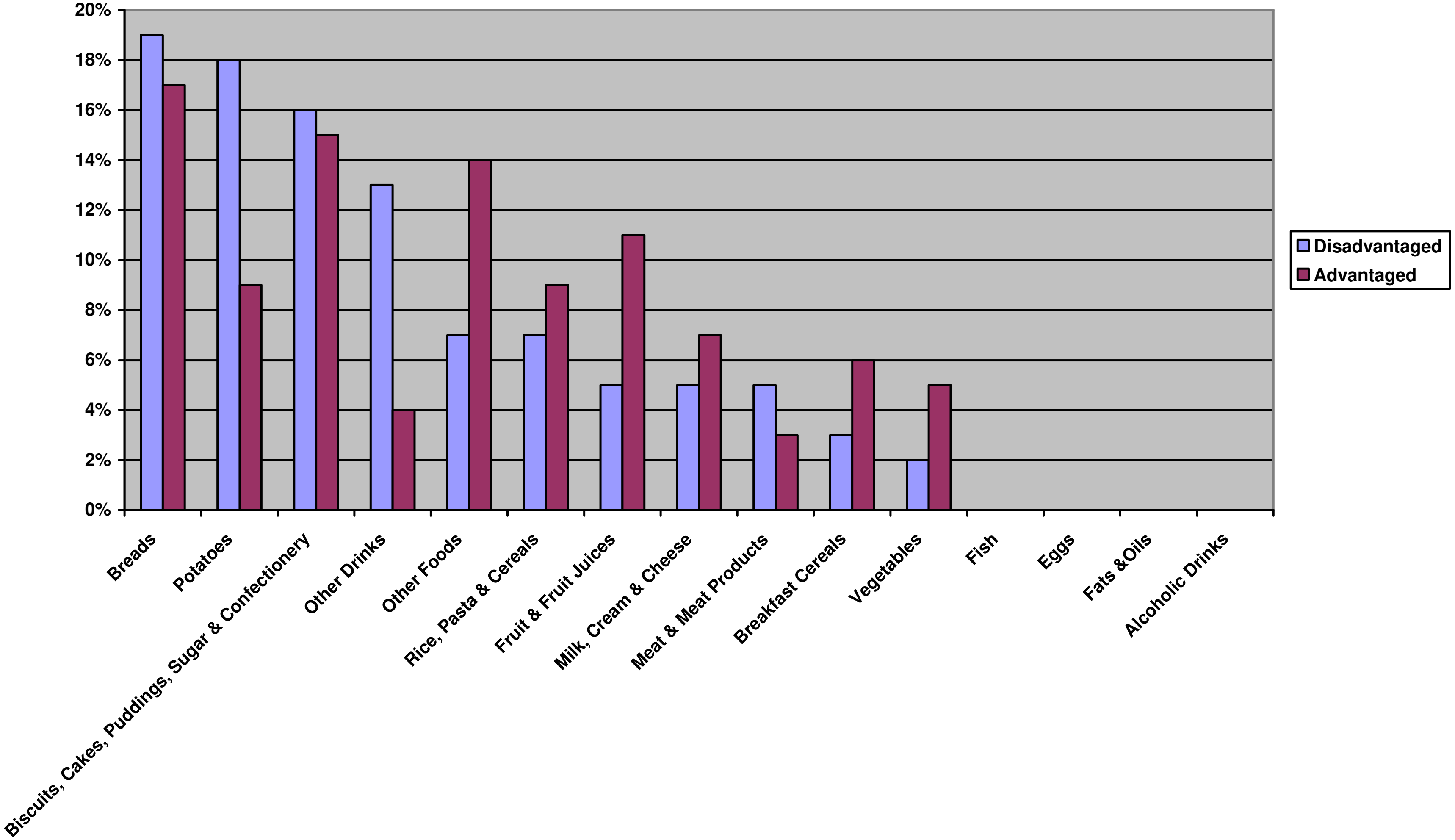
Appendix XII (a) Food Group Contributors to Total Energy among Disadvantaged and Advantaged Respondents



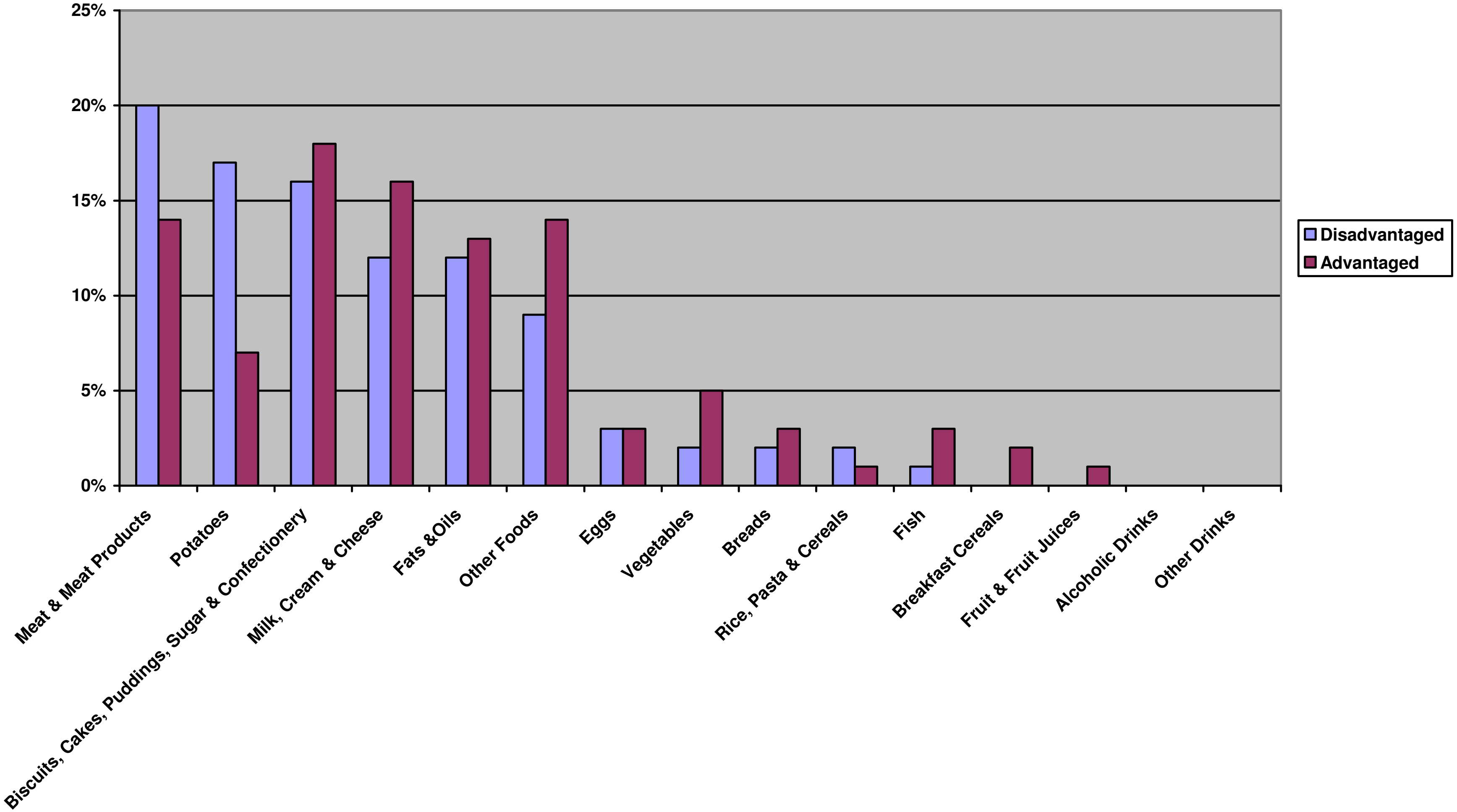
Appendix XII (b) Food Group Contributors to Dietary Fibre (Southgate, AOAC) among Disadvantaged and Advantaged Respondents



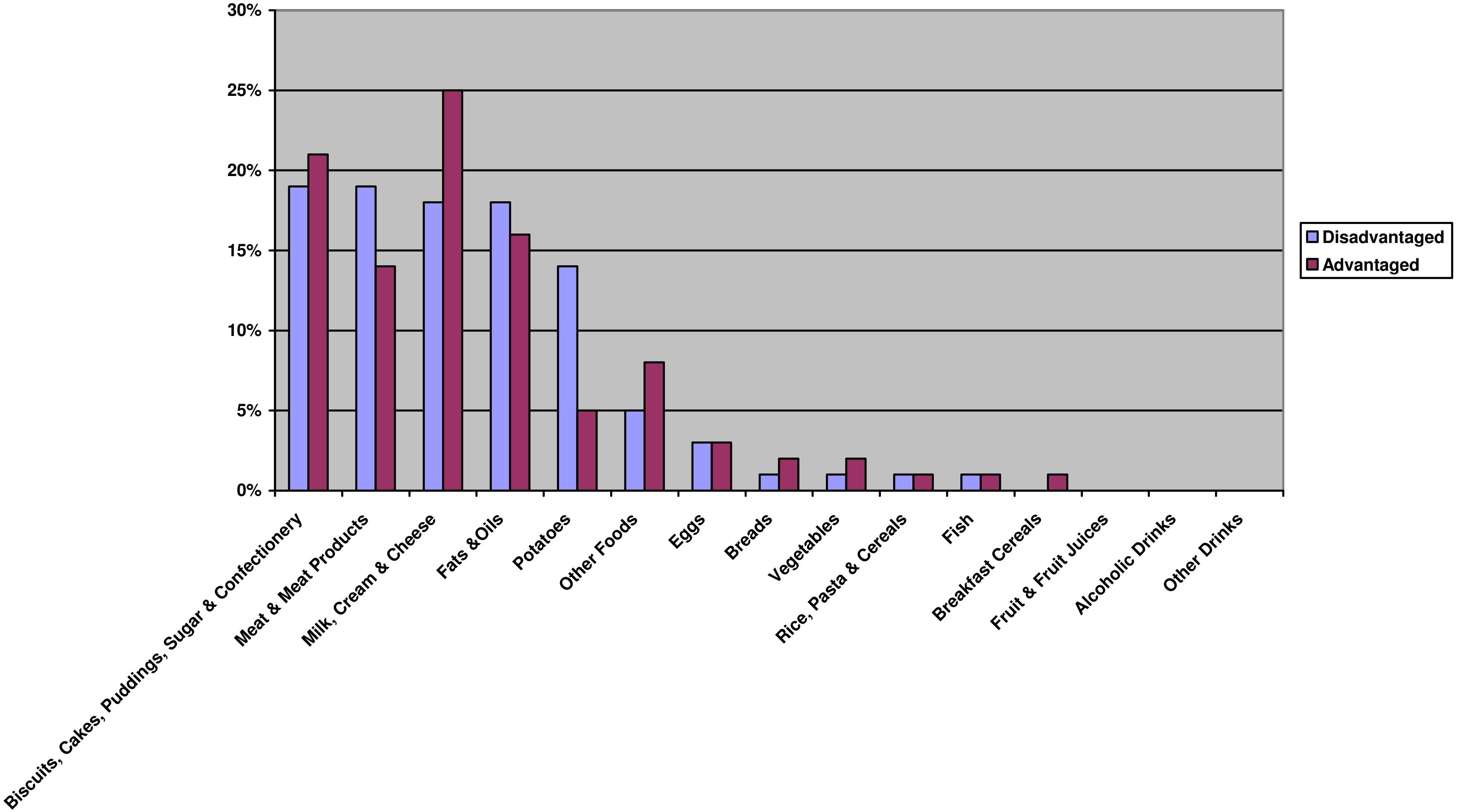
Appendix XII (c) Food Group Contributors to Non-Starch Polysaccharide (NSP) among Disadvantaged and Advantaged Respondents



