DESIGNING DIETARY INTERVENTIONS: A REAPPRAISAL OF THE DEMOGRAPHIC AND SOCIO-ECONOMIC DETERMINANTS OF DIETARY CHOICE IN THE UK

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Abstract

The facilitation of healthier dietary choices by consumers is one of the key elements of the UK Government's food strategy. Designing and targeting dietary interventions requires a clear understanding of the determinants of dietary choice. Conventional analysis of the determinants of dietary choice has focused on mean response functions which may mask significant differences in the dietary behaviour of different segments of the population. In this paper we use a quantile regression approach to investigate how food consumption behaviour varies amongst UK households in different segments of the population, especially in the upper and lower quantiles characterised by healthy or unhealthy consumption patterns. We find that the effect of demographic determinants of dietary choice on households that exhibit less healthy consumption patterns differs significantly from that on households that make healthier consumption choices. A more nuanced understanding of the differences in the behavioural responses of households making less-healthy eating choices provides useful insights for the design and targeting of measures to promote healthier diets.

Introduction

The Cabinet Office report *Food Matters* (Cabinet Office: 2008) identifies the promotion of healthier dietary choices by consumers as a key element in the UK Government's food strategy for the 21st century. This follows from the recognition of the enormous health gains that would accrue to the UK if diets matched nutritional guidelines on fruit and vegetable consumption, saturated fat, added sugars and salt intake. The Cabinet Office report estimates that adherence to nutritional guidelines would reduce the risks related to cancer, heart disease and other illnesses leading to 70,000 fewer people dying prematurely every year. Improved dietary choices are also crucial for meeting the challenge of obesity, with a quarter of adults and 10% of children in the UK already classified as "obese". In addition to the social impacts, the economic burden of diet related ill-health is estimated at almost £6 billion a year by way of additional National Health Service costs alone.

Analysis of data from the Expenditure and Food Survey (DEFRA: 2007) suggests that average food consumption patterns in the UK involve significant deviations from dietary guidelines prescribed by the Department of Health and also from the dietary norms suggested by the World Health Organization (Table-1). The contribution to total energy intake from total fats (38%) and sugars (14%) is considerably in excess of the norms. The contribution of Polyunsaturated Fatty Acids (PUFAs) to energy intake (6.4%) and the average cholesterol consumption are within the acceptable range. However, fruit and vegetable intake falls well short of the recommended intake of 400 grams per day. Designing effective policy interventions to promote healthy eating requires identification of households and individuals within households that make less healthy dietary choices or are at risk of food insecurity and an understanding of the determinants of their dietary choice.

Determinants of Dietary Choice

The analysis of dietary choice spans a wide range of social science perspectives and the literature identifies a diverse set of determinants of dietary choice that extend well beyond physiological or nutritional needs. Other factors influencing food choice include biological, economic, physical, social and psychological determinants besides attitudes, beliefs and knowledge about food (EUFIC: 2008)[2]. Dietary choice is, thus, the result of a complex interaction between a wide range of determinants. The influence of individual determinants

[2] Biological determinants include hunger, appetite and taste, economic determinants include cost, income and availability, physical determinants include access to food, cooking skills, education and time, and social determinants include family, culture, peers and meal patterns

can also vary significantly across individuals and groups and over time. Different interventions may have to be designed to modify the dietary choices of different groups of the population, taking into account the multiplicity of factors influencing their decisions on food choice. The influence of different sets of determinants of dietary choice identified above has largely been analysed within the disciplinary framework to which they relate. For instance, economic studies have focused almost exclusively on socio-economic and demographic determinants while psychological studies have largely confined themselves to the analysis of psychological determinants, expecting the impact of socio-economic determinants to be mediated through their impact on attitudes, norms and beliefs.

Although the literature recognises the role of a complex set of determinants in influencing dietary choice that go well beyond demographic and socio-economic determinants, these determinants remain a key area of interest from a practical policy making perspective. This is because dietary interventions can be readily targeted at broad groups based on demographic and socio-economic characteristics of households. For instance, if it is known that the poorest households deviate the most from healthy eating norms, then it is relatively easy to target interventions at the poorest households. Even if the information available to the policy maker is that the relationship between low household income and poor dietary choice holds only when a number of factors (e.g., age, education, attitudes and knowledge) are controlled for, the policy maker may still opt for targeting interventions based on household income – simply because of the difficulties in identifying and targeting households that conform to a complex set of characteristics. It is also much more difficult (and probably a lot more expensive) to target interventions at households or individuals with certain attitudes, beliefs and knowledge or other psychological attributes.

