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Arsenic exposure from seafood in healthy adult Norwegians -a randomized controlled diet trial

Molin, Marianne; Dahl, Lisbeth; Ulven, Stine M.; Telle-Hansen, Vibeke H.; Sloth, Jens Jørgen; Oshaug, Arne; Haldorsen, Anne-Katrine L.; Julshamn, Kåre; Meltzer, Helle M.

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Diet, physical activity and energy balance: complementary advances in methodologies

Nick Wareham
MRC Epidemiology Unit, CAMBRIDGE, United Kingdom

Physical activity, like dietary intake, is a complex multi-dimensional exposure which is difficult to measure in epidemiological studies (1). Many of the methodological challenges that face nutritional epidemiology are mirrored in the assessment of physical activity. This talk summarises these areas of similarity.

The earliest epidemiological studies that considered activity took an ecological perspective and compared groups who differed in their activity levels principally through the nature of their occupation. These intriguing initial group-level observations were followed by efforts to characterise individual exposure. These efforts focused on different approaches to self-report and the range of different instruments that have been developed is huge. They range from global indices of activity (2), through single and multi-domain questionnaires (analogous to FFQs)(3) to diaries. The issues of participant burden, computational difficulty, face validity, reproducibility and validity differ by instrument as with nutritional assessment tools.

Prompted by the relatively low levels of apparent validity, many have moved their efforts towards more objective measurement of activity, akin to biomarker development in nutrition. The key questions for objective measurement of activity on an epidemiological scale are those of validity and feasibility (4). However, technological advances are being made but need to be driven by the intellectual need for application in epidemiological research settings. These needs include estimation of energy intake, for which a measure of energy expenditure may be a realistic biomarker (5). Given that an objective instrument is valid and feasible, the next issue is the degree to which a single short period of measurement of activity is representative of the usual or habitual level, which in turn leads one to consider the broader question of adjustment of observed associations for measurement error (6).

Although some have painted subjective and objective measurement as competing alternatives, it is increasingly clear that they are complementary methods with self-report methods having utility as descriptors of behaviour with objective measurement being valuable for measurement of the underlying physiological construct. The problems arise when the former is used to compute the latter, an issue common to self-report measures and objective assessment in nutritional epidemiology.

1. Wareham NJ, Rennie KL. The assessment of physical activity in individuals and populations: Why try to be more precise about how physical activity is assessed ? International Journal of Obesity 1998;22(S2):S30-38
2. Wareham NJ, Jakes RW, Rennie KL, Schuit J, Mitchell J, Hennings S, Day NE. Validity and repeatability of a simple index derived from the short physical activity questionnaire used in the European Prospective Investigation into Cancer (EPIC) study. Public Health Nutrition 2003; 6(4): 407-413
3. Wareham NJ, Jakes RW, Rennie KL, Mitchell J, Hennings S, Day NE. Validity and repeatability of the EPIC-Norfolk physical activity questionnaire. International Journal of Epidemiology 2002;31:168-174
4. Brage S, Brage N, Franks PW, Ekelund U, Wareham NJ. Reliability and validity of the combined heart and movement sensor Actiheart. Eur J Clin Nutr 2005; 59:561-70
5. Jakes RW, Day NE, Luben R, Welch A, Bingham S, Mitchell J, Hennings S, Rennie K, Wareham NJ. Adjusting for energy intake – what measure to use in nutritional epidemic studies. Int J Epidemiol 2004; 33:1382-6
6. Wareham NJ, Wong M-Y, Day NE. Glucose intolerance and Physical inactivity: The relative importance of low habitual energy expenditure and cardiorespiratory fitness. American Journal of Epidemiology 2000;152:132-139

PL02-01

Glycemic index/Load – is it a useful dietary indicator of disease?

Berit Heitmann, Helle Hare-Bruun
Instiute of Preventive Medicine, COPENHAGEN K, Denmark

It has been proposed that low glycemic index (GI) diets may be beneficial to health and help prevent disease. Indeed, a recent meta-analysis of randomized controlled trails concluded that GI may be used as a tool to enable selection of carbohydrate-containing foods to reduce serum cholesterol and to improve overall metabolic control of diabetics. In agreement, some countries include in their public health recommendations on food intake, advise on how to understand and use the GI. However, most of the randomized controlled trails performed previously have been short-term by nature, have used GI levels in the intervention groups that were unrealistically high/low compared to normal diets, and have generally been performed among smaller groups of subjects with metabolic disturbances, such as the obese, the diabetic, or the cardiac patients, rather than on general population subsets. In this regard, results based on healthy subjects are limited, mostly cross-sectional and have not had the potential for examining the directional relationships with glycemic index or load. In fact, results from the few prospective studies available, that examined the influence of glycemic index or load on development in cardiovascular risk factors, or incidence of heart disease, show associations that were weak, inconsistent and generally confined to subgroups. Hence, the results from published literature do not provide sufficient support for using GI as a useful dietary indicator of disease. Rather these results would suggest that it is premature to educate the general public about reducing their dietary glycemic index.

PL02-02

Glycemic index/load - is it a useful dietary indicator for the prevention or treatment of disease?

Jeya CK Henry
Oxford Brookes University, OXFORD, United Kingdom

In the 1980s the concept of Glycaemic Index (GI), a means of ranking carbohydrate-containing foods according to their glycaemic response, was proposed as a dietary aid in patients with diabetes mellitus (DM). The rationale for this was based on the observation that low-GI foods minimised the postprandial rise in blood glucose. It is now well established that a high-GI food with comparable carbohydrate content as a low-GI food induces a much larger area under the blood glucose curve response over the postprandial period. A low-GI diet appears to have several health benefits including reduced insulin demand, improved blood glucose control & reduced lipid concentration. Since these early observations, several recent clinical trials & meta-analyses have reported a beneficial effect of low-GI diets on glucose control in diabetics. A review of this extensive literature will form the first part of my supportive evidence. This will be followed by presenting data on the role low GI diets play on cardiovascular disease (CVD) risk reduction & long term effects on glucose control as measured by HbA1c. Our recent work on 24 hr glucose monitoring of blood glucose on a low/high GI diet will be presented to confirm the usefulness of a low GI diet in reducing overall 24-hour glucose levels. Despite medical & pharmacological advances in the management, prevention & treatment of CVD & DM, they remain leading causes of morbidity & mortality. More importantly, in countries such as India & China, DM remains a major public health concern. If we are to address DM & CVD on a global scale it is imperative to understand how dietary choices/ interventions can be used to improve overall metabolic control of diabetes & CVD. An extensive body of the literature is providing a convincing case for the use & application of GI/GL to improve the health & well being of patients with diabetes & CVD. In conclusion GI/GL certainly have a role to play in the treatment /management of DM & CVD.