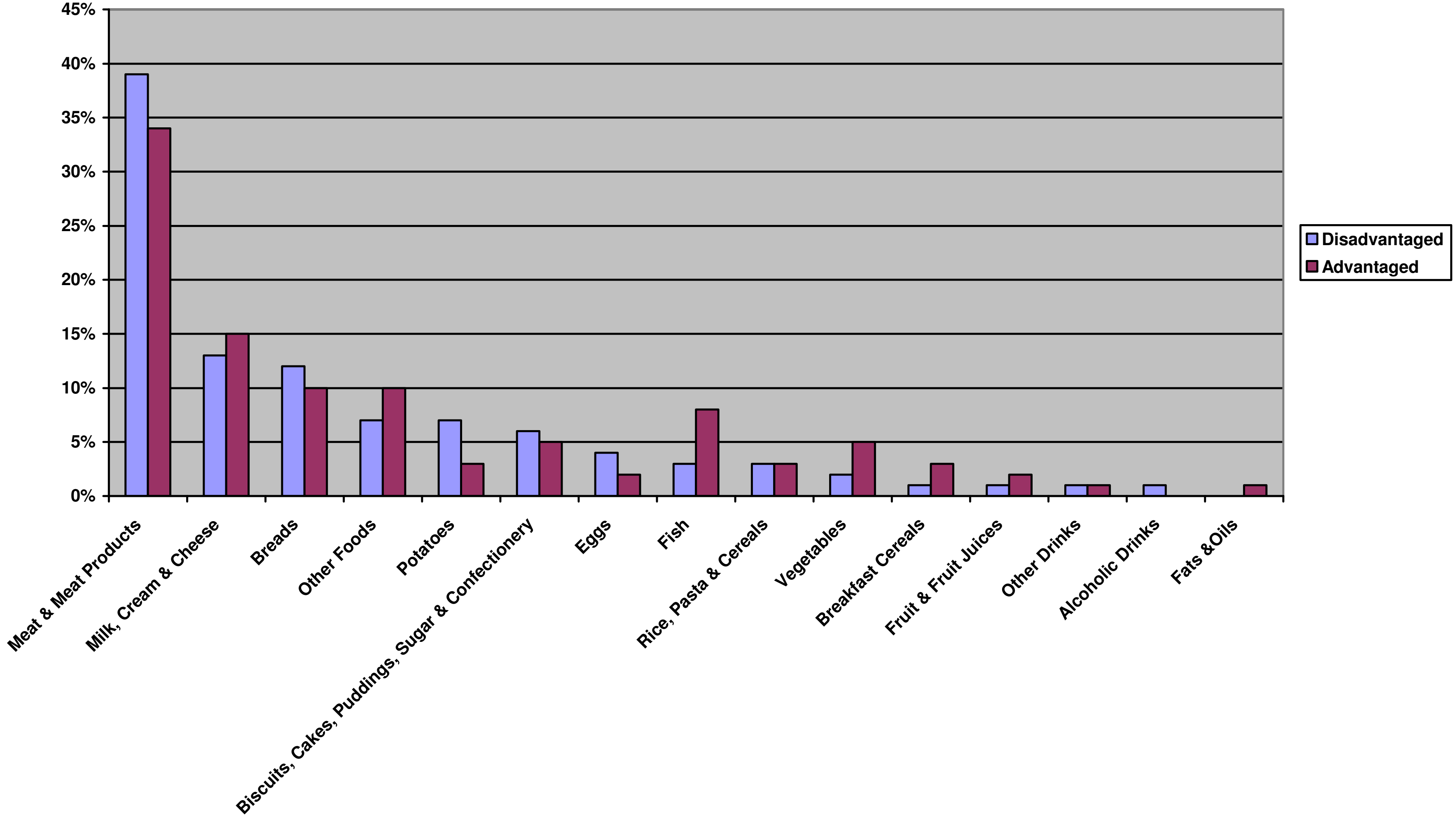
Appendix XII (d) Food Group Contributors to Carbohydrate Intake among Disadvantaged and Advantaged Respondents



Appendix XII (e) Food Group Contributors to Total Fat Intake among Disadvantaged and Advantaged Respondents

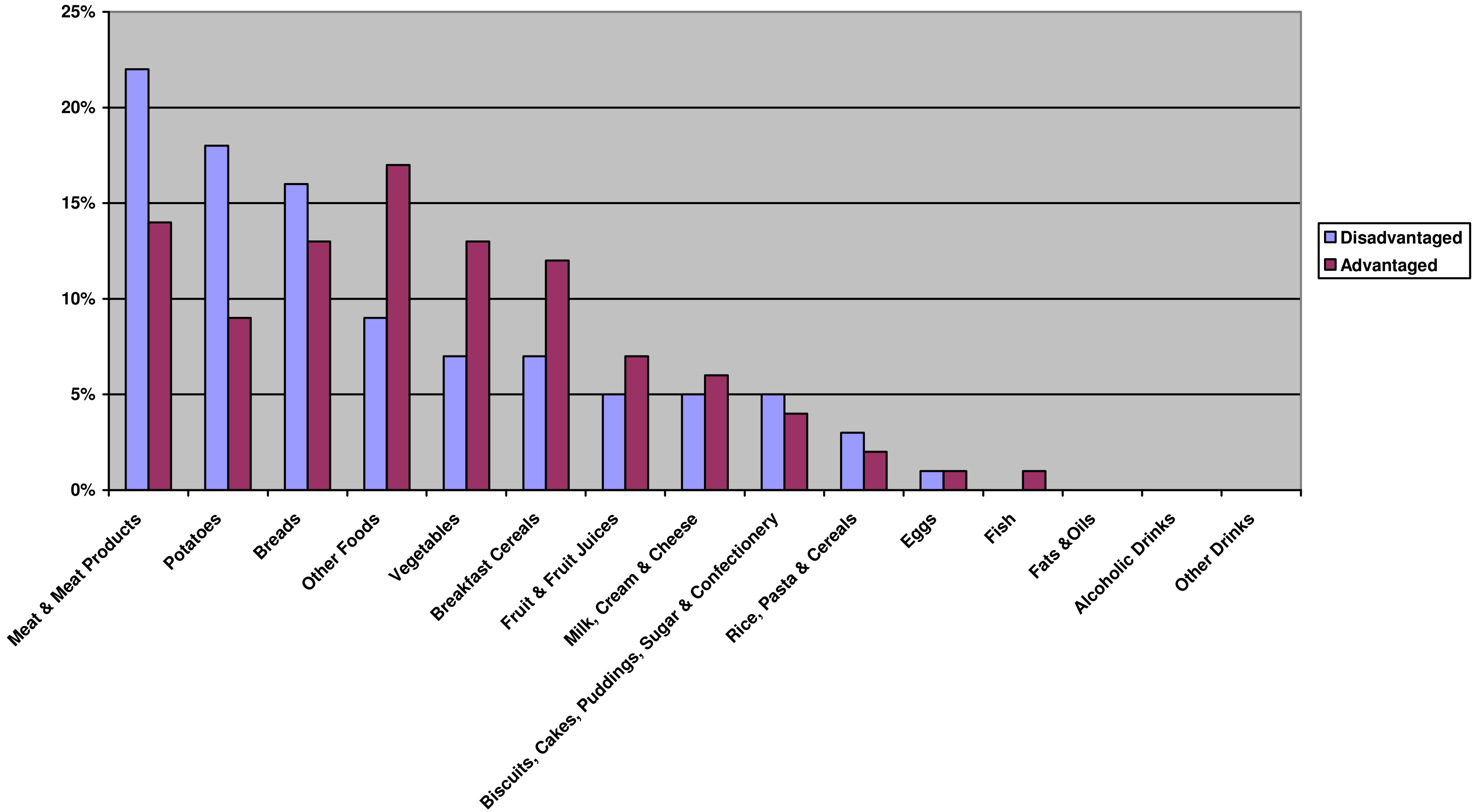


Appendix XII (f) Food Group Contributors to Saturated Fat Intake among Disadvantaged and Advantaged Respondents

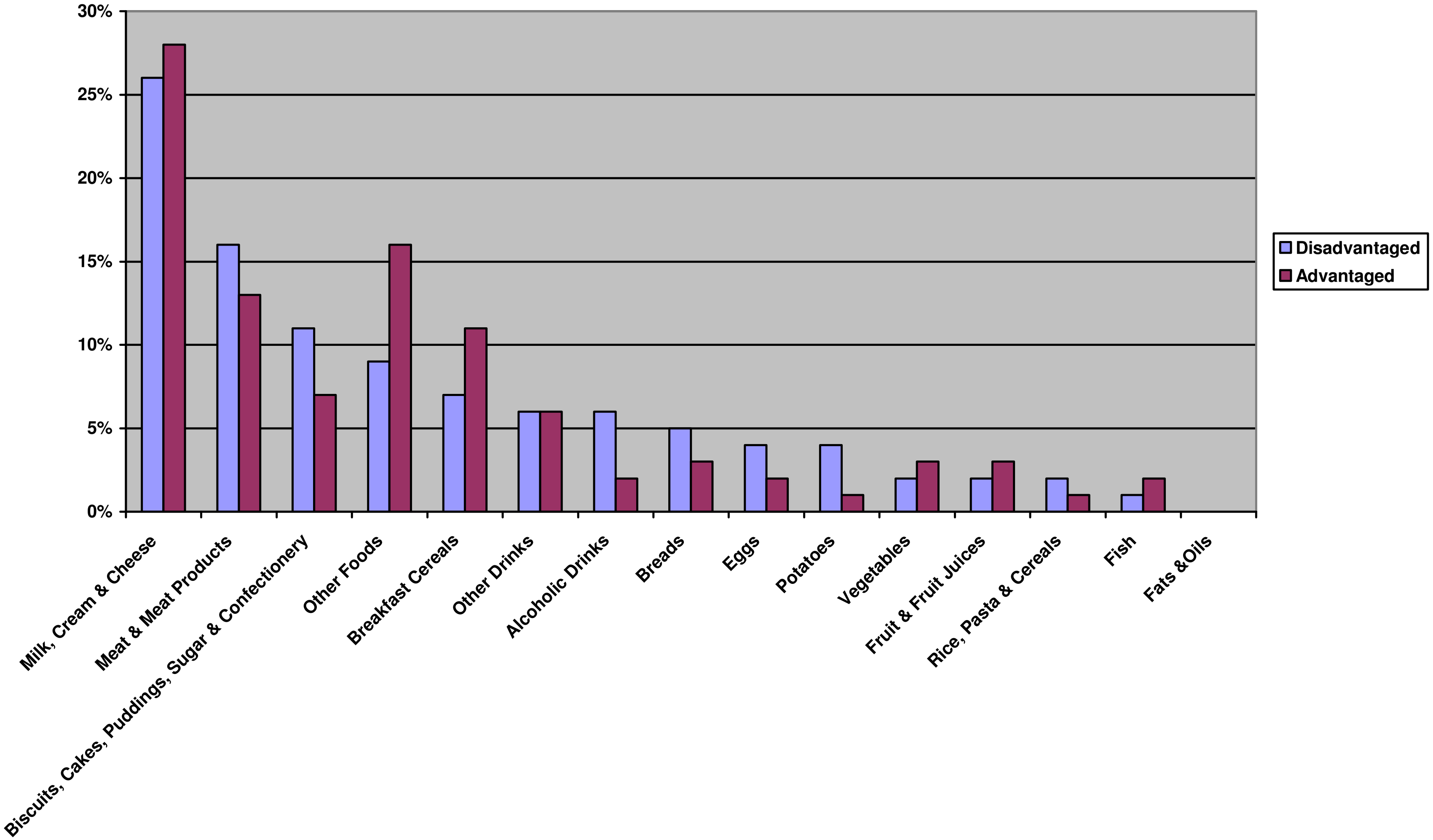


Appendix XII (g) Food Group Contributors to Protein Intake among Disadvantaged and Advantaged Respondents