In this paper we use a quantile regression approach to investigate the influence of demographic and socio-economic drivers of dietary choice in UK households in different segments of the population, especially those characterised by less healthy consumption patterns. Previous econometric approaches in the literature have relied on multiple linear or logistic regressions to analyse the impact of these drivers on dietary choice. These approaches assess the mean response of the outcome variables and constrain the effect of explanatory variables to be the same along the whole range of (dietary) outcomes. In designing interventions, we are more interested in the behaviour of households in the upper or lower tails of dietary outcomes (denoting inadequate or excessive consumption of certain nutrients or food products). In the context of dietary choice, the heterogeneity of response to explanatory variables in different consumption ranges is a key element of interest. This paper explores the hypothesis that the impact of demographic and socio-economic explanatory variables tends to vary along the whole range of dietary outcomes and could be significantly different from the mean response values in the consumption ranges of interest.

We use a quantile regression approach using household data from the UK's Expenditure and Food Survey to explore the demographic and socio-economic drivers of fat consumption in UK households –specifically adherence to the dietary guidelines relating to the the share of energy derived from fat consumption. We have chosen to explore the determinants of fat consumption because excessive fat consumption has been strongly linked to a range of chronic diseases, besides being considered a major cause of the increasing incidence of obesity. The approach can, however, be readily extended to other dietary guidelines (e.g., those related to sugar, salt, cholestrerol or fruit and vegetable intake). The methodological advantage of this approach is that it allows us to understand how the impact of drivers of dietary choice in non-compliant groups (characterised by less healthy dietary choice) differ from that in other groups that appear to conform to healthy eating advice. This can provide insights into the potential effectiveness of dietary interventions targeted at specific demographic/socio-economic groups. The quantile regression (QR) technique allows the impact of the selected drivers to vary along the whole range of fat intake (share of energy derived from fat). The relevance of QR in diet and nutrition analysis arises from the interest in the tails of the dietary outcome distributions – characterised by inadequate or excessive consumption of nutrients and foods- and an increasing number of applications are emerging (e.g,Variyam, Blaylock and Smallwood (2002), Sinha (2005). A recent application examined the impact of socio-economic determinants on fruit and vegetable intake in the UK (Boukouvalas, Shankar and Traill: 2009).

Data and Variables

This paper uses data from the UK's Expenditure and Food Survey (EFS) for 2005-06 which now incorporates DEFRA's National Food Survey data. DEFRA's Food Survey collects detailed information about food consumption at the household level based on two-week diaries maintained by household members and the household reference person (HRP). The Food Survey of 2005-06 surveyed a nationally representative sample of 6785 households and includes data on food consumed at home as well as food consumed outside the home. The survey records food consumed in 2225 categories, which makes it possible to analyse household food consumption at several different levels of disaggregation. The dataset also provides nutrient conversion factors for each food category covering a total of 47 macro and micro nutrients. It is, therefore, possible to compute the intake of different nutrients at the household level using the data set.

The dietary norms related to certain foods/nutrients (e.g., fruit and vegetables, cholesterol etc) are related to the per capita per day consumption of those foods/nutrients. Meaningful estimation of per capita consumption of these foods/nutrients from household data requires the calculation of the number of adult equivalents in each household. The weights to be used for household members in different age-groups in calculating the adult equivalents were derived from the Estimated Average Requirements (EARs) for Energy of the Department of Health (1991). The EFS also provides information on the "equivalised[3]" income of each household using the OECD scale and the McClement scale (EFS: 2006).The demographic and socio-economic characteristics of each household in the survey are available from the EFS. The variables considered in this paper are based on primarily on the earlier literature and are summarised in Table-2.

The categorical variables listed in Table-2 have a large number of categories in the EFS. They were redefined and reduced to a smaller number of categories for convenience in regression analysis and presentation. For these categorical variables a number of dummy variables were defined for use in regression analysis. The base category defined for each categorical variable is indicated in Table-2. After deleting the households which did not maintain food consumption diaries data on 6767 households were used in the analysis.

Least Squares and Quantile Regression Analysis

A multiple linear regression was first estimated to provide a basis for comparison with quantile regression results. The dependent variable was the share of fat in total energy intake in the household (expressed in percentage points) [hereinafter referred to as "fatshare"] which was computed from the data on all the food consumed by the household and the associated nutrient conversion factors. The explanatory variables were the demographic and socio-economic variables described in Table-1. For household income, a quadratic term was also included in the equation to allow its effect to vary with size. All the continuous variables were centred at the median for convenience in the interpretation of regression coefficients.