Mapping food consumption, dietary intake and risk factor levels in Finland

Liisa Valsta, O Similä, O Taskinen, Satu Männistö, M Lahti-Koski, T Laatikainen, M Karvonen
National Public Health Institute, HELSINKI, Finland

Prevention of chronic diseases through promotion of healthy dietary habits and prevention of obesity is an important public health goal. Effective visual tools for illustrating population and geographical differences are useful for monitoring purposes. In this study the geographical and gender differences of diet and obesity in Finland were visualized as maps. Data were collected in the Health 2000 Study and the FINRISK 1997 and 2002 Studies. Food consumption over the preceding 12 months was assessed by a validated food frequency questionnaire (n=6647). The pooled risk factor data was obtained from all the three studies (n=17816). Coordinates of the respondents were obtained from the Population Register. Food and nutrient intake and risk factor levels were estimated using a Bayesian conditional autoregressive model. The quality of the diet was evaluated with five dietary indicators of health: consumption of vegetables and fruit, whole grain bread (rye) and fish as well as intake of saturated fatty acids and salt. The diet was evaluated to be best in the capital area and in Eastern Finland. Energy intake and BMI were smaller in cities compared with other areas. The proportion of population with abdominal obesity was highest in Western and Eastern Finland.

The Community Nutrition Mapping Project (CNMap)

Ellen Harris, Alvin Nowverl
Beltsville Human Nutrition Research Ctr., BELTSVILLE, United States of America

Geographical Information Systems (GIS) tools have tremendous potential to create profiles, which can be used to characterize communities by food program participation, food habits, environment and socio-demographic variables. These tools can be used to identify community problems; inform, educate and empower people about health issues; develop policies and plans that support community health; and link people to needed services. The Community Nutrition Mapping Project (CNMap) is an application that combines and aggregates food and nutritional indicators to create a snapshot of human nutrition, health and behavior at the state and regional level. GIS software is combined with national food survey data and other data on physical activity, body weight, healthy eating patterns, food security, and Census demographics. Estimates are created by merging state Federal Information Processing Standards (FIPS) code to respondents in a national food survey; then aggregating their nutrient and Pyramid Servings intakes to state levels. Regional estimates are used for states with no respondents in the survey. Sample weights are ratio adjusted to reflect state population totals as needed. CNMap, version 1, was developed using the last USDA Continuing Survey of Food Intakes by Individuals and provides a series of easy-to-read tables that can be accessed via the World Wide Web. CNMap, version 2, updated with the latest National Health and Nutrition Examination Survey (NHANES) data, will be presented.

SY00-03

Nutrition Assessment Methods in NHANES: What's old, what's new, and what are the issues

Clifford Johnson
Cdc, hyattsville, MARYLAND, United States of America

Nutrition components and assessment methods have always been part of the National Health and Nutrition Examination Survey (NHANES). Over the years, dietary intake data , dietary supplement use data , body measurements, and nutrition biomarkers have been included in the survey to assess the nutritional status of the U. S. population. Changes is data collection methodologies have complicated the ability to compare results over time. The current NHANES has the most extensive set of nutrition and diet data ever collected in the history of the survey. Potential analytic uses of these data and the methodologic concerns that must be addressed when using this data will be discussed, focusing on dietary data and nutrition biomarkers as examples.

SY00-04

Revisions and improvements to USDA's healthy eating index

Patricia Guenther[1], Jill Reedy[2], Susan Krebs-Smith[2], Bryce Reeve[2], Peter Basiotis[1]
[1]U.S. Department of Agriculture, ALEXANDRIA, VA, United States of America
[2]National Cancer Institute, BETHESDA, MD, United States of America

USDA's Healthy Eating Index (HEI) is a measure of overall diet quality, used to monitor change within the context of the U.S. National Nutrition Monitoring System and to measure conformance of the population and individuals to federal dietary guidance. In 2005, new Dietary Guidelines for Americans were released, motivating a revision to the HEI and improvements to its psychometric properties. The revised index includes measures of fruit; non-juice fruit; total vegetables; dark-green vegetables, orange vegetables, and legumes; total grains; whole grains; milk; meat; oils; sodium; calories from saturated fat; and 'extra calories' from solid fats, added sugars, beer, wine, and distilled spirits. Standards for scoring most components are now expressed as densities, that is, recommended amounts of food groups, saturated fat calories, and extra calories per 1,000 calories of reported energy intake. Goals for the revision were content validity, maximum variation in scores, detection of changes over time, and standardized scores within and between components. To maximize variation, criteria for the minimum score (0) for sodium, saturated fat calories, and extra calories were set at the 85th percentile of the distribution of the population's 1-day intakes in 2001-2002.

Sociodemographic factors modify the association between fast food consumption and maternal weight gain

U Uusitalo[1], T Arkkola[2], ML Ovaskainen[1], C Kronberg-Kippilä[1], MG Kenward[3], R Veijola[2], OG Simell[4], M Knip[5], Suvi Virtanen[1]
[1]National Public Health Inst., HELSINKI, Finland
[2]Universtity of Oulu, OULU, Finland
[3]Institut, LONDON, United Kingdom
[4]Turku, TURKU, Finland
[5]Helsinki, HELSINKI, Finland

Food consumption frequency, sociodemographic and anthropometric data on pregnant women within the DIPP Nutrition Study were collected in 1997-2002 in order to study their dietary patterns and pregnancy weight gain. The sample comprised 3876 mothers (aged 16-47 years) whose weight was measured at their initial antenatal visit (0-15th week of pregnancy), and again before delivery (35-42nd week). Factor analysis was carried out on daily consumption frequencies of 53 food groups that were formed from the food consumption frequencies in a 181-item questionnaire. Seven factors were extracted describing dietary patterns named according to their factor loadings: 'healthy', 'fast food', 'traditional', 'bread', 'low-fat', 'coffee' and 'alcohol'. Fast food pattern was most strongly associated with maternal weight gain when adjusted for maternal age, maternal height, first measurement of weight, education, and number of siblings of the newborn infant. Sociodemographic factors that were positively associated with fast food consumption related to larger weight gain were cohabitation without marriage, age below 30 years, and living area.