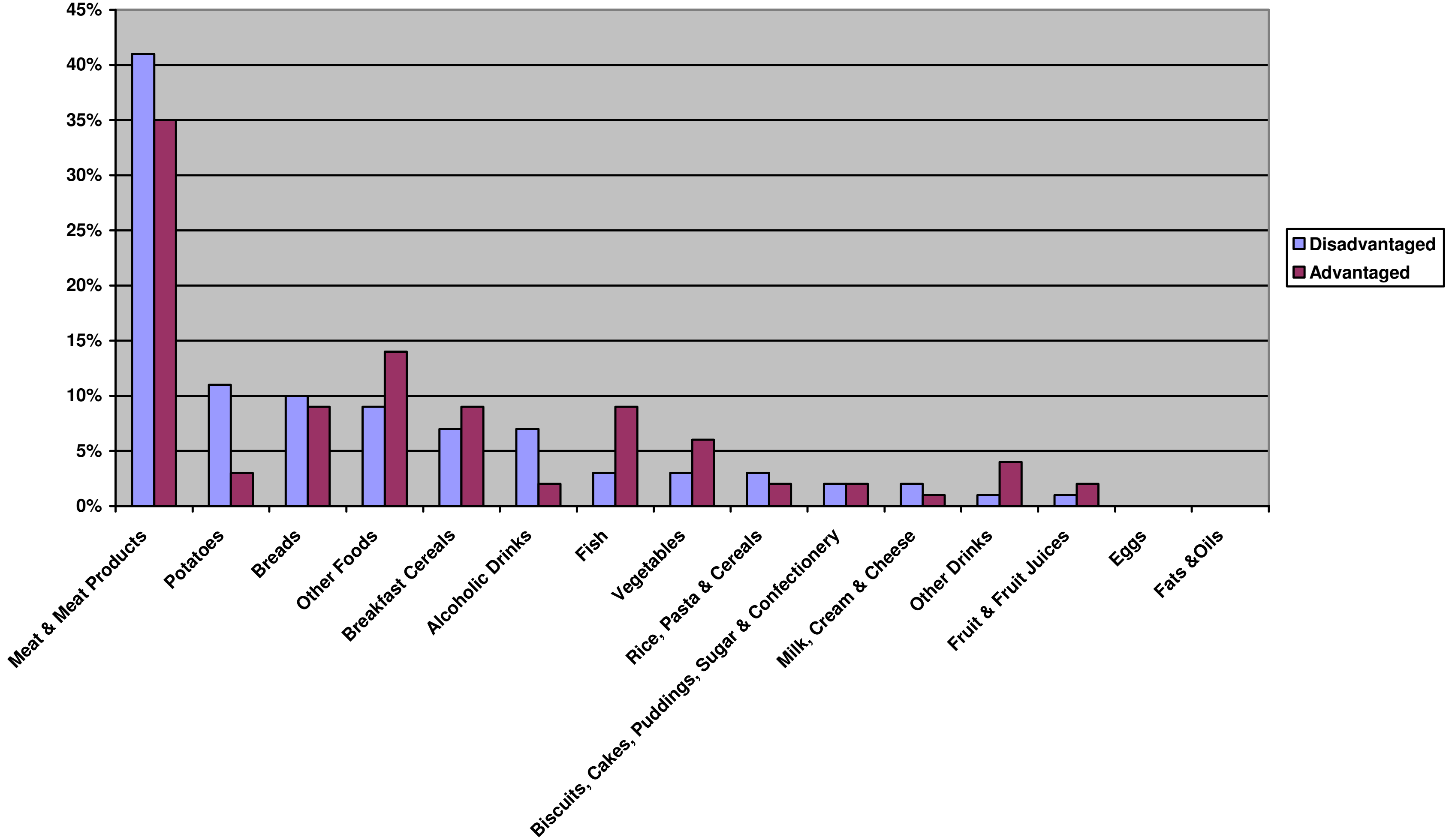
Appendix XIII - Food Group Contributors to Vitamin Intakes



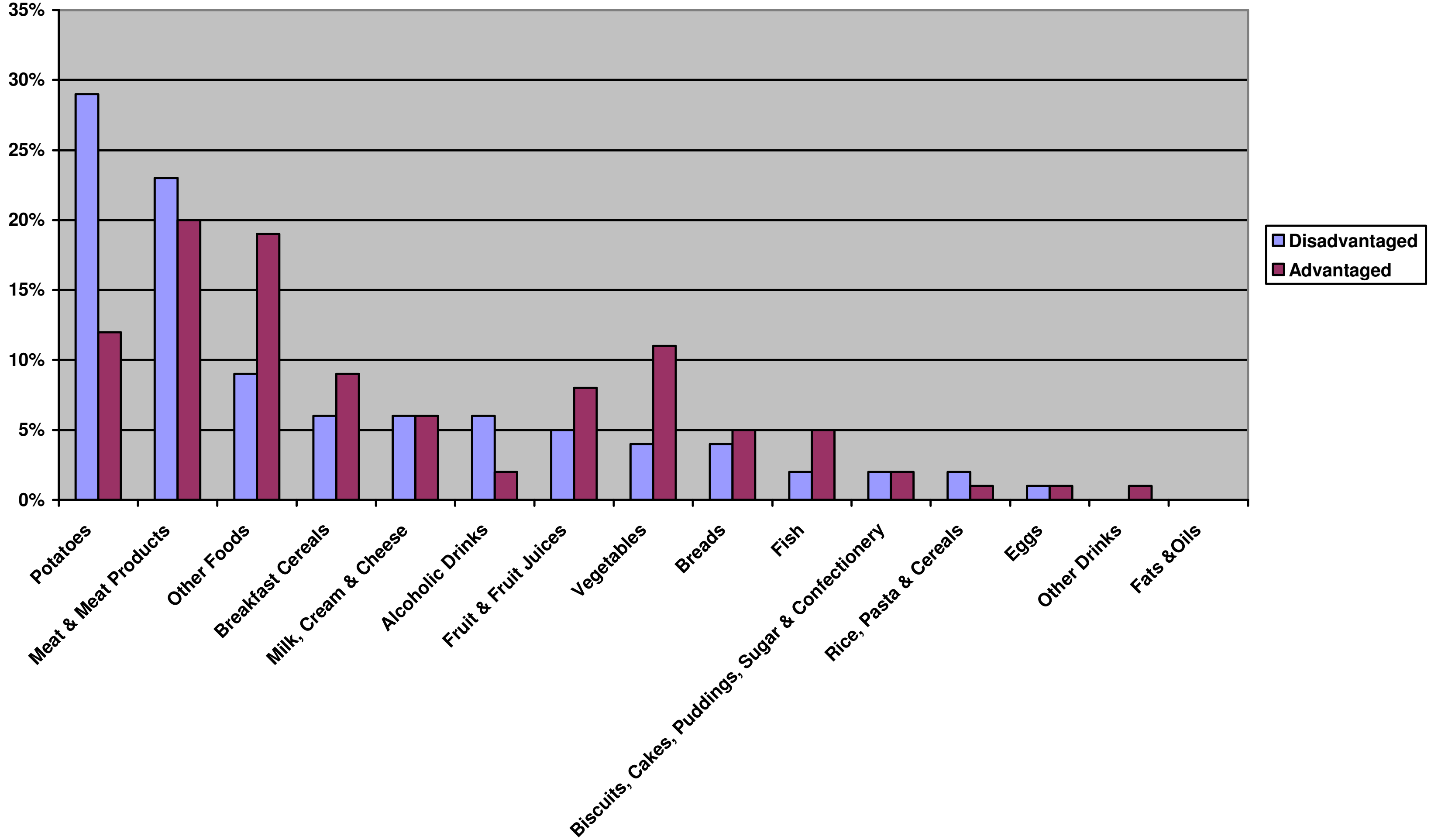
Appendix XIII (a) Food Group Contributors to Thiamin (B1) Intake among Disadvantaged and Advantaged Respondents



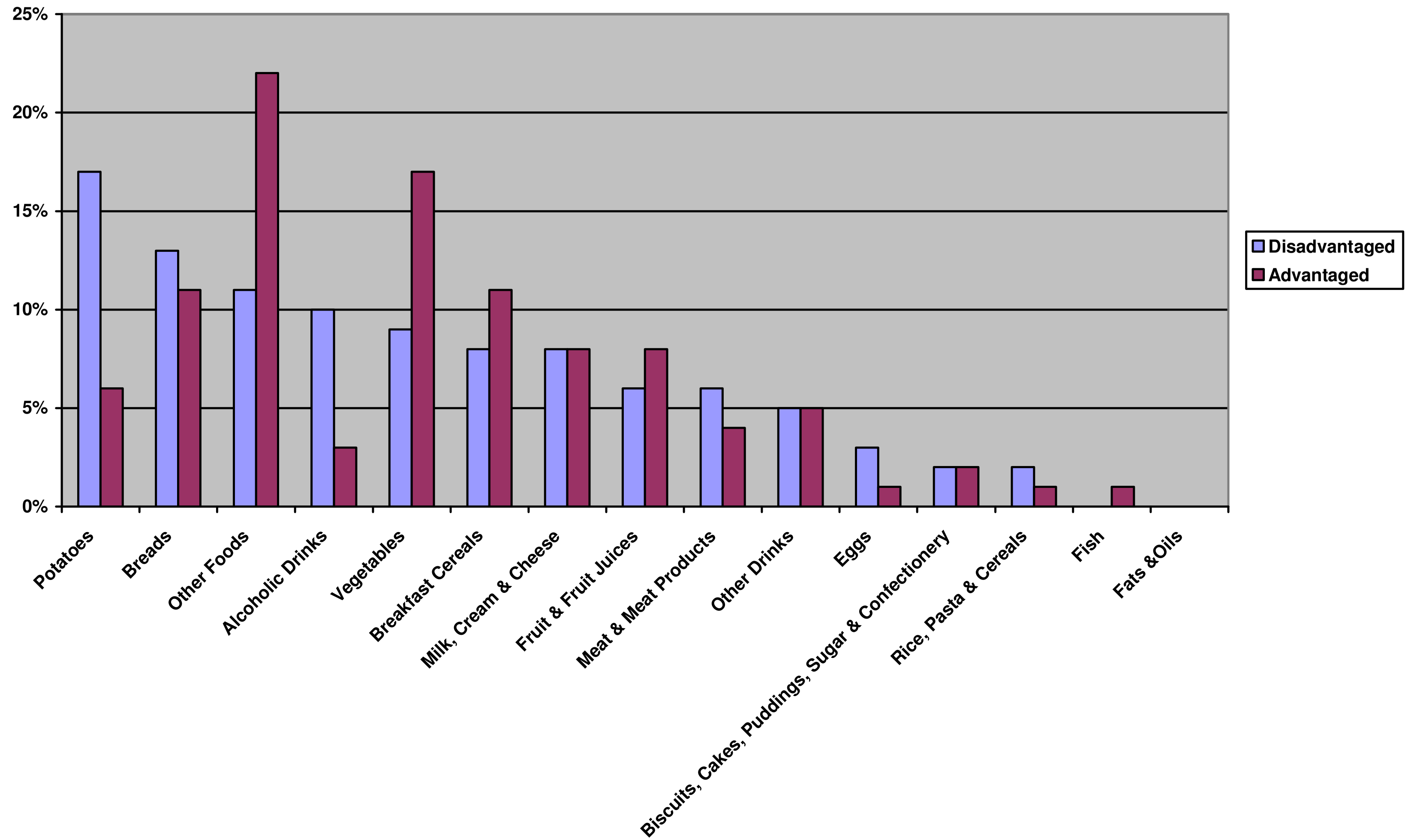
Appendix XIII (b) Food Group Contributors to Riboflavin (B2) Intake among Disadvantaged and Advantaged Respondents