[3] "Equivalised" income is a measure of income for each household which adjusts for the composition of the household and economies of scale in expenditure in different categories.

In quantile regression, conditional quantiles were estimated for fatshare at six different quantiles – 0.05, 0.25, 0.50 (median), 0.75, 0.90 and 0.95. The estimation was done using the ‘quantreg’ module in the R statistical software package. Confidence intervals were computed using the bootstrap procedure described in Koenker (2005) which is incorporated in the quantreg module.

Results

The UK dietary guidelines for fat consumption suggest that energy derived from fats should not exceed 30% of total energy intake. Figure-1 shows the distribution of energy derived from fat (in percentage points) for the survey households. It may be seen that variance in energy intake from fat is considerable at the household level. A little over 50% of the households exceed the 30% recommended norm for fat intake. A quarter of the households derive more than 40% of their total energy from fats. This variance can be observed even within specific ranges of the socio-economic determinants (e.g., within a specific household income range). This suggests that the impact of these determinants may vary by intake level, which is what quantile regression allows us to explore.

Table-3 presents the results for linear quantile regression with “fatshare” as the dependent variable and the same set of explanatory variables as used in the multiple linear regression. The table presents the coefficients and P-values for all the explanatory variables for the selected set of quantiles from 0.05 to 0.95. The ordinary least squares (OLS) estimates are also presented in the last column of the table to facilitate comparisons. Figure-2 presents the graphs for each explanatory variable showing the coefficients estimated at each of the selected quantiles. The shaded areas in the graphs show the 95% percent confidence intervals associated with the co-efficient estimates. The OLS estimates and the associated 95% confidence intervals, shown as the black line and dotted lines respectively, are superimposed on the quantile regression graphs.

It may be seen from the graphs in Figure-2, that for most variables, some portion of the QR estimates lie outside the OLS confidence intervals. Interestingly, these differences are marked at the lower and upper quantiles, which represent healthy or less healthy eating choices. In the case of fatshare, it is the upper quantiles that represent less healthy dietary choices, while the lower quantiles represent healthier dietary choices. The large divergence of the QR estimates from the OLS estimates, particularly in the extreme quantiles suggests that the simple conditional mean shift suggested by the OLS model may be a misleading representation of the impact of demographic/socio-economic drivers on dietary choice. The implications of the QR results for the impacts of these drivers are discussed below.

The coefficients of equivalised household income are insignificant in OLS as well as QR. This suggests that income has virtually no effect on the share of fat in energy intake. The QR coefficients at all quantiles lie within the OLS confidence intervals. Moreover, the quadratic household income term is also insignificant which suggests that the effect of income does not change as the size of income increases or decreases. It must be noted that these results are not inconsistent with results from previous studies (e.g. Riccuito, Tarasuk and Yatchew (2006), Giskes et al (2006)) that find a positive relationship between income and dietary intakes, particularly in the lower income ranges. Our dependent variable is the *share* of energy derived from fat and the OLS and QR coefficients only indicate that this share is not affected significantly by changes in the level of income. It is the adherence to the dietary guideline which is insensitive to income, not the level of dietary intakes.

Ethnicity appears to be a highly important factor explaining variations in fatshare. The base category for ethnicity is “White”, so the coefficients for ethnic “Asians”, “Blacks” and “Others” must be interpreted as the differences in fatshare compared to “Whites”. The OLS coefficients for all the three ethnic categories are highly significant. For “Asians”, the OLS coefficient suggests that at the median value of continuous variables, fatshare is just 0.02 percentage points above those of “Whites”. However, the OLS coefficient masks the significant differences in the impact of Asian ethnicity across quantiles. In the lower quantiles, representing healthier eating choices, “Asians” have a sharply lower fatshare compared to “Whites”- in the lowest quantile, their fatshare is lower than that of “Whites” by more than 9 percentage points. However, the picture is completely reversed in the upper quantiles, representing less healthy eating choices, with “Asians” having a fatshare which is more than 10 percentage points compared to that of “Whites”. In the case of “Blacks”, the OLS coefficient implies that, at median values of explanatory variables, they have a fatshare which is 2.86 percentage points less than that of “Whites”. However, this is true only in the lower quantiles, where “Blacks” have a substantially lower fatshare; in the upper quantiles fat intake patterns of “Blacks” are only marginally different from those of “Whites”. Thus in the less healthy quantiles, there is virtually no difference between “Blacks” and “Whites”. For the “Others” group (which includes a mixture of ethnicities) the QR coefficients are close to the OLS coefficients in most quantiles, except in the top quantiles where they have a fatshare 4-7% above those of “Whites”. These results have certain interesting implications for the targeting of dietary interventions. The average figures for fatshare for “Asians” (37%) and “Blacks” (33%) are only marginally different from “Whites” (36%) which may suggest that the dietary choices of these ethnic groups are not of special concern in dietary interventions aimed at reducing fatshare. This may not be an appropriate conclusion in the light of the QR results. While “Asians” and “Blacks” make better dietary choices in the lower (healthy eating) quantiles, in the upper quantiles (characterised by less healthy eating choices) they fare substantially worse than “Whites” (as in the case of “Asians”) or are not different from “Whites” (as in the case of “Blacks”). Any dietary intervention targeting high fatshare groups should in fact prioritise these ethnic groups for attention.