Differences between food reports of low energy reporters (LERs) and non-LERs on both 24-hour recalls and a food frequency questionnaire

Amy Millen[1], Janet Tooze[2], Amy Subar[3], V Kipnis[3], Lisa Kahle[4], Susan Krebs-Smith[3]
[1]University at Buffalo, BUFFALO, United States of America
[2]Wake Forest University, WINSTON-SALEM, NC, United States of America
[3]National Cancer Institute, BETHESDA, MD, United States of America
[4]Information Management Services, Inc., SILVER SPRING, MD, United States of America

In the Observing Protein and Energy Nutrition Study, differences were examined between food reports of LERs and non-LERs on 24-hour recalls (24HRs) (n=451) and a food frequency questionnaire (FFQ) (n=450), by sex. LERs were identified using doubly labeled water (DLW). LERs' and non-LERs' food reports were examined in three ways: whether they reported a food, how frequently they reported eating a food (<1 vs. = 1/day), and portion size per mention. Analyses were adjusted for total energy expenditure from DLW. Among men, LERs were not significantly less likely to report any food on either instrument. However, LERs reported eating some foods less frequently, and some in smaller portions, than their non-LER counterparts, on both instruments. Among women, LERs compared to non-LERs, were less likely to report some foods, and reported foods with smaller portions, on both instruments. Additionally, women LERs reported eating foods less frequently than non-LERs, but only on the FFQ. LERs reported eating specific foods less frequently and in smaller portions than non-LERs for more foods on the FFQ compared to the 24HRs. The knowledge regarding which foods are most often under reported may be utilized in the design of dietary assessment tools to help minimize underreporting bias.

SY00-07

Greater underreporting of dietary intake among immigrant women from Iran and Turkey than in native-Swedish women in Uppsala County

Achraf Daryani[1], Tahire Kocturk[2], Agneta Andersson[3], Brita Karlström[3], Bengt Vessby[3], Wulf Becker[4]
[1]Uppsala Universitet, UPPSALA, Sweden
[2]Centre for Migration Medicine, STOCKHOLM, Sweden
[3]Public Health and Caring Sciences, UPPSALA, Sweden
[4]Swedish National Food Administration, UPPSALA, Sweden

This study examined the energy and nutrient intake among immigrant women from Iran and Turkey, vs. native-Swedish women. Dietary data were collected using four 24-hour dietary recall performed in the subjects' native languages. The reported mean daily energy intake was lower in Iranian (5.6±1.1 MJ) and Turkish women (5.7±1.6 MJ) than in Swedish women (7.5±1.5 MJ). The prevalence of underreporting, identified as a food intake level (energy intake/BMR) less than 1.06, was 65 %, 47 % and 20 % for Iranian, Turkish, and Swedish women, respectively. The immigrant women had a higher BMI and were less active than the Swedish subjects, which contribute to the lower EI/BMR ratio. The Turkish women had the lowest level of education, while both the Iranian and Swedish women were generally better educated. Furthermore it may be considered improper to discuss the food one eats in those immigrants's culture, and certain food items, such as candy, sugar, nuts, may not considered 'real' foods meaning that their consumption is likely to be overlooked by the subjects. All those factors together may have contributed to the greater underreporting in the immigrant women. Specific problems in the dietary assessment of immigrant groups emphasize the need for more research in this area.

SY01-01

Use of nutritional biomarkers to describe participant-related measurement error from dietary self-report in the women's health initiative

Marian Neuhouser[1], Lesley Tinker[1], Dale Schoeller[2], Shirley Beresford[3], Linda Van Horn[4], Bette Caan[5], Sheila Bingham[6], Annlouise Assaf[7], Gerardo Heiss[8], Lew Kuller[9], Judith Okene[10], Gloria Sarto[2], Suzanne Satterfield[11], Marcia Stefanick[12], Cynthia Thomson[13], Jean Wactawski-Wende[14], Ross Prentice[1]
[1]Fred Hutchinson Cancer Research Center, SEATTLE, United States of America
[2]University of WI, MADISON, United States of America
[3]University of WA, SEATTLE, United States of America
[4]Northwestern University, , United States of America
[5]Kaiser Permanente, OAKLAND, United States of America
[6]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom
[7]Brown University, PROVIDENCE, United States of America
[8]University of NC, CHAPEL HILL, United States of America
[9]University of Pittsburgh, PITTSBURGH, United States of America
[10]University of MA, WORCESTER, United States of America
[11]University of TN, MEMPHIS, United States of America
[12]Stanford University, PALO ALTO, United States of America
[13]University of Arizona, TUCSON, United States of America
[14]University of Buffalo, BUFFALO, United States of America

Background: Dietary assessment using standard instruments of self-report such as diet records, recalls and food frequency questionnaires (FFQ) provide the primary exposure data for most nutritional epidemiology research. A recognized limitation of these assessment tools is that measurement error from self-report distorts any observed diet-disease associations. Still, there are few studies that have utilized objective measures of diet to describe the measurement properties (including the error variance) of self-report dietary assessment tools, particularly across age, race/ethnicity and obesity classifications. The objectives of this study were: (1) to use nutritional biomarker data to describe the measurement error distributions for self-reported intake of total energy, total and percent energy from protein, and percent energy from non-protein from the Women's Health Initiative (WHI) FFQ; and 2) to examine whether the measurement error structure varied by participant characteristics such as age, race/ethnicity, body mass index and various lifestyle habits.

Methods: Participants were 543 postmenopausal women recruited from the WHI Dietary Modification (DM) Randomized Trial (a low-fat dietary intervention). The recruitment scheme was designed to obtain a sample of women that would be representative of the DM in terms of age, race/ethnicity, body mass index and randomization assignment in the trial. Women attended two visits at their local WHI clinic where they completed a doubly labeled water protocol (objective measure of total energy expenditure) and collected a 24-hour urine sample (objective measure of protein intake). Participants completed several standard self-report instruments including the WHI FFQ and questionnaires on physical activity and lifestyle habits. Clinic staff measured participants' height and weight. One hundred ten women repeated all measures six months after the first application of the protocol.

Results: Of the 1,456 WHI participants who were invited to participate, 677 (46.5%) declined, 223 (15.3%) were ineligible and 556 (38.2%) agreed to participate. Thirteen women (2%) dropped out, leaving a sample of 543 women who completed the protocol. There were equivalent participants from the intervention and control arms of the WHI-DM and 18.2% were racial or ethnic minorities. On average, compared to the objective total energy expenditure, women underreported energy intake on the FFQ by 20% and 30% in the WHI-DM control and intervention arms, respectively. Underreporting of protein intake was smaller (less than 10%). There were modest differences in energy underreporting by race/ethnicity, with slightly more underreporting by African-American and Hispanic women, compared to non-Hispanic white women.

Conclusions: This study used nutritional biomarkers to examine the measurement properties of an FFQ used in a large study of diet and women's health. The overall result showing that measured energy expenditure and self-reported energy intake differed by about 20-30% supports previous research. A novel contribution of this report is the suggestion of systematic dependence of the error distribution on subject characteristics such as race/ethnicity.