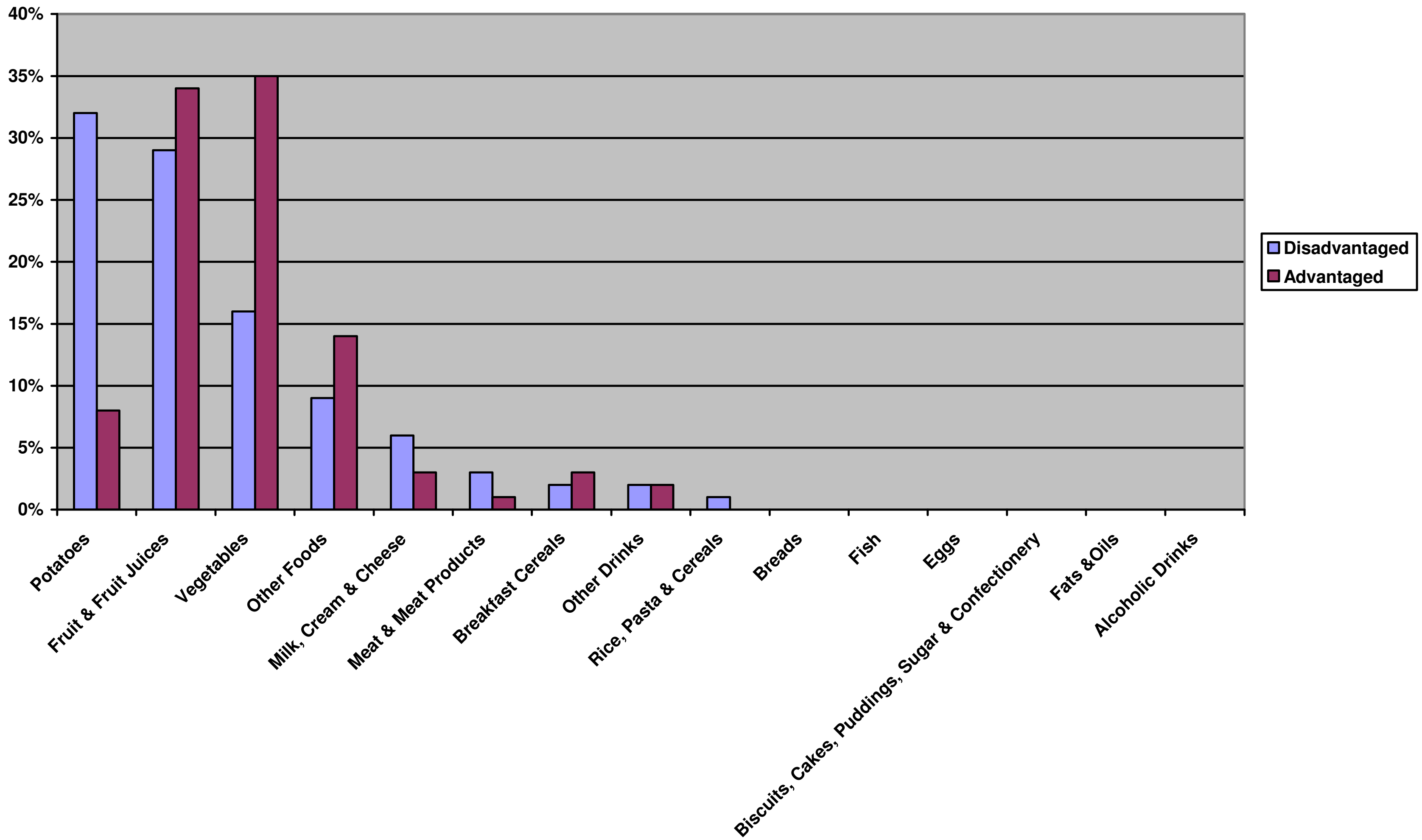
Appendix XIII (c) Food Group Contributors to Niacin (B3) Intake among Disadvantaged and Advantaged Respondents



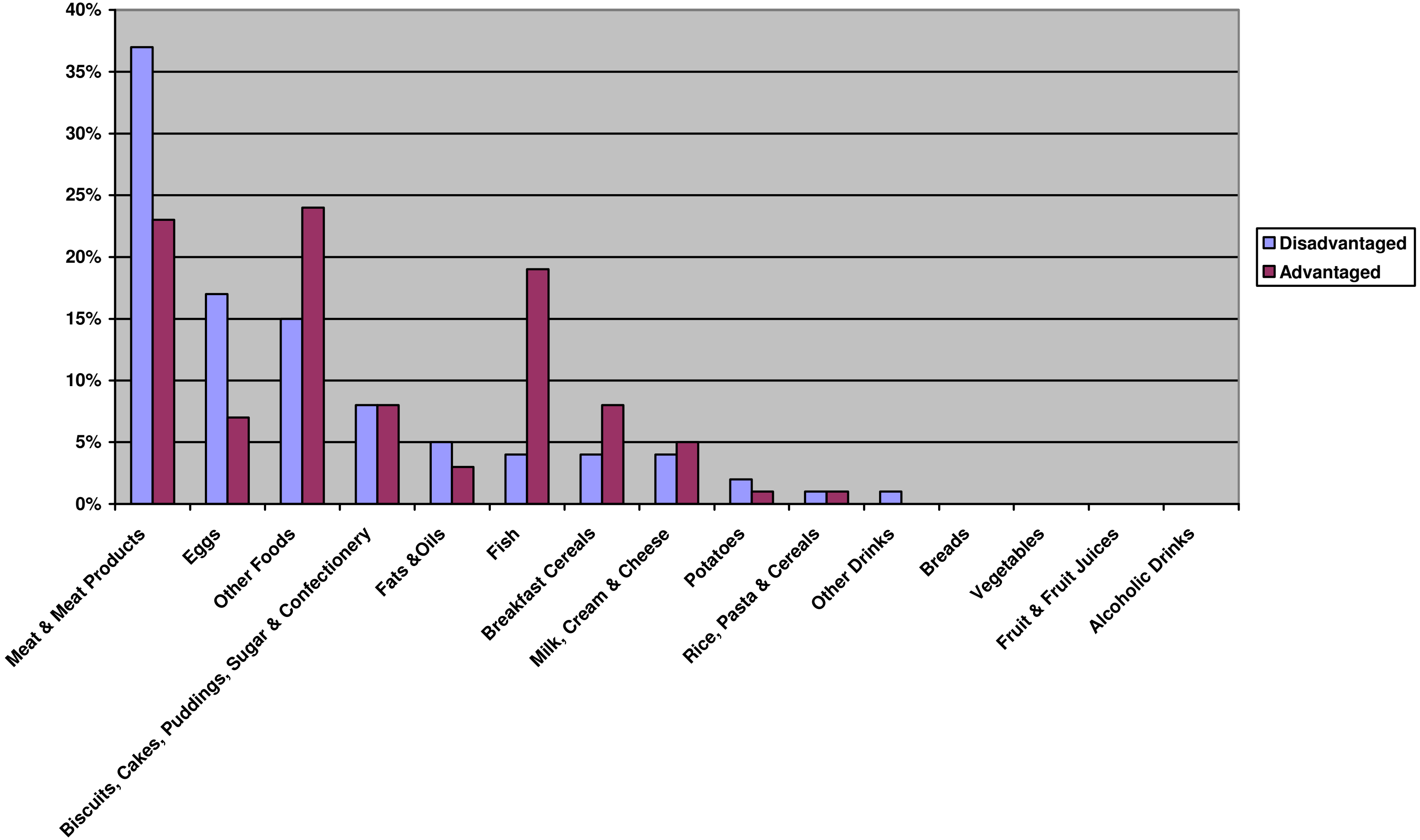
Appendix XIII (d) Food Contributors to Pyridoxine (B6) Intake among Disadvantaged and Advantaged Respondents