The education variable shows the age at completion of full time education of the HRP. Higher the age at completion, the better educated a person is likely to be – although that may not always be the case. It should be noted that this variable does not directly measure the level of educational attainment. The OLS and QR coefficients for education are all significant but their effect on fatshare is small compared to the effect of ethnicity. The nature of the effect is similar across all quantiles with an increase in education being associated with a small decline in fatshare of 0.01 -0.04 percentage points. Previous studies using the level of educational attainment as an explanatory variable have found a much stronger influence of education in promoting healthier dietary choices (e.g, Roos et al.(1998), Turrell et al. (2002)).

Occupational class is a categorical variable with the base category being the “Higher” (managerial, professional and executive) occupations. The coefficients reflect the change in fatshare in different occupational categories relative to the base category. Most of the OLS and QR coefficients of occupational class are small and insignificant. Households in the “Intermediate” occupational class have a lower fatshare relative to the “Higher” category but the effect wears off as we go up the quantiles. The coefficients of employment status are also small and insignificant. The only significant QR coefficients indicate that in the upper quantiles, the unemployed have a higher fatshare by 1-2% in relation to the base category of households in full time employment. The age of the HRP (generally the household head) has a small effect on fatshare, which is significant in the upper quantiles.

The coefficients of the accommodation variable measure the impact of accommodation status (rented, mortgaged or free) relative to the base category of households that fully own their accommodation. The OLS coefficients are insignificant except for the rented category. However, several QR coefficients are significant. Households in rented accommodation have higher fatshare relative to the base category (of the order of 1-3 percentage points) and this effect increases in the higher quantiles. Similarly, households with a mortgage also have a higher fatshare relative to the base category – but this effect is smaller compared to rented accommodation households.

The effect of the number of adult equivalents in a household on fatshare is also significant in OLS and QR. The OLS coefficient implies that an increase in the number of adult equivalents in a household has the effect of increasing fatshare by 0.01 percentage points. However, this masks the differential impact of the variable in different quantiles. In the lower quantiles an increase in the number of adult equivalents *increases* fatshare. However, as we move up the quantiles, the effect changes sign, leading to a decrease in fatshare at the higher quantiles. For households making less healthy eating choices, the size of the household is *not* a factor increasing fatshare.

The regional effects are generally insignificant except in the case of the "Midlands" where fatshare is consistently lower at all quantiles. The insignificance of the regional effects suggests that certain popular conceptions about diets in particular regions being oriented to excessive fat consumption may not be accurate. Once we control for other socio-economic drivers, households in Scotland and North of England cannot be said to have diets with high fatshare.

Conclusions

In designing dietary interventions, we are more interested in the impact of demographic and socio-economic determinants in segments of the population characterised by less healthy eating choices and large deviations from recommended dietary guidelines. The QR results discussed above show that the effect of demographic and socio-economic determinants can be quite different in the healthy and less healthy quantiles of dietary choice – with the direction of effect of some determinants being reversed in the less healthy quantiles. The different impact of the determinants in the upper quantiles of fat intake can be masked by the conditional mean response functions in multiple linear regression models. In general, the effects of these determinants in the healthy quantiles (characterised by low fatshare and better conformity to recommended dietary guidelines) are much weaker in the less healthy quantiles characterised by "excessive" consumption of fat. The implication for the design of dietary interventions is that these determinants provide limited leverage in influencing the dietary choices of segments of the population making less healthy dietary choices. The results may also indicate that traits and preference patterns unrelated to socio-economic characteristics may be responsible for poor dietary choice. This is perhaps reflected in the large impact of ethnicity relative to other socio-economic determinants. Ethnicity may encapsulate a range of culturally determined traits and preferences, which are independent of the socio-economic situation of the household. The results also suggest that some of the popular perceptions of the drivers of dietary choice (e.g., attribution of better dietary choice to ethnic minorities or association of excessive fat consumption with certain regional diets or occupational status) may be inaccurate. This analysis can be extended to other nutrients and associated dietary guidelines. This can provide useful insights into the potential effectiveness or utility of targeting dietary interventions based on demographic and socio-economic characteristics of the population.