The development of new biomarkers of nutritional intake

Natasa Tasevska, Shirley A Runswick, Sheila A Bingham
MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

The use of biomarkers has emphasized the extent of measurement error in nutritional epidemiology (1, 2). However, there are few biomarkers that can be used to assess measurement error. More need to be developed using facilities where all food intake can be measured and all specimens collected. We describe here the development of two new urinary biomarkers (sucrose and fructose, and thiamine) and further work on an established biomarker (potassium) for use in future nutritional epidemiology studies. In two studies with 25 volunteers carried out in a metabolic suite, total sugars intake was significantly correlated with the sum of sucrose and fructose in urine (r = 0.888; p < 0.001; r = 0.841; p < 0.001) (3). In the regression, 100 mg of sucrose and fructose in urine predicted approximately 200g of sugars intake. Urinary thiamine was also highly correlated with thiamine intake (r = 0.781; p < 0.001; r = 0.720; p < 0.001). On average, 25 ± 8% (range 11.9 to 41.5%) of thiamine intake was excreted in the urine when subjects consumed their habitual diet. A significant correlation was found between dietary and urinary potassium (Study 2: r = 0.89; p < 0.001). On average, 77.0 ± 6.7% and 18.0 ± 5.0% of potassium in the diet was excreted in the urine and the stool, respectively. Correlations from a shorter protocol using randomly selected 16d of intake and 8d of urine collections were similar for urinary sugars (r = 0.80, p < 0.001) and 24-h urinary potassium (r = 0.86; p < 0.001), although lower for urinary thiamine (r = 0.60; p = 0.03). The high correlation with intake and predictive potential suggest that urinary sugars could qualify as a biomarker for sugars intake and can be classified in our newly suggested group of predictive biomarkers. The predictability of the regression equation requires confirmation using data from larger studies with free-living individuals where dietary intake has been validated. The ability of this biomarker to characterise sugars intake from different food sources or dietary patterns still needs to be investigated. The wide range of thiamine recoveries in the urine imply that urinary thiamine can be used as a concentration biomarker in comparative validation studies. Furthermore, it was confirmed that 24-h urine potassium is a valuable addition to the established nutritional biomarkers used to assess the accuracy of reports of dietary intake in epidemiological studies.

1.Day N, McKeown N, Wong M, Welch A, Bingham S. Epidemiological assessment of

diet: a comparison of a 7-day diary with a food frequency questionnaire using urinary markers of nitrogen, potassium and sodium. Int J Epidemiol. 2001 Apr;30:309-17.
2.Bingham SA, Day NE, Luben R, Ferrari P, Slimani N, Norat T, Clavel-Chapelon F, Kesse E, Nieters A, et al. Dietary fibre in food and protection against colorectal cancer in the European Prospective Investigation into Cancer and Nutrition (EPIC): an observational study. Lancet. 2003 May 3;361:1496-501.
3.Tasevska N, Runswick SA, McTaggart A, Bingham SA. Urinary sucrose and fructose as biomarkers for sugar consumption. Cancer Epidemiol Biomarkers Prev. 2005 May;14:1287-94.

Re-OPEN: Comparing effect of measurement error in 4-day food records, FFQ and 24-hour recalls using biomarkers of protein and energy

D Midthune[1], Amy Subar[1], Frances Thompson[1], N Potischman[1], Arthur Schatzkin[1], RP Troiano[1], Laurence Freedman[2], V Kipnis[1]
[1]National Cancer Institute, BETHESDA, MARYLAND, United States of America
[2]Gertner Institute for Epidemiology, TEL HASHOMER, Israel

The Re-OPEN Study is a follow-up to the Observing Protein and Energy Nutrition (OPEN) biomarker study, conducted in 1999-2000, that evaluated measurement error in a food frequency questionnaire (FFQ) and 24-hour dietary recall (24HR) using urinary nitrogen and doubly labeled water as reference instruments for protein and energy intake. Three years later, the 484 participants in the original OPEN study were re-contacted and 345 (71%) completed and returned a FFQ and two 4-day food records (4DFRs). These data were combined with original OPEN data to evaluate the measurement error structure in the 4DFR and to compare it with the FFQ and 24HR for use in epidemiologic studies. To avoid possible bias due to changes in diet in the three-year period between the collecting of biomarkers in OPEN and the collecting of 4DFRs in Re-OPEN, we used changes in FFQ-reported intake and weight to identify and exclude from analysis subjects who seemed to have changed their diets. Results indicate that, for energy-adjusted protein in men, two 4DFRs perform similar to four 24HRs and that both are better than a single FFQ; in women, two 4DFRs perform as well as a single FFQ, but both are inferior to four 24HRs.

SY01-04

A simple, quantitative, energy expenditure tool for validating group and individual energy intake

Mary Kretsch[1], CA Blanton[2]
[1]United States Department of Agriculture, BELTSVILLE, MD, United States of America
[2]USDA, ARS, WHNRC, DAVIS, CA, United States of America

The doubly-labeled water (DLW) method is an accurate, yet expensive means to identify misreported dietary intake. Seeking a less costly alternative, we evaluated the Actical accelerometer (MiniMitter, Bend, OR) as a validation tool for self-reported energy intake (EI). Methods: Ten highly motivated, normal-weight premenopausal women [age 29.9 ± 4.0 y (mean ± SD); BMI 22.3 ± 1.8] participated in a 14-d free-living DLW study during which they kept daily food records (FR) & wore a waist-mounted Actical. Physical activity measurements were translated into daily total energy expenditure (TEE) using MET-based algorithms. Results: Actical TEE (2260 ± 235 kcal) was not significantly different from DLW TEE (2199 ± 361) & TEE ACTICAL/TEE DLW & TEI FR/ TEE DLW were strongly correlated (r=0.90, p<0.01). Stepwise regression analysis showed that 3 d of Actical measurements accurately predicted 14 d of TEE (adjusted R2: 0.88) on a group basis. Conclusions: Actical TEE closely approximated DLW TEE & appears to provide the requisite accuracy for validating group EI with three d of data. The Actical has strong potential to serve as an accurate, inexpensive tool to verify the EI of individuals. Further research is required to determine if these results can be extended to other groups. Funding: USDA, ARS.