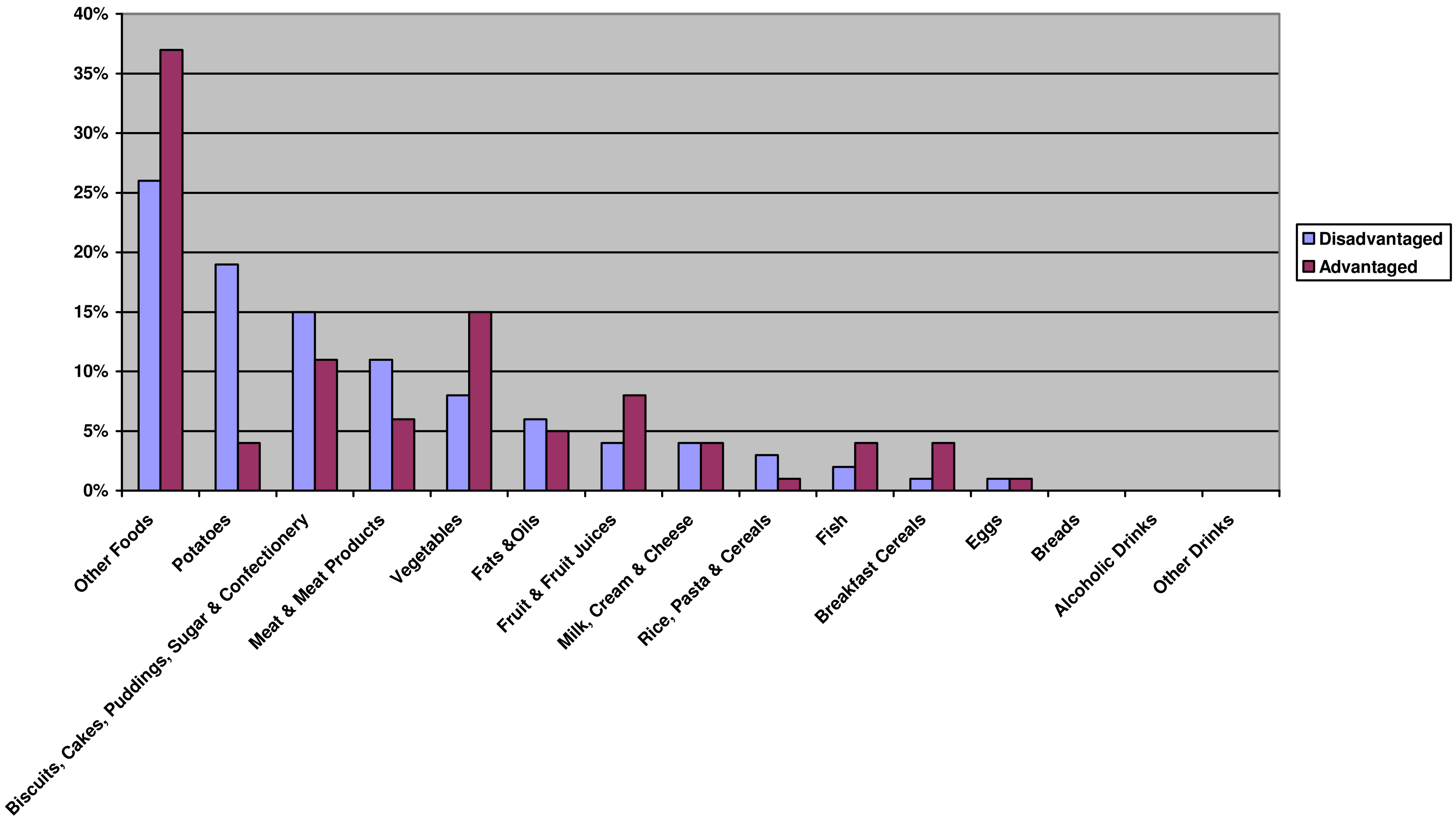
Appendix XIII (e) Food Contributors to Folate Intake among Disadvantaged and Advantaged Respondents



Appendix XIII (f) Food Group Contributors to Vitamin C Intake among Disadvantaged and Advantaged Respondents

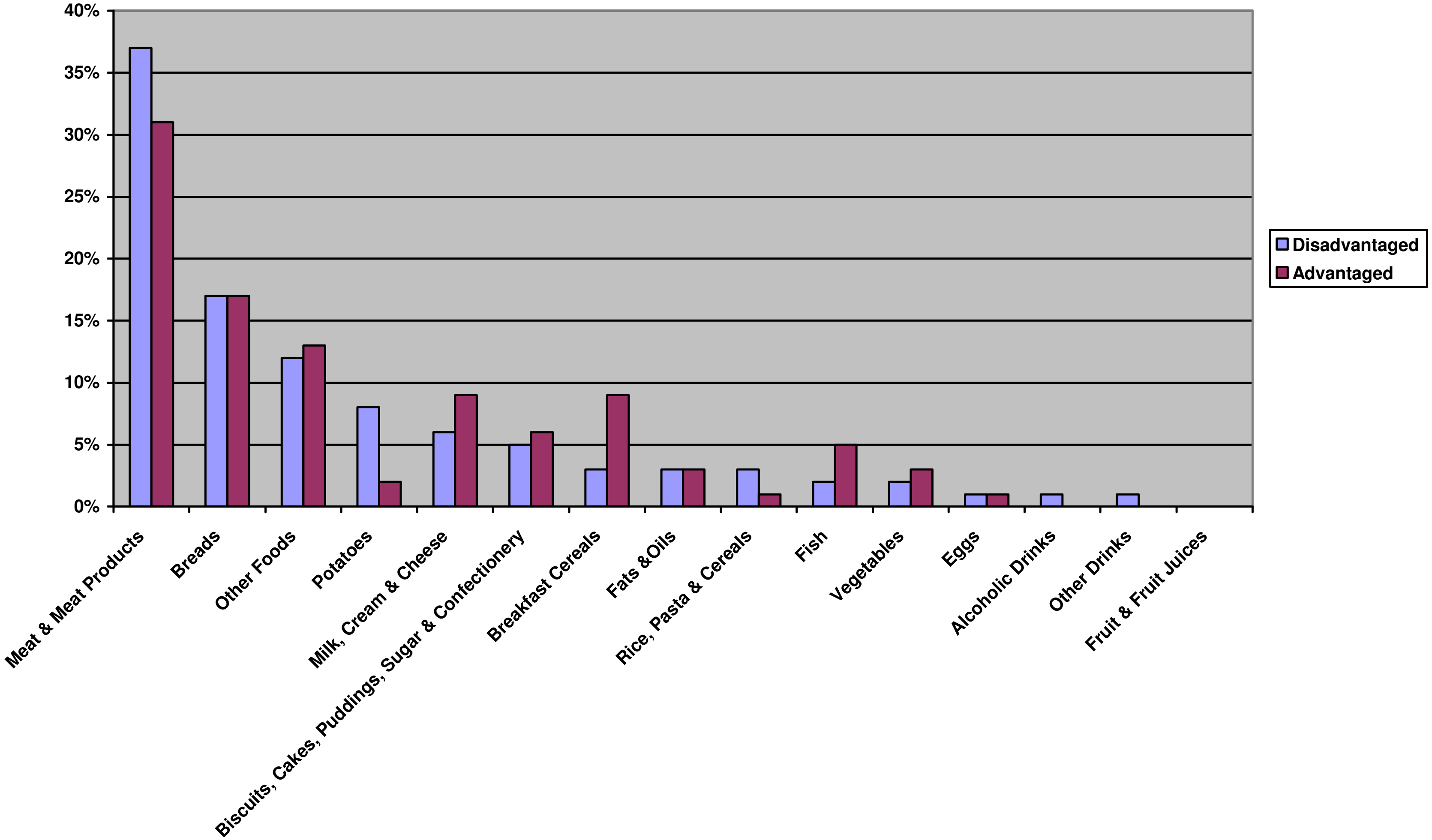


Appendix XIII (g) Food Group Contributors to Vitamin D Intake among Disadvantaged and Advantaged Respondents

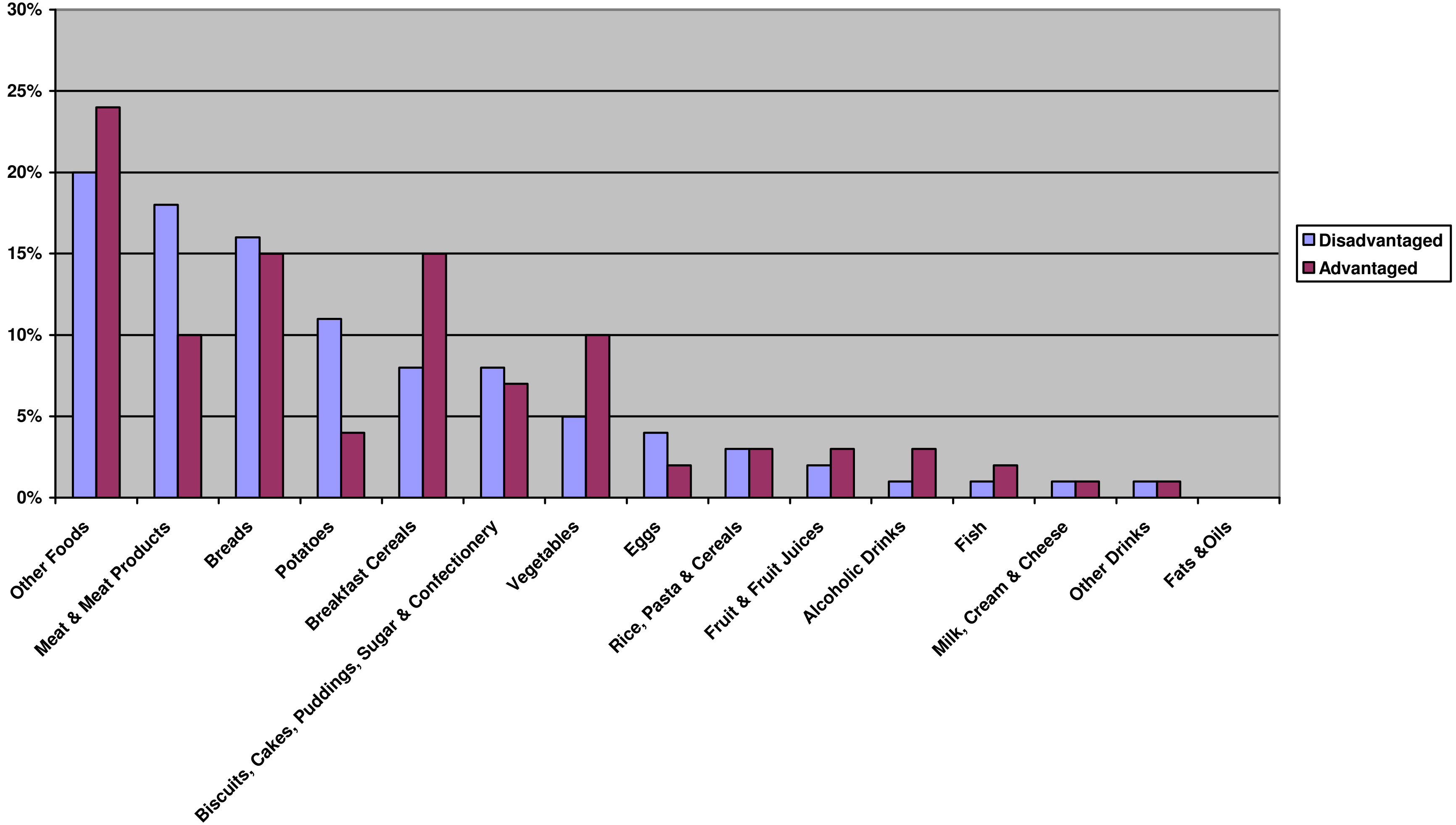


Appendix XIII (h) Food Group Contributors to Vitamin E Intake among Disadvantaged and Advantaged Respondents