References

Boukovoulas,G, Shankar, B and Traill, W.B. (2009). Determinants of Fruit and Vegetable Intake in England: A Re-examination Based on Quantile Regression. Public Health Nutrition, 12(11), 2183-2191.

Cabinet Office (2008). Food Matters: Towards a Strategy for the 21st Century. The Strategy Unit, Cabinet Office. Accessed from http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf

DEFRA (2007).Family Food: A Report on the 2007 Expenditure and Food Survey. A National Statistics Publication by DEFRA, London (TSO).

Department of Health (1991). Dietary Reference Values of Food Energy and Nutrients for the United Kingdom. Report on Health & Social Subjects 41. Report of the Panel on Dietary Reference Values of the Committee on Medical Aspects of Food Policy. TSO, UK.

European Food Information Council (2008). The Determinants of Food Choice. Accessed from http://www.eufic.org/article/en/page/RARCHIVE/expid/review-food-choice/

Giskes, K.,Turrell G, van Lenth, F.J. and Mackenbach J.P. (2006). A Multi-Level Study of Socio-Economic Inequalities in Food Choice Behaviour and Dietary Intake Among the Dutch Population: The GLOBE Study. Public Health Nutrition 9, 75-83.

Koenker, R. (2005). Quantile Regression. Cambridge University Press.

Ricciuto, L, Tarasuk, V. and Yatchew A. (2006). Socio-demogrpahic Influences on Food Purchasing Among Canadian Households. European Journal of Clinical Nutrition, 60, 778-790.

Roos, E, Lahelma, E, Virtanen, M. Prattala, R and Pietinen, P (1998). Gender, Socio-Economic Status and Family Status as Determinants of Food Behaviour. Social Science and Medicine, 12 (15), 1519-1529.

Sinha, K. (2005). Household Characteristics and Calorie Intake in Rural India: A Quantile Regression Approach. Accessed fromhttp://dspace.anu.edu.au/bitstream/1885/43190/1/WP2005_02.pdf

Turrell, G., Hewitt, B., Patterson, C.,Oldengburg, B. and Gould, T. (2002). Socio-Economic Differences in Food Purchasing Behaviour and Suggested Implications for Diet-Related Health Promotion. Journal of Human Nutrition and Dietetics, 15 (5), 355-364.

Variyam, J.N., Blaylock, J. and Smallwood, D. (2002). Characterizing the Distribution of Macronutrient Intakes Among US Adults: A Quantile Regression Approach. American Journal of Agricultural Economics, 82(2), 454-466.

WHO (2003). Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation, Geneva, 28 January - 1 February 2002, WHO Technical Report Series: 916. Geneva: World Health Organization.

Table-1: Recommended Dietary Intake Norms – UK and WHO

UK Dietary Norms (DOH: 1991)	
Nutrient	**Recommened amount**
Share of energy from:	
Total fat	<33%
Saturated fatty acids (SFAs)	10%
Monounsaturated fatty acids (MUFAs)	12%
Polyunsaturated fatty acids (PUFAs)	6-10%
Trans fatty acids (TFAs)	<2%
Glycerol	3%
Protein	10-15%
Free Sugars	<10%
Total carbohydrates	50%
Other nutrients	
Cholesterol	<300 mg/day
Fruit and Vegetables	>= 400 gms per day
Salt	<6 gms/day
Sodium equivalent	<2.36 gms/day
Total dietary fibre	>=18 gms/day

WHO Dietary Norms (WHO: 2003)	
Dietary factor	**Goals**
Total fat	15-30% energy
Saturated fatty acids	<10% energy
Polyunsaturated fatty acids (PUFAs)	6-10% energy
n-6 Polyunsaturated fatty acids (PUFAs)	5-8% energy
n-3 Polyunsaturated fatty acids (PUFAs)	1-2% energy
Transfatty acids	<1% energy
Monosaturated fatty acids (MUFAs)	By difference [a]
Total carbohydrate [b]	55-75% energy
Free sugars [c]	<10% energy
Protein	10-15% energy
Cholesterol	<300 mg/day
Sodium chloride (sodium)	<5 g/day
Fruits and vegetables	>= 400 g/day
Total dietary fibre	From foods

[a] This means "total fat – (saturated fatty acids + polyunsaturated fatty acids + trans fatty acids)"

[b] The percentage of total energy available after taking into account that consumed as protein and fat, hence the wide range.