SY01-05

Food consumption, supplement use, and physical activity in relation to vitamin D status in Dutch elderly. The Hoorn Study

Rob Van Dam[1], Marieke Snijder[2], Paul Lips[3], Jacqueline Dekker[3]
[1]Harvard School of Public Health, BOSTON, United States of America
[2]Vrije Universiteit Amsterdam, AMSTERDAM, The Netherlands
[3]EMGO Institute, VU Medical Center, AMSTERDAM, The Netherlands

Aim: To evaluate lifestyle determinants of vitamin D status in an elderly Caucasian population.
Methods: We used cross-sectional data from 544 Dutch men and women aged 60-87 years who participated in the population-based Hoorn Study. Vitamin D status was assessed by measurement of Serum 25-hydroxyvitamin D (25-OH-D) concentrations and usual diet and physical activity were assessed with validated questionnaires. Regression coefficients were adjusted for age, sex, season, body fatness, energy intake and the other studied variables.
Results: Vitamin D deficiency (25-OH-D <25 nmol/l) and insufficiency (<50 nmol/l) were present in 5.0% and 45% of the participants. Higher consumption of vitamin D fortified margarine products (2.6 nmol/l [SE 0.6] per 10 g/d increment) and fatty fish (2.5 nmol/l [SE 1.3] per 10 g/d), but not dairy (not fortified), were significantly associated with higher 25-OH-D concentrations. Daily use of vitamin D-containing supplements was associated with 5.1 nmol/l (SE 2.2) higher 25-OH-D concentrations as compared with no use. Gardening and cycling were also significantly associated with higher 25-OH-D concentrations.
Conclusions: The use of biomarkers of vitamin D status has the advantage of reflecting different important diet and sun exposure-related sources in the general population.

Ethnographic approaches to evaluate the impact of a credit with an education program on food and dietary intakes of pre-school children in rural Ghana

Margaret Armar-Klemesu
University of Ghana, LEGON, Ghana

Many development organizations are engaged in projects aimed at improving household nutrition through improved incomes and subsequently increased availability and access to food. Such projects are often required to show impact and evaluation of dietary intake is an essential part of such evaluations. Conducting food consumption studies in developing country settings is however costly and increasingly simple indicators are being developed to measure household and individual food and nutrition security. These methods range from household dietary diversity score and other measures of household food insecurity to assessing dietary intake of one individual member as a proxy for the household. This paper discusses some of the methods being developed and presents data from a dietary assessment study of the impact of a credit and nutrition education program on feeding practices and food intake of pre-school children in rural coastal Ghana. The study was intended to complement and provide conclusive evidence of the positive impact of the program on child feeding practices, household food security and child nutritional status. A food ethnographic design employing observation, in-depth key informant interviews and 2 non-consecutive days of 24-hour recall of food intake of pre-school children aged 8 to 20 months was conducted in households and mother-child pairs sampled from each of three groups: women who had participated in the program for at least one year; women living in program communities who had never joined; and women living in control communities. Common patterns of household food behaviour, such as purchasing, cooking and sharing of food were identified and the information used to develop a dietary database for quantification of food intake and a dietary diversity score. Only children still breastfeeding were included in the final analysis.
Feeding frequency was similar among the three groups but the dietary quality and estimated caloric intakes of the participants' children were significantly higher relative to the other two groups. These findings confirmed the positive impact of the program on child feeding practices, reported household food security and child nutritional status and suggest that individual dietary intake of key household members such as young children together with a greater understanding of household food behaviour holds promise as a valid and complementary approach to assessing program impact.

Food ethnography, food consumption and biomarkers measurement are complementary approaches towards determination of efficacy of food based approaches

Inge Brouwer
Wageningen University, WAGENINGEN, The Netherlands

Micronutrient deficiencies constitute the major and most widespread nutrition problem in the world. Food fortification and dietary diversification are considered as long-term and sustainable solutions for controlling micronutrient deficiencies such as iron deficiency and vitamin A deficiency. The choice of the food vehicle for fortification and the key-foods for promotion in dietary diversity are crucial for the success of the interventions. Important prerequisites are that the selected foods should be available, consumed and culturally acceptable by the target group. This is highly situation specific and dependant on the cultural and socio-economic context of the nutrition problem. Therefore, a systematic and focused food ethnographic study including a food consumption study is required in order to make a selection of the appropriate foods to focus on. However, a food ethnography can not measure the impact of promoting the selected foods on nutritional status, and should therefore always be followed by a small but well designed efficacy study including measurement of biochemical markers.
This paper discusses a systematic and focused approach to identify appropriate foods to be included in a food-based approach towards controlling micronutrient deficiencies. It presents a methodological flow chart combining recall methods, observation and focused group discussions to study the availability, utilization and identification of all constraints and barriers that could limit or promote the consumption of key-foods. The approach is illustrated by two studies in Burkina Faso and Vietnam where food ethnographic study was followed by small efficacy studies to show effect of promoting selected foods. The study in Burkina Faso focused on identification of vitamin A rich foods to control vitamin A deficiency of pre-school children. Results indicated that liver was the single best source of vitamin A, was available year-round, and was culturally acceptable for children, but was consumed in low frequency by few children. Mango was the second promising food for the reduction of vitamin A deficiency, but was consumed in low quantity and low frequency. A subsequent intervention focused on weekly consumption of liver and daily consumption of mango showed clearly improvement of serum retinol levels. The study in Vietnam focused on the selection of an appropriate vehicle for iron

fortification to improve iron status of schoolchildren. Three candidates were considered: instant rice soup, biscuits and noodles. Ethnographic data showed that instant rice soup was not accepted as food for schoolchildren and that biscuits were not considered as food but as sweets and consumed in too small quantities. Noodles were more frequently consumed, with large enough portion sizes, and were culturally acceptable. A subsequent intervention focused on iron fortified noodles clearly showed improvement of hemoglobin level and anemia of schoolchildren. Both studies show the useful complementarities of more anthropologic approaches and nutrition science in the identification of key foods for an effective food based approaches to control micronutrient deficiencies.

Validation of qualitative dietary assessment methods for designing population-specific food-based complementary feeding recommendations

[1], Timothy Harper[2], EL Ferguson[2], U Fahmida[3], V Livingstone[2], S Fitriyanti[3], S Skeaff[2], N Darmon[4]
[2]University of Otago, DUNEDIN, New Zealand
[3]SEAMEO Trop Med, University of Indonesia, JAKARTA, Indonesia
[4]Institut National de la Sante et de la R, MARSEILLE, France

Recently, an approach based on linear programming was developed to design food-based complementary feeding recommendations (CFR's) to improve infant feeding practices in disadvantaged populations. To overcome its reliance on dietary survey data, a rapid qualitative dietary data collection method was developed. This study aimed to assess the relative validity, for estimating the required dietary parameters, of this qualitative method versus a quantitative survey method. Qualitative and quantitative dietary data were collected from 6-12 month old infants living in East Lombok, Indonesia, between January and March 2005. Non-consecutive 2-day weighed food records were collected from 143 randomly selected infants. Qualitative dietary methods included in-depth interviews with 10 public health workers, and group discussions with mothers (n=33). Overall, the qualitative methods identified 74% of foods consumed, missing snacks most often. Frequency of consumption agreement ranged from moderate (kappa=0.43) to fair (kappa=0.20), depending on age. Despite significant inter-method differences for most portion estimates, the final CFR's produced by the two methods showed that, depending on age, 50-62% of recommendations agreed and the same top three problem nutrients were identified. These results suggest that when quantitative dietary survey data are unavailable, in this population, qualitative collection methods can be used to design CFR's.