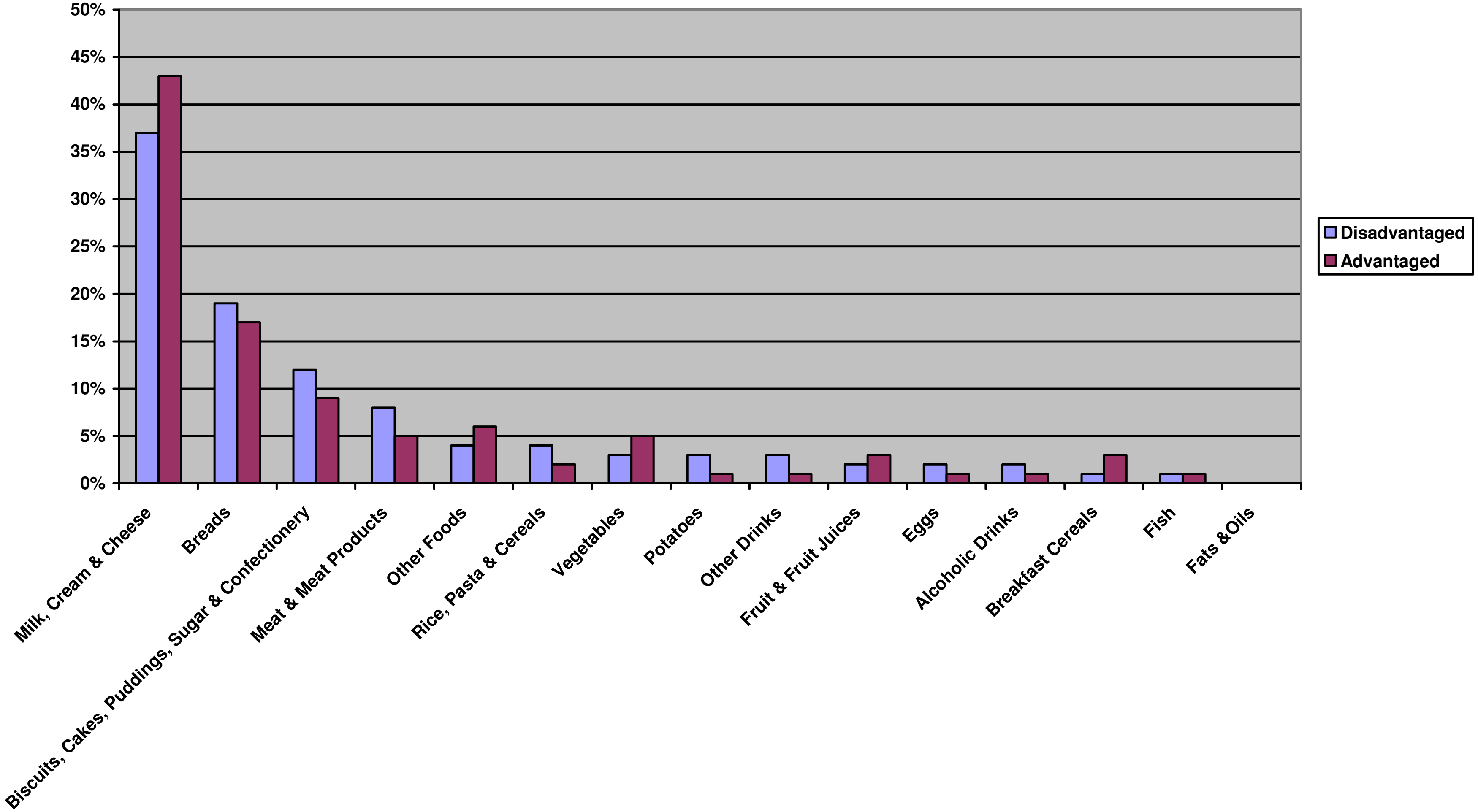
Appendix XIV - Food Group Contributors to Mineral Intakes



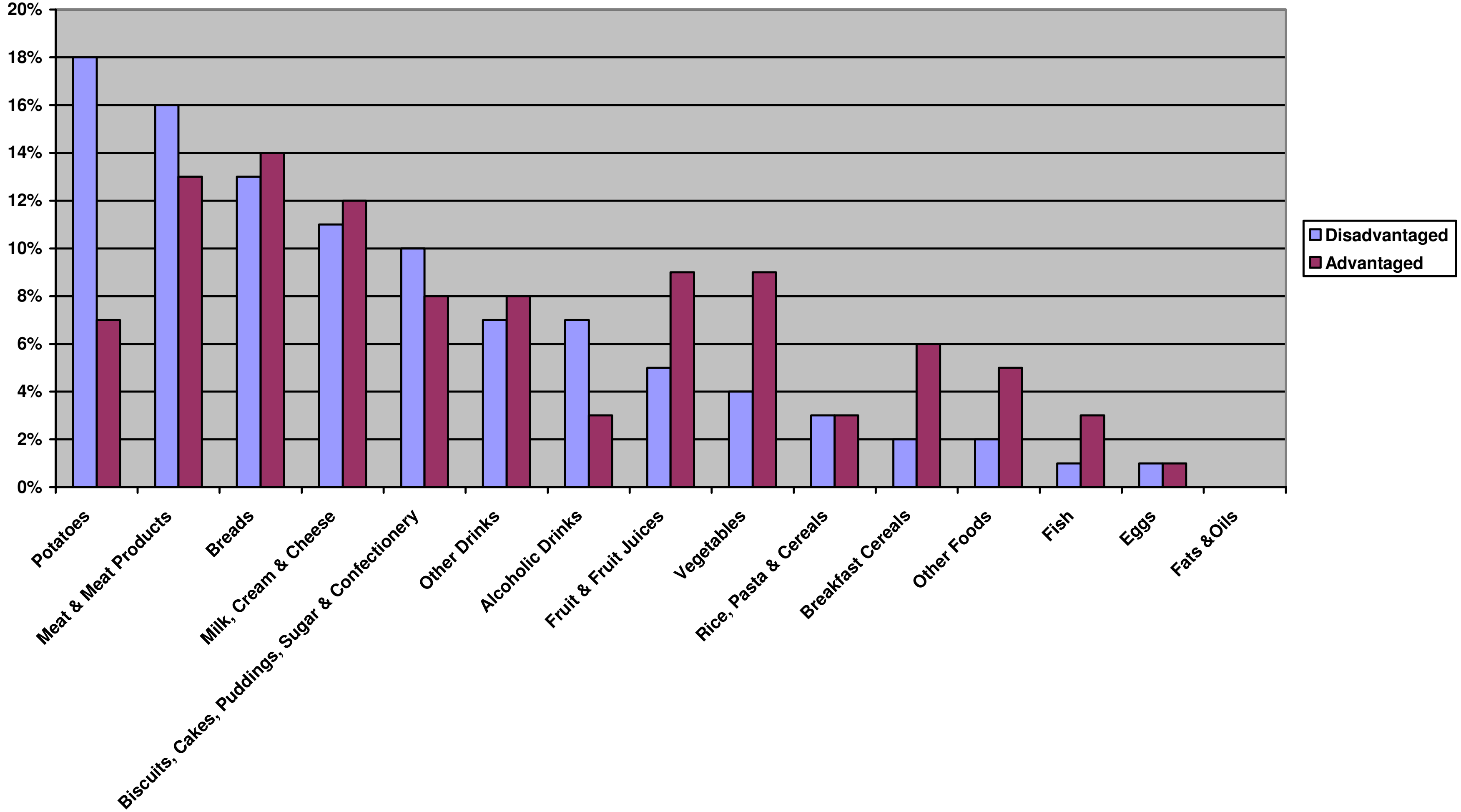
Appendix XIV (a) Food Group Contributors to Sodium Intake among Disadvantaged and Advantaged Respondents



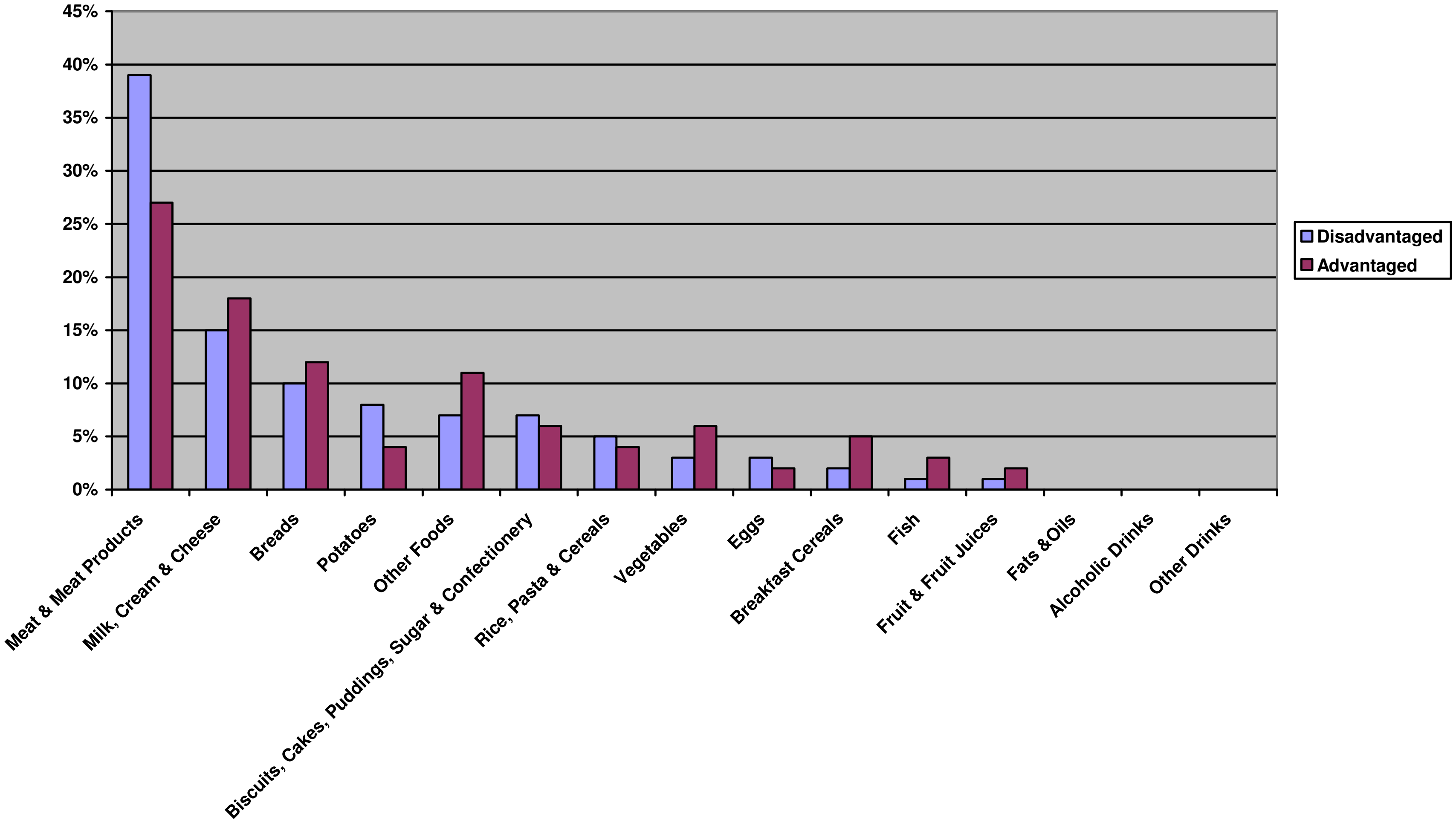
Appendix XIV (b) Food Group Contributors to Iron Intake among Disadvantaged and Advantaged Respondents