[c] The term "free sugars" refers to all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey syrups and fruit juices.

Table 2: Socio-Economic and Demographic Variables

Variable	Units	Categories
Household income from all sources	£ '000 per week	
Equivalised household income	£ '000 per week	
Age of HRP	Years	
Education of HRP (age at completion of full time education)	Years	
Accommodation status of household	Categorical variable	Owned, Mortgaged, Rented, Free [Base = Owned]
Mortgage outstanding (proxy for debt burden of the household)	£ 000s	
Employment status of the household	Categorical variable	Full time, Part time, Self-Employed and Unemployed [Base = Full time]
Occupational status of the household	Categorical variable	Higher, Intermediate, Lower, Not working [Base= Higher]
Ethnicity	Categorical variable	White, Black, Asian, Others [Base = White]
Government Office Region	Categorical variable.	North, Midlands, East, South, London, Scotland, Wales, Northern Ireland [Base= London]

Table-3: Quantile regression and Ordinary Least Squares estimates of the impact of demographic and socio-economic determinants on the share of energy derived from fats.

	tau=0.05		tau=0.25		tau=0.50		tau=0.75		tau=0.90		tau=0.95		OLS	
Variables	**Co-efficient**	**Pr(>|t|)**	**Co-efficient**	**Pr(>|t|)**	**Co-efficient**	**Pr(>|t|)**	**Co-efficient**	**Pr(>|t|)**	**Co-efficient**	**Pr(>|t|)**	**Co-efficient**	**Pr(>|t|)**	**Estimate**	Pr(>|t|)
(Intercept)	**26.20**	0.00	**31.93**	0.00	**35.99**	0.00	**40.69**	0.00	**43.71**	0.00	**46.72**	0.00	**36.41**	0.00
Income	**-0.16**	0.91	**0.11**	0.94	**0.02**	0.99	**-0.20**	0.85	**-0.13**	0.92	**-0.16**	0.87	**-0.07**	0.75
Income^2	**0.04**	0.92	**0.02**	0.97	**0.02**	0.98	**0.02**	0.93	**0.05**	0.75	**0.01**	0.97	**0.02**	0.15
Ethnic-ASIAN	**-9.10**	0.00	**-2.08**	0.08	**1.02**	0.23	**3.56**	0.00	**6.75**	0.00	**10.40**	0.00	**1.20**	0.02
Ethnic-BLACK	**-8.71**	0.00	**-4.67**	0.01	**-1.59**	0.13	**-1.57**	0.10	**-0.59**	0.47	**0.06**	0.93	**-2.86**	0.00
Ethnic-OTHERS	**-0.06**	0.95	**1.51**	0.17	**1.48**	0.00	**1.99**	0.16	**4.46**	0.01	**6.82**	0.00	**1.93**	0.01
Education	**-0.01**	0.60	**-0.03**	0.00	**-0.04**	0.00	**-0.02**	0.18	**-0.04**	0.00	**-0.02**	0.45	**-0.03**	0.00