SY02-04

The 24-hour recall for ultra poor households: a validation exercise

Farhana Haseen
BRAC, DHAKA, Bangladesh

Objective: To assess the validity of the 24-hour recall method for ultra poor households by comparison with the weighting technique.
Design: Cross sectional study, where food consumption was estimated with recall and weighted methods on the same day in 54 ultra poor households.
Results: No significant differences in the mean family food intake comparing two techniques were noted. Comparison in the number of food items was recorded between the recalled and weighted showed complete agreement on 78% of foods consumed. The mean energy intake calculated from recall and weighted was 2055.3 kcal/day and 2050.9 kcal/day respectively and this difference was insignificant (P=0.971). Mean difference of nutrients intake between observations of each technique did not differ significantly. The percentage estimated at risk of inadequacy of food and nutrients were similar for recalled and weighted intakes of food, calorie and protein. There was no significant difference between the mean values of all food items, energy and nutrients for all age groups living in ultra poor households.
Conclusion: The recall could be substituted for the weighted record to estimate average intake of food, energy and most nutrients, dietary quality and food consumption pattern, and assess the risk of malnutrition in ultra poor households.

SY02-05

Physical activity patterns and nutrients intake during ramadan fasting

Huda Al Hourani, Manar Atoum
The Hashemite University, ZARQA, Jordan

The purpose of this study was to assess physical activity levels and nutrients intake during Ramadan fasting. A total of 64 university students, were recruited from The Hashemite University in Jordan. Physical activity patterns were determined from 3-day activity diary; the amount of physical activity was expressed as the physical activity level (PAL).
Three-day estimated food records were used to assess the intake of energy, carbohydrates, protein and fat before and during Ramadan fasting. WinDiets software was used to analyze the collected data. The mean physical activity level (PAL) before Ramadan was 1.54 and 1.50 during Ramadan, which was not significantly different. The mean nutrients intake before Ramadan (% carbohydrates: protein: fat=56:12:32) and during Ramdan (54:13:33) was not significantly differ. Mean dietary energy intake before Ramadan was 1239 kcal/day, compared to 1154 kcal /day during Ramadan, which was not significantly differ. In conclusion, the physical activity level and nutrients intake of students during Ramadan fasting didn't change despite the reduction in the number of meals taken.

SY02-06

Using method triangulation to study changes in dietary patterns after migration from South Asia to Norway.

Margareta Wandel[1], Gerd Holmboe-Ottesen[1], Bernadette Kumar[1], Tonje Mellin-Olsen[2]
[1]University of Oslo, OSLO, Norway
[2]Lovisenberg Hospital, OSLO, Norway

Dietary changes may contribute to the diabetes epidemic among South Asian immigrants in Europe. The aim of this study is to enhance the knowledge about dietary changes after migration and the mechanisms involved, by using a combination of methods.
Three methods were used: 1) Dietary questionnaire from 607 Sri Lankan and Pakistani immigrants in The Oslo Health Study; 2) 2x24 h recalls in 133 Pakistani immigrants; 3) Focus group interviews in 24 Pakistani women.
Both ethnic groups reported a net decrease in consumption of beans/lentils and a net increase in oil, meat, potatoes and fruits. The Sri Lankans reported net increases in consumption of butter, margarine, milk, yoghurt, and decreases of fish, whereas the Pakistanis reported opposite changes of these foods. Average intake of total fat among the Pakistanis was 41 E% and saturated fat 13 E%. The changes were influenced by many factors, such as social pressure, health perceptions, availability, time, work patterns and stress.
The method triangulation provided a rich picture of dietary changes occurring after migration and an understanding of some of the mechanisms, which will form important inputs for dietary interventions in these immigrant groups.

SY03-01

Issues in assessing dietary supplement use

Kathy Radimer
National Center for Health Statistics, HYATTSVILLE, United States of America

Assessment of dietary supplement use requires many methodological decisions. At present there is little consensus on assessment methodology. Differences include: the term used (e.g. dietary supplement, vitamins, nutrient supplement); explication (if any) of this term and what constitutes 'usage'; the referent time frame; collection of data on usage frequency and amount; and the method of administering the survey. Similarly, analytic method and presentation of results differ between studies.
These differences hinder comparison of study results over time and between population groups, and they may affect observed statistical associations with health, nutritional, and socio-demographic variables. Similar issues arise with dietary food assessment.
However, supplements often contain nutrient quantities that are far higher than those in individual foods or even the average diet, especially single nutrient supplements. Thus, the impact of inaccurately estimating or omitting nutrients from supplements may have a greater impact on estimates of total nutrient intake as well as on the breadth of nutrient intake ranges than inaccurate estimates of food nutrients.
Accurate total nutrient intake is especially important when comparing an individual's or a population's intake in relation to a nutrient standard such as a Recommended Dietary Allowance (RDA). A narrowed nutrient intake range can reduce the ability to identify associations between nutrient intake and health or other parameters of interest.
Supplement intake has been associated with personal, nutritional, and health behaviors that are generally considered to be healthful. Therefore, accurate nutrient intake may be especially important to our ability to distinguish the specific association of nutrient intake with health or disease conditions from their association of other behaviors or attributes.
A number of studies have assessed validity and reliability of reported dietary supplement use. In general, these are assessments of correlation between reports of dietary supplement use at different times or use of different data collection instruments or methodologies. Some have examined correlations of disease and nutrient intake with and with out supplement use. Correlation-based study results quite are useful for epidemiologic studies that compare population or sample groups by relative nutrient intake level (e.g. by quartiles). However, for assessment of nutrient intake in relation to standards (such as a Daily Value or a Recommended Allowance) absolute, rather than relative, nutrient intakes are necessary.

Non-vitamin, non-mineral supplements (NVNM) have complicated supplement assessment, and the distinction between vitamin/mineral supplements and NVNM supplements is blurred. Are fish oil supplements - traditionally used to provide vitamins A and D but now taken for fatty oil content - vitamin or NVNM supplements? If an herb in a capsule is a dietary supplement; is it still a supplement if the contents are used to make tea?