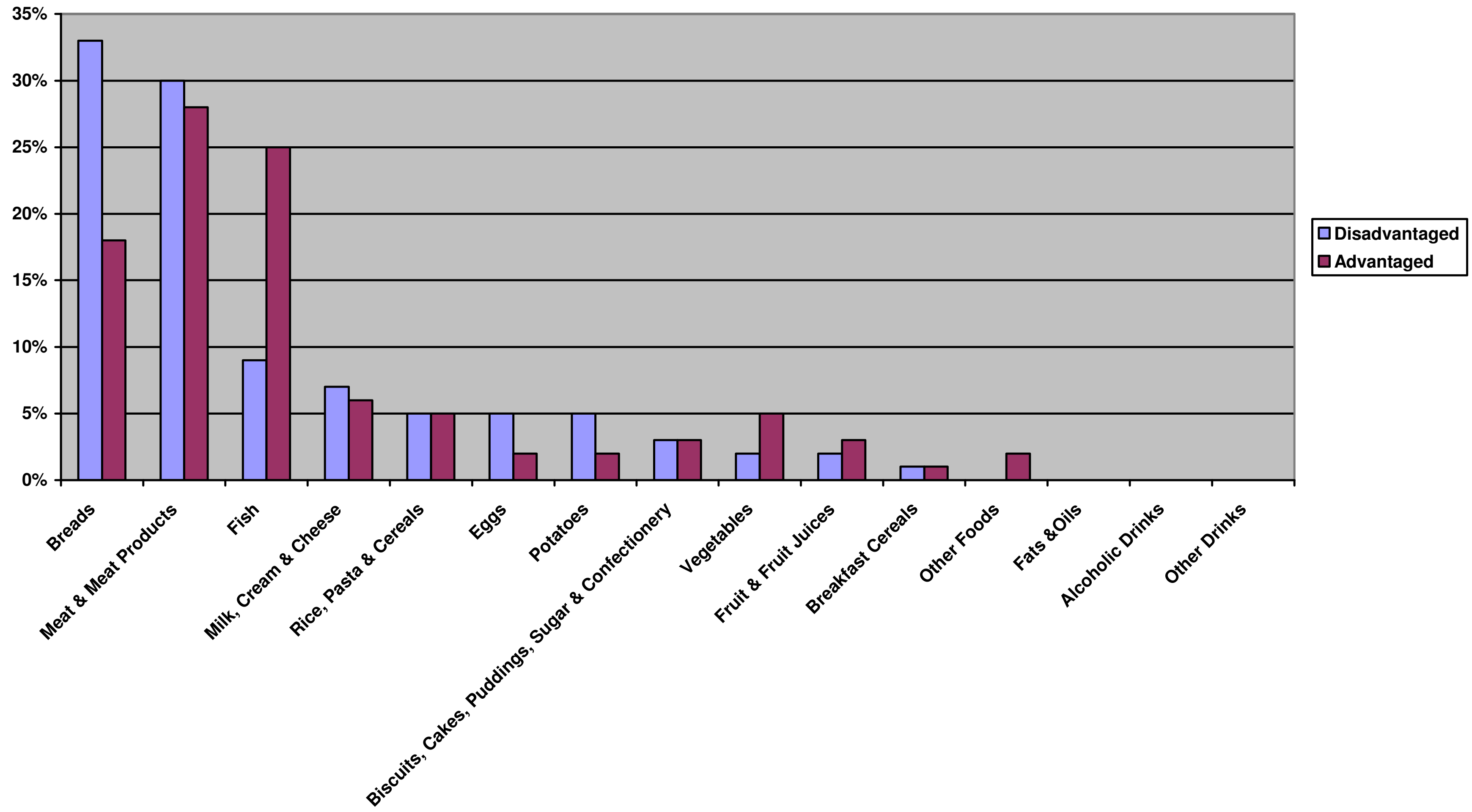
Appendix XIV (c) Food Group Contributors to Calcium Intake among Disadvantaged and Advantaged Respondents



Appendix XIV (d) Food Group Contributors to Magnesium Intake among Disadvantaged and Advantaged Respondents



Appendix XIV (e) Food Group Contributors to Zinc Intake among Disadvantaged and Advantaged Respondents



Appendix XIV (f) Food Group Contributors to Selenium Intake among Disadvantaged and Advantaged Respondent

Appendix XV – Publications

EN111-8 **Oral communication**

SOCIO-ECONOMIC DIFFERENCES IN FOOD AND NUTRIENT INTAKES AMONG IRISH ADULTS

McCartney DMA, Younger KM, Kearney JM.
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e-mail Daniel.McCartney@dit.ie

Objectives: To describe socio-economic differences in food group and nutrient intakes among a representative population of Irish adults.
Materials and Method: Intake data for food groups (fruit and vegetables, breakfast cereals, red meat and confectionery) and nutrients (fat, saturated fat, fibre, iron, calcium, folate and vitamin C) from the North South Ireland Food Consumption Survey (NSIFCS) were analysed according to educational status and social class.
Results: Analysis of variance (ANOVA) revealed lower fruit and vegetable ($p<0.001$) and breakfast cereal ($p=0.018$) intakes and higher red meat ($p<0.001$) and confectionery ($p<0.001$) intakes as social class declined. Analysis of co-variance (ANCOVA) demonstrated the emergence of similar adverse food consumption patterns as education level declined. These differences in food intake were reflected in significantly lower intakes of fibre, iron, calcium, folate and vitamin C among women, but not men, as both social class and education declined. Crucially, univariate chisquare analyses also demonstrated significantly lower compliance with fibre, iron, calcium, folate and vitamin C intake guidelines among women of lower social class and education. Among men, of the nutrients analysed, only compliance with the vitamin C guideline varied significantly according to social class and education.
Conclusions: Irish adults of lower education and social class have less favourable food consumption patterns than their more advantaged peers, and these differences are reflected in sub-optimal fibre and micronutrient intakes among disadvantaged women in particular. These findings identify disadvantaged women as an important target group for public health nutrition interventions in Ireland.

McCartney DMA, Younger KM, Kearney JM (2006) Socio-economic Differences in Food and Nutrient Intakes among Irish Adults. ***Public Health Nutrition*** **9(7A), 86.**

Socio-economic examination of Irish data from pan-EU attitudinal surveys regarding food, nutrition, physical activity, bodyweight and health

By D.M.A. MCCARTNEY[1], K.M. YOUNGER[1] and J.M. KEARNEY[1],
[1]*School of Biological Sciences, Dublin Institute of Technology, Kevin Street, Dublin 8.*

Three pan-EU attitudinal surveys were conducted by the Institute for European Food Studies from 1995 to 2001. Two of these examined attitudes to food, nutrition and health among adults aged 15-64 years (n=1009) (Gibney *et al.*, 1997) and among adults aged 55 years upwards (n=466) respectively. The third survey examined the attitudes of adults aged 15-64 years to physical activity, bodyweight and health (n=1001) (Kearney *et al.*, 1999). Data from each of these studies was analysed by univariate crosstabulation (Chisquare), analysis of variance (ANOVA) and analysis of covariance (ANCOVA). Attitudinal characteristics associated with declining educational status and social class are shown below.

Declining Education	**Diet**	**Population Group**	**Parameter**	**Significance**
		Adults	↓ Selection of "healthy eating" as influence on food choice	p<0.001
		Adults (young men)	↑ Levels of precontemplation regarding dietary change	p=0.007
		Adults (young women)	↓ Levels of action/maintenance regarding dietary change	p=0.021
		Adults	↑ Awareness of health effects of excessive alcohol	p<0.001
	Physical Activity	Adults	↓ Awareness of the health benefits of physical activity	p<0.001
		Older Adults	↓ Awareness of the health benefits of physical activity	p=0.015
		Adults	↓ Number of types of physical activity	p=0.004
		Adults	↓ Intention to increase physical activity	p<0.001
		Adults	↓ Work and study as a barrier to PA	p<0.001
		Adults	↑ Facilities as a barrier to PA	p=0.041
		Adults	↑ Levels of precontemplation regarding physical activity	p<0.001
	General Health	Adults	↑ Fatalistic approach to health	p=0.002
		Adults	↑ Contentment with bodyweight	p=0.002

Table 1. Variation in attitudes as educational status declines

Declining Social Class	**Diet**	**Population Group**	**Parameter**	**Significance**
		Adults	↓ Selection of "healthy eating" as influence on food choice	p<0.001
		Adult women	↑ Selection of "price" as influence on food choice	p=0.005
	Physical Activity	Adults	↓ Awareness of the health benefits of physical activity	p=0.005
		Adults	↓ Number of types of physical activity	p=0.008
		Adults	↓ Intention to increase physical activity	p=0.011
		Adults	↓ Work and study as a barrier to PA	p=0.017
		Adults	↑ Facilities as a barrier to PA	p=0.025
		Adults	↑ Levels of precontemplation regarding physical activity	p=0.003
	General Health	Adults	↑ Fatalistic approach to health	p=0.008

Table 2. Variation in attitudes as social class declines

These findings confirm the existence of less favourable attitudes regarding diet, physical activity, and health among socio-economically disadvantaged groups in Ireland.

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Prochaska, J.O., DiClemente, C.C. (1983). Stages and processes of self-help smoking: Toward an integrative model of change. *Journal of Consulting Psychology* **51** (1983), pp. 390–395.

McCartney DMA, Younger KM, Kearney JM (2006) Socio-economic examination of Irish data from pan-EU attitudinal surveys regarding food, nutrition, physical activity, body weight and health. ***Proceedings of the Nutrition Society*** **65, 30A.**

Socio-economic differences in diet- and health-related attitudinal variables among young Dublin women. By D.M.A. MCCARTNEY, M.T. O'NEILL, J. WALSH, K.M. YOUNGER and J.M. KEARNEY, *School of Biological Sciences, Dublin Institute of Technology, Kevin Street, Dublin 8, Republic of Ireland*

A sample population of 138 young female respondents aged 18–35 years were recruited from twenty-seven areas across Dublin from September to November 2006. These respondents were categorised into socially 'advantaged' (*n* 20) and 'disadvantaged' (*n* 118) cohorts for comparative purposes, based on their geographical area of recruitment. Socio-economic data, including occupational social class, education, household structure, accommodation, medical card entitlement and income, were collected for each respondent to confirm their 'advantaged' or 'disadvantaged' designation.

Attitudinal data concerning general issues, health and diet were also collected for each respondent. Subjects were asked to indicate how often they thought about their life in the future to assess future salience. Subjects' health locus of control was also assessed by indicating the extent to which they felt their health was influenced by fate (chance locus), outside factors (external locus) and their own behaviour (internal locus). In relation to dietary stages of change[1], respondents were also asked to indicate which stage of change (pre-contemplation, contemplation, decision, action, maintenance or relapse) best described them at that point in time. Finally, some of the potential barriers to following a healthy diet were investigated.

Univariate Pearson's χ^2 tests were conducted to examine differences in each of these attitudinal variables between the socially 'advantaged' and 'disadvantaged' groups. The Table describes the attitudinal differences observed.