Occupational class -INTERMEDIATE	**-1.55**	0.00	**-0.88**	0.04	**-0.32**	0.44	**-0.77**	0.08	**-0.23**	0.68	**0.17**	0.84	**-0.84**	0.02
Occupational class -LOWER	**0.20**	0.67	**-0.14**	0.72	**-0.22**	0.55	**-0.03**	0.94	**0.04**	0.94	**-0.34**	0.56	**-0.13**	0.65
Occupational class -NOTWORKING	**0.19**	0.88	**-1.07**	0.09	**-0.51**	0.35	**-1.55**	0.03	**-1.14**	0.26	**-0.62**	0.44	**-0.90**	0.10
Employment status -PT	**0.57**	0.23	**-0.02**	0.96	**-0.09**	0.81	**-0.51**	0.29	**0.46**	0.48	**1.19**	0.19	**0.00**	1.00
Employment status -SE	**1.37**	0.01	**0.53**	0.29	**0.10**	0.82	**-0.08**	0.87	**-0.33**	0.64	**-0.84**	0.43	**0.35**	0.41
Employment status -UE	**-0.94**	0.47	**0.99**	0.16	**0.31**	0.63	**1.23**	0.12	**1.76**	0.07	**1.90**	0.01	**0.68**	0.20
Age of HRP	**-0.01**	0.56	**0.01**	0.50	**0.01**	0.31	**0.03**	0.00	**0.04**	0.00	**0.05**	0.00	**0.02**	0.04
Accommodation-FREE	**-2.26**	0.77	**-0.26**	0.68	**0.76**	0.52	**2.02**	0.02	**0.59**	0.54	**0.73**	0.66	**-0.08**	0.92
Accommodation-MORTGAGE	**0.22**	0.54	**0.58**	0.02	**0.45**	0.08	**0.43**	0.18	**0.67**	0.06	**1.23**	0.02	**0.40**	0.13
Accommodation-RENTED	**0.09**	0.83	**0.80**	0.02	**1.21**	0.00	**1.52**	0.00	**1.99**	0.00	**2.85**	0.00	**1.09**	0.00
Adult equivalents	**1.79**	0.00	**0.67**	0.00	**0.24**	0.14	**-0.24**	0.14	**-0.73**	0.00	**-0.94**	0.00	**0.26**	0.01
GOR-East	**-0.16**	0.81	**0.24**	0.60	**-0.22**	0.59	**-0.32**	0.55	**0.20**	0.77	**-0.90**	0.42	**-0.15**	0.73
GOR-Midlands	**-0.96**	0.04	**-0.90**	0.03	**-0.88**	0.02	**-0.88**	0.05	**-0.43**	0.46	**-1.38**	0.18	**-0.94**	0.01
GOR-N Ireland	**-0.37**	0.43	**-0.34**	0.49	**-0.24**	0.57	**-0.60**	0.24	**-0.23**	0.78	**-1.13**	0.29	**-0.36**	0.43
GOR-North	**-1.17**	0.01	**-0.25**	0.57	**0.02**	0.96	**-0.09**	0.84	**0.01**	0.99	**-0.37**	0.72	**-0.15**	0.68
GOR-Scotland	**-0.96**	0.22	**-0.42**	0.43	**-0.52**	0.23	**-0.64**	0.27	**0.24**	0.76	**0.37**	0.75	**-0.42**	0.33
GOR-South	**-0.32**	0.51	**-0.25**	0.58	**0.22**	0.48	**0.06**	0.90	**0.74**	0.20	**0.46**	0.68	**0.02**	0.96
GOR-Wales	**0.20**	0.71	**-0.65**	0.21	**-0.50**	0.30	**-0.65**	0.36	**0.07**	0.93	**-1.95**	0.08	**-0.55**	0.28

Notes: Data on 6852 UK households from the Expenditure and Food Survey (2005-06). Shaded cells highlight co-efficients significant at 10% level of significance

Figure 1: Distribution of share of fat in energy intake

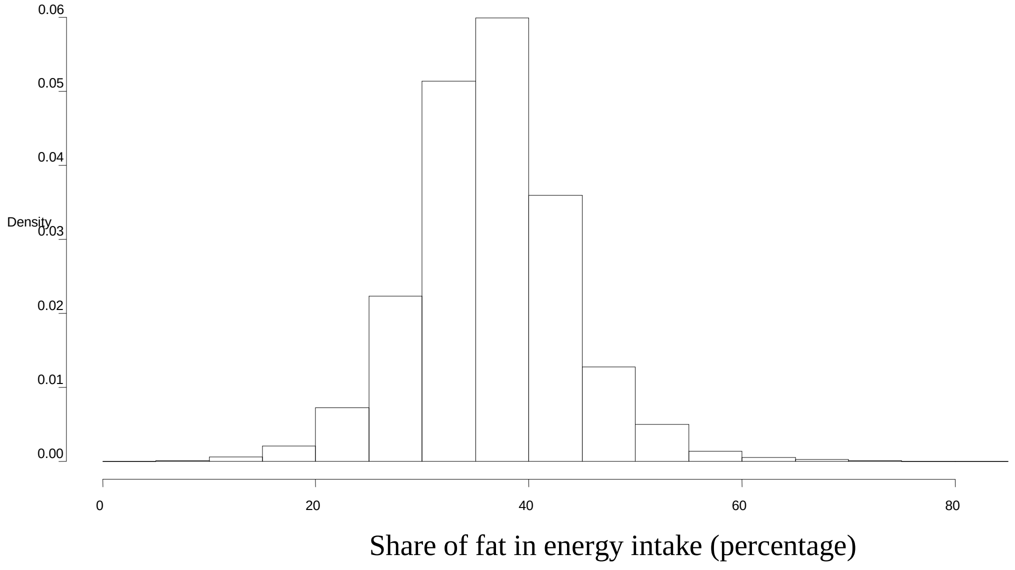
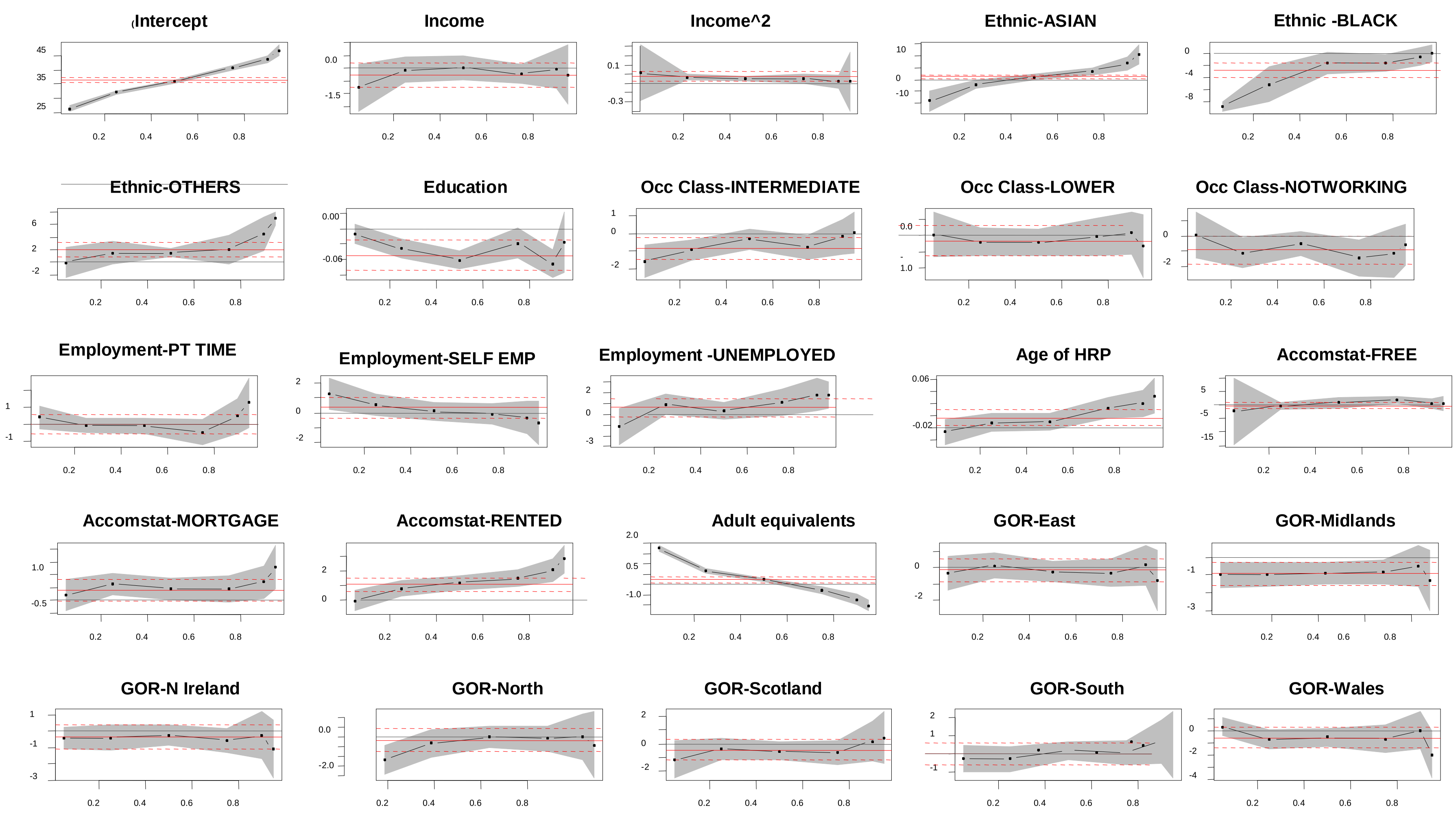


Figure-2: OLS and Quantile Regression Results: Effect of Demographic and Socio-Economic Variables on Share of Fat in Total Energy Intake



Note: Quantiles are shown along the x-axis and the share of fat in energy intake (percentage points) are shown along the y axis. The black lines show the quantile regression coefficients and the shaded area shows the 95% confidence intervals. The red line shows the OLS coefficient and the dotted red lines show the 95% OLS confidence intervals