While supplement intake methodology must fit a survey's purpose and circumstances, some consensus on what is and is not a dietary supplement would improve comparability between studies. Similarly, some common categorization of supplements by type would enhance inter-survey comparisons of prevalence and associations with disease and health. For population-based surveys, using a common time frame and frequency of use categories would also facilitate comparisons.

Preliminary results from the Supplement Reporting (SURE) Study

Suzanne Murphy[1], LR Wilkens[1], KM Yonemori[1], Y Morimoto[1], CL Albright[1], KR Monroe[2], LN Kolonel[1]
[1]University of Hawaii, HONOLULU, HI, United States of America
[2]University of Southern California, LOS ANGELES, CA, United States of America

The SURE Study is designed to evaluate errors in reporting dietary supplements, a subject about which very little is known. Several different methods of reporting supplement use (diaries, recalls, and frequency questionnaires) are being compared to a comprehensive household inventory of dietary supplements, collected quarterly across one year. Subjects are randomly chosen from participants in the Multiethnic Cohort in Hawaii and Los Angeles who reported regular supplement use. Data collection began in March, 2005 with an anticipated recruitment of 440 adults aged 55 years and older representing five ethnicities and both genders. Preliminary data comparing supplement use reported during an interviewer-administered recall and via a daily diary are available for 121 subjects. Subjects reported over 300 different supplements during the 2-4 week period, and each took an average of 5 supplements (range=1 to 21). Agreement between the two instruments was excellent for type of supplement used, and the frequencies reported were highly correlated (R=0.81). When completed in 2007, the SURE results will inform the choice of instruments to be used for collecting dietary supplement data and permit the development of appropriate adjustments that can be used during analyses to account for variation and biases in self-reported data.

The contribution to total intake of vitamins and minerals from dietary supplements

Celia Prynne[1], Sarah McNaughton[1], Mike Wadsworth[2]
[1]Medical Research Council Human Nutrition, CAMBRIDGE, United Kingdom
[2]Medical Research Council National Survey, LONDON, United Kingdom

The use of vitamin and mineral supplements has become increasingly prevalent in the UK. However few studies have investigated the contribution from supplements to total intake of micronutrients and whether supplements correct for inadequacies or are surplus to requirements. The MRC National Survey of Health and Development (NSHD)(1946 birth cohort) has used a diet diary to provide detailed information about all food consumed as well as dietary supplement use over a 5-day period. In order to analyse the intake of nutrients derived from supplements an extensive database containing >800 supplements commonly used in the UK has been created. Of the 1772 subjects who completed a diet diary 36% recorded taking one or more supplements. The most commonly consumed were multivitamins +/- minerals, vitamin C and vitamin B complexes. The mean contribution to total intake was greatest for vitamin A; 47%, vitamin E; 42% and vitamin C; 28%. Iron and calcium supplements contributed 22% and 13% respectively. Supplement users had significantly greater intakes of dietary vitamin C and iron than non-users but non-users had lower intakes of dietary vitamin A. In this cohort there was no evidence that supplements were needed to compensate for low intakes of dietary micronutrients.

Evaulation of recording of periconceptional folic acid use in week 30 of gestation

Vibeke Knudsen[1], Tina Mikkelsen[2], Sjurdur Olsen[2]
[1]Statens Serum Institut, COPENHAGEN, Denmark
[2]Maternal Nutrition Group, SSI, COPENHAGEN, Denmark

Background: In the Danish National Birth Cohort information on supplement use is collected in early pregnancy in an enrolment form, and in a telephone interview in week 30 of gestation, where use of supplements from the beginning of pregnancy was recorded. This enabled us to examine the validity of information on use of periconceptional folic acid collected in week 30 of gestation, using the enrolment form as the gold standard.
Methods: A sub-sample of pregnant women in the DNBC who fulfilled the enrolment form and the telephone interview in week 30 of gestation. Estimated intakes of periconcep-tional folic acid use recorded at enrolment and in telephone interview were com-pared.
Results :18.4% of the women reported intake of a minimum of 400 mcg folic acid from sup-plements from week 1 to 6 at the enrolment form. 16.2% recorded use of folic acid and/or multivitamin tablets in the 2nd telephone interview.
Assuming the information collected at enrolment as the gold standard
Sensitivity: $1740/(1740+1811)= 0.49$
Specificity: $14,386/(1392+14,386)=0.91$
Predictive value of folic acid use $(1740/(1740+1392))=0.56$
Predictive value no folic acid use $(1811/(1811+14386))=0.11$
Kappa=0.42
Conclusion: A telephone interview in week 30 seems less ideal to assess use of folic acid in early pregnancy

SY04-01

Web-based and mailed questionnaires: A comparison of response rates and compliance in a population-based study in Sweden

Katarina Augustsson Bälter[1], Olle Bälter[2], Elinor Fondell[2,] Ylva Trolle Lagerros[1]
[1]Karolinska Institutet, STOCKHOLM, Sweden
[2]School of Computer Science & Comm., STOCKHOLM, Sweden

Background: The Internet is an unexploited resource for collecting self-reported information in epidemiologic studies. Web-based questionnaires are easy to administer and offer several advantages including immediate checks for incomplete or implausible answers, reminder messages to the respondent, automatic summarization of answers, personalized feedback, inclusion of illustrations or sounds to clarify complex questions, and hiding non-relevant follow-up questions. However, access to the Internet can be biased with regard to age, sex, and education, among other factors, and a substantial proportion of the general population is unfamiliar with Web questionnaires, and might hesitate to answer a Web questionnaire due to lack of experience or worries about security issues. However, these obstacles are likely to diminish over time. We explored response rates and compliance in a population-based study in Sweden where Internet access is estimated to be 80% in the working population. In addition, we explored the influence of adding personalized feedback (such as daily energy expenditure, intake of fiber in gram per day) to the Web questionnaire.
Methods: 875 randomly selected men and women age 20-59 were asked to fill out a questionnaire about lifestyle factors. There were three versions of the questionnaire; 1) a traditional printed questionnaire, 2) a regular Web questionnaire, and, 3) an interactive Web questionnaire with personalized feedback. The participants were randomly assigned to one of the three versions of the questionnaire at the beginning of the study. The questionnaire had two parts, first a general section and then a dietary section.
Results: Response rate for the general section was 64% for the printed questionnaire compared with 50% for the Web questionnaire with feedback. For the dietary questionnaire, the rates were reversed, resulting in a total response rate for the dietary questionnaire that did not differ between printed and web questionnaire with feedback.
Conclusions: Interactivity in the Web questionnaire increased compliance in completion of the second section of the questionnaire. Web questionnaires can be useful for research purposes in settings where the Internet access is high.

SY04-02

Assessing children's diet with innovative technology

Anne Marie Siega-Riz, M Mangan, M Larson, L Kupper, W Wong
University of North Carolina, CHAPEL HILL, United States of America
Baylor University, HOSTON, United States of America

This talk will report on our study that assess dietary intake of children ages 5-8 using camera enabled cell phone validated against doubly labeled water. Parents are instructed to take pictures of the foods that the child consumes both before and after consumption to help identify the type of foods eaten and estimate portion sizes for 3 nonconsecutive days during a 2 week period. They then complete a 24 hour recall after each day by a trained interviewer. During this 2 week period, the child's total energy expenditure has been assessed using the doubly labeled water method. Estimates from the 24 hour recall are being compared to the gold standard using statistical methods appropriate for validation studies. We will report on the feasibility of using this new technology as well as on its validity to estimate dietary intake of children in this age group.

SY04-03

Comparison of 3 methods of assessing dietary fat intake in African Americans

Jessie Satia
University of North Carolina, CHAPEL HILL, United States of America

Given the well-known limitations of commonly used self-report dietary assessment methods, it is important to identify new and innovative approaches to capturing diet in population-based studies. Careful assessment of fat intake is important because dietary fat has been implicated in the etiology of several chronic diseases, including cardiovascular disease and various cancers. This presentation will describe and compare three methods of assessing dietary fat intake in African Americans and describe demographic, behavioral, and psychosocial correlates of fat intake in this population. Data are from a population-based study of cancer prevention behaviors among 658 African Americans (age 20-70 years) in 6 counties of North Carolina. Data on fat intake was captured using the Block Fat screener (total and saturated fat), the Fat-Related Diet Habits Questionnaire (a measure of fat-related dietary behaviors), and a household food inventory focused on the presence of high- and low-fat foods in the home. Unique features of this study include the fact that 1) it provides a rare opportunity to compare data derived from 3 dietary assessment methods capturing different domains (food intake, behaviors, and the environment); 2) it was conducted in a population (African Americans) in which there is a dearth of data on fat intake but which is at very high-risk for fat-related chronic diseases; and 3) correlates of dietary fat intake would be identified, which can be applied in intervention and education programs in this population.

SY04-04

Development of a new instrument for evaluating individuals' dietary intakes

Dahong Wang[1], M Kogashiwa[2]
[1]Okayama University, OKAYAMA, Japan
[2]Okayamagakuin University, OKAYAMA, Japan

With the aim of developing a new dietary instrument for assessing individual's usual intakes, we evaluated a handheld personal digital assistant with camera, called Wellnavi, in which the practicability of Wellnavi method in comparison with 24-h recall and food record was examined. Twenty-eight college students were asked to keep 1-day weighed food record and took digital photos of all these recorded food at the same time, then send these photos to the dietitians by a mobile phone card. A 24-h recall was obtained next day. The procedures were carried out twice in different seasons. We found no significant differences between Wellnavi method and food record, except in zinc, manganese, Vitamin E, saturated fatty acid, polyunsaturated fatty acid, and dietary fiber. The median correlation coefficients for the nutrient intakes were 0.66 between Wellnavi method and food record. The survey showed 57.1%of subjects considered Wellnavi method was the least burdensome one and consumed the least time in recording all meals of a day. Half participants were willing to use Wellnavi for one month if performing food recording. This study suggests that such a handheld digital assistant could be considered as an instrument to measure individual's usual intake possibly over a long interval.

Development of a self-administered automated 24-hour dietary recall for use in large-scale nutrition research

Amy Subar[1], Richard Buday[2], Frances Thompson[1], N Potischman[1], Patricia Guenther[3], Suzanne McNutt[4], Barbara Forsyth[4], Stephen Hull[4], Debbie Richards[5], Arthur Schatzkin[1], Tom Baranowski[6]
[1]National Cancer Institute, BETHESDA, MD, United States of America
[2]Archimage, HOUSTON, TX, United States of America
[3]US Department of Agriculture, WASHINGTON, DC, United States of America
[4]Westat, ROCKVILLE, MD, United States of America
[5]Animatrix Computer Arts, Inc, HOUSTON, TX, United States of America
[6]Baylor College of Medicine, HOUSTON, TX, United States of America

Twenty-four-hour dietary recalls (24HRs) are used to collect high quality dietary data. Because they require highly trained interviewers, recalls are expensive and impractical for large-scale nutrition research, leading to the use of food frequency questionnaires. We are developing a computer-based, self-administered 24HR for use by adults. Our goal is an easy-to-use, low-cost, publicly available, Web-enabled instrument that will include elements of the Automated Multiple Pass Methodology (AMPM) developed by the US Department of Agriculture. Using a cross-over design, we conducted initial formative pilot testing among 18 adults in a self-administered computer environment. We tested two versions of a 'quick list' (the first AMPM pass) for remembering foods consumed the previous day: 'unstructured' and 'meal-based.' Respondents showed a strong preference for the meal-based version (13 of 18), though positive features of both were identified. Chronological reporting was most common, although many foods were sporadically reported out of order. Versions did not appreciably differ in number of foods reported, moved, or deleted. Usability issues and preferences were also identified. If these developmental efforts prove successful, the use of affordable automated recalls could be valuable in clarifying diet-disease associations in observational epidemiologic studies and measuring dietary compliance in clinical trials.

Objective instruments for measuring physical activity – an overview

Andrew P Hills
Queensland University of Technology, BRISBANE, Australia

The objective measurement of physical activity is particularly challenging. Physical activity is widely variable, often complex in nature and further complicated by age, gender, body weight and composition differences. An extensive range of instruments for measuring physical activity has been reported in the literature, from simple and modestly-priced mechanical and electronic devices to more sophisticated and expensive technologies. Schutz et al. (2001) suggested a categorisation of objective methods to measure physical activity according to whether the assessment is based on energy cost, exercise intensity (heart rate recording), or body movement (accelerometry).
Critical elements in the utility of an instrument to measure physical activity are that it be relatively inexpensive, cause minimal inconvenience to the participant; and is able to be administered with relative ease. Objective instruments should also meet the necessary criteria for precision (ability to produce a consistent, stable value; reliability or repeatability/reproducibility; and intra- and inter-tester reliability); accuracy (ability to achieve the 'right' answer or correct value as arbitrated by a 'gold standard' method); and sensitivity and specificity. There is considerable misunderstanding in the literature regarding the strengths and weaknesses of available methodologies and this contributes to the difficulty in choosing the most appropriate instrument(s).
The goal of this paper is to provide an overview of selected objective instruments for measuring physical activity preparatory to more specific consideration of