	'Advantaged' (%)	'Disadvantaged' (%)	*P*
Future salience			
Consider life in 1 month rarely or not very often	15.0	30.5	
Consider life in 1 month fairly or very often	85.0	69.5	0.248
Consider life in 10 years rarely or not very often	75.0	56.4	
Consider life in 10 years fairly or very often	25.0	43.6	0.188
Health locus of control			
Chance Locus	0.0	22.0	0.034
External Locus	0.0	14.4	0.039
Internal Locus	100.0	96.6	0.705
Stages of dietary change			
Action or maintenance	55.0	29.1	0.043
Pre-contemplation	5.0	17.1	0.293

These data indicate no statistically significant difference in future salience between the 'advantaged' and 'disadvantaged' young women. However, those women in the 'disadvantaged' group are significantly more likely to believe that their health is determined by chance or by external factors, than their more-'advantaged' peers. Additionally, the 'disadvantaged' women are significantly less likely to be in the 'action' or 'maintenance' stages of dietary change.

In relation to potential barriers to healthy eating, Fisher's exact χ^2 analysis revealed that a greater percentage of those with low and intermediate education cite poor dietary knowledge (19.8% vs. 0%) (p=0.008) as a barrier, compared with their more-educated peers. However, a much lower percentage of those with low or intermediate education cited 'busy lifestyle' as a barrier to healthy eating than their more-educated counterparts (39.7% vs. 69.0%) (p=0.006).

These findings indicate that interventions that improve dietary knowledge, and that raise awareness of, and emphasise, the role of diet in health, remain important when seeking to improve the diets of young ‘disadvantaged’ women. Further interventions that facilitate healthy eating, such as price reduction of healthy food, may also yield improvements in dietary behaviour among this group.

1. Prochaska JO & DiClemente CC (1983) *J Consult Psychol* **51**, 390–395.

McCartney DMA, O’Neill MT, Walsh J, Younger KM, Kearney JM (2007) Socio-economic differences in diet- and health-related attitudinal variables among young Dublin women. *Proceedings of the Nutrition Society*, 66, 53A.

An Examination of Socio-economic Variation in Food and Nutrient Intake Patterns among Young Women in Dublin using Novel Diet Scores

By J. WALSH[1], M.T. O'NEILL[1], D.M.A. McCARTNEY[1], K.M. YOUNGER[1] and J. KEARNEY[1],

[1]*School of Biological Sciences, Dublin Institute of Technology, Kevin Street, Dublin 8, Ireland.*

Socio-economic status has been identified as an important factor in determining dietary quality. Shahar (2005)[1] found a poorer quality of diet in those who were of low socio-economic status. Robinsion et al (2004)[2] used diet scores to elucidate an association between poor educational attainment and poor dietary quality in a sample of young Australian women. This study aims to illuminate socio-economic differences in the consumption of breakfast cereals, fruit and vegetables, red meat, confectionery, fizzy drinks, fibre and selected nutrients among a population of young Dublin women (n=73). Socio–economic variation in the *overall quality* of these women's diets is then described using novel diet scores based on the intake of these food groups and nutrients.

Participants' demographic details, health- and diet-related views and attitudes, health status and behaviours, local environment and other social factors were recorded. Food and nutrient intakes were assessed using a 7-day diet history. To create the novel diet scores, intakes of fruit and vegetables, breakfast cereals, red meat, confectionery, fizzy drinks, calcium, iron, folate, vitamin C and fibre were dichotomised and each subject identified as having a low or high intake of each. Subjects were given a score of one for each of the following: high intake of fruit and vegetables, high intake of breakfast cereals, low intake of red meat, low intake of confectionery, low intake of fizzy drinks and high intake of calcium, iron, folate, vitamin C and fibre. Subjects' diet scores ranged from 1 to 10, with higher scores indicating better overall dietary quality.

Using novel diet scores, socially disadvantaged women were found to have poorer overall dietary quality. Mann-Whitney and Kruskal-Wallace analyses revealed that women of lower social class (p=0.038), low socio-economic group (p=0.006) and low educational attainment (p<0.001) had significantly lower diet scores, as did those who were unemployed (p=0.037) or who left school early (p<0.001). This study provides unique novel data regarding the dietary intakes of young disadvantaged women in Dublin. The findings of low micronutrient intake and over-consumption of certain food groups among disadvantaged young women, highlight the need for continued targeted public health strategies aimed at improving the quality of these women's diet.

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2. Robinson S, Crozier S, Borland S, Hammond J, Barker D and Inskip H 2004: Impact of educational attainment on the quality of young women's diets. *Eur Jour of Clin Nut* **58** 1174-1180.

Walsh JM, O'Neill MT, McCartney DMA, Younger KM, Kearney JM (2007) An Examination of Socio-economic Variation in Food and Nutrient Intake Patterns among Young Women in Dublin using Novel Diet Scores. ***Proceedings of the Nutrition Society,*** **66, 106A.**

Poverty, Diet and Health Behaviours

Addressing Research Needs

There is extensive evidence which demonstrates that those in the lower socio-economic strata have poorer health than their more affluent peers. In Ireland, those in the lowest occupational social class have mortality rates from cardiovascular disease which are twice as high as those of the highest social class. Along with their significantly greater death rates from cancer and respiratory disease, these trends contribute to overall mortality rates in this group which are more than double that of their more advantaged peers (Balanda & Wilde, 2001).

While the factors underpinning these profound health inequalities have not been fully articulated, there is evidence from other countries which suggests that diet plays a key role in this process (James et al., 1997). The diets of those living in poverty have been consistently characterised by low fruit and vegetable intakes (Irala-Estevez *et al.*, 2000, Giskes *et al.*, 2002, Shohaimi *et al.*, 2004), low wholegrain cereal and breakfast cereal consumption (Siega-Riz *et al.,* 2000, Mishra *et al.,* 2002, Lang *et al.,* 2003), high sweet food and beverage intakes (Drewnowski & Specter, 2004, Bhargava & Amialchuk, 2007), high processed meat consumption (Cosgrove *et al.,* 2005), low fish intakes (Galobardes *et al.,* 2001, Vannoni *et al.,* 2003) and low dairy food consumption (Kirkpatrick & Tarasuk, 2003). Unfortunately however, there is a paucity of robust recent data describing the dietary patterns and nutrient intakes of the very poorest groups in Irish society, increasing the imperative to develop substantive research in this area.

Unsurprisingly, nutrient analyses reveal that the diets described above are high in energy, fat, saturated fat and refined sugar, as well as being low in many important health protective micronutrients including iron, calcium, folate, vitamin C, beta carotene, vitamin D, vitamin E and omega-3 fatty acids. Apart from their substantially poorer nutrient profile, perhaps the most prominent feature of these diets is that they are significantly cheaper than more energy-dilute, micronutrient-dense diets. Whilst this issue of cost has been suggested as a key factor driving the preponderance of poorer dietary patterns among socially disadvantaged groups (Darmon *et al.,* 2004, Drewnowski, 2004, Andieu *et al.,* 2007), further examination of food intake patterns among these groups soon reveals that there are other potent influences at hand.

Our work over the past three years has focussed on elucidating some of the precipitants of poor diet and health behaviours among young women of low socio-economic status (SES) across Dublin. While the successful completion of large dietary surveys is inherently challenging, there are specific obstacles to be overcome in carrying out such work among low socio-economic groups, and these difficulties may partly explain the dearth of current data in this area, despite their considerable public health utility.

One of the first challenges which we met was determining how to actually gain access to these low SES groups. Our pilot work indicated a response rate of less that ten percent by door to door enrolment, precluding this as a realistic recruitment option. However, liaison with local groups such as community development projects and statutory training schemes proved a much more effective means of capturing this target population. In addition to their established and trusted position within the community, these agencies and their personnel were often also able to facilitate settings-based interview sessions which were more convenient to respondents. In order to incentivise participation, it was necessary to provide participants with a modest inducement (shopping vouchers), and this proved critical to the successful engagement of respondents. While this issue remains contentious in the research arena, feedback from local community leaders and pilot groups clearly indicated that progress would be prohibitively difficult without such provision.

Once the areas and agencies for recruitment had been identified, the data collection methods needed to be clearly defined. Again, there were significant challenges in this regard. While choosing the optimum method of dietary assessment can be difficult at the best of times, issues such as low literacy, poor comprehension, difficulty of follow-up and respondent burden are particularly problematical in this area. While the diet history methodology was ultimately selected as the protocol of choice in this case, this should not imply that superior methods for this purpose cannot be developed in the future.

Apart from the challenges concerning dietary data collection, significant difficulties also arose in determining which socio-economic data to gather. Poverty and disadvantage are measured by many indices including education, income, social class, household structure, area of residence and numerous others. While many of these parameters overlap, they are not interchangeable and none in isolation can comprehensively convey the full "lived experience" of poverty. Also, those measures which may have greatest relevance in the policy context (e.g. income inequality), may not be the indices which are most associated with inequalities in diet and health behaviours. For this reason, data relating to several of these parameters were collected. Despite generating this wealth of socio-economic data however, it remains important to realise that all of these indices are only markers or proxies for the complex sociological processes of disadvantage which influence diet and health behaviours. From this perspective, even if low fruit and vegetable intake were observed to associate strongly with low education for example, it would remain difficult to disentangle the elements of low education (if any), which might contribute to this pattern. Other health research has attempted to move beyond the empiricism of common socio-economic indicators, to establish the proximal attitudinal and psycho-social correlates of these indicators which mediate effects on health behaviours, and our study attempted to do the same thing.

Data were collected which described various attitudinal, psychological and cultural parameters. The associations between these variables and low socio-economic status and diet and health behaviours were then examined, to establish whether they lay at an intermediate stage of the causal pathway between poverty and poor behaviour. For example, we were keen to establish whether low motivation to eat healthily is actually associated with poorer dietary behaviour, and if so, was this low motivation overrepresented among our low SES women.

The elucidation of such pathways is important from a public health perspective as it increases our understanding of why disadvantaged people behave in the way that they do.

Unfortunately, because of the complex psycho-social phenomena at hand, quantitative (survey) work will be unlikely to ever comprehensively capture the full nature of these relationships. This is particularly the case in such formative research, where the putative influences on these behaviours have not been clearly defined by previous work. For this reason, we conducted qualitative (focus group) research alongside our quantitative study, to allow respondents to identify and describe other unanticipated influences on diet and health behaviour which were not predicated on our own *a priori* assumptions or suppositions at the beginning of the research project. This provided a rich contextual narrative to further elaborate the barriers to healthy diet and behaviour among these women, and did indeed throw up several unanticipated factors in this regard.

The provisional findings of this study, perhaps as expected, reveal significantly less favourable dietary patterns and health behaviours among these young disadvantaged women when compared with their more affluent peers. From the nutritional perspective, vitamin and mineral intakes are lower among these women while their energy and macronutrient intake profiles are also substantially less favourable. Future work in this area will need to further illuminate the nature of the material, structural, social and cultural impediments to healthy diet and lifestyle which pervade life in disadvantaged communities, and which yield such health subversive behaviours. In doing so, it will create the basis for evidence-based interventions to redress the behavioural inequalities which continue to compromise the health of the poor.

The disproportionate preponderance of chronic disease among disadvantaged communities in Ireland means that the utility of developing such effective, targeted health promotion strategies for these groups is enormous. The challenge will be not just to generate research findings which underpin such initiatives, but ultimately to convince policy makers that such interventions are warranted, efficacious, cost-effective and achievable.

This project has been funded in its entirety by the Food Safety Promotion Board (*Safe*Food) whose generous sponsorship we acknowledge with gratitude.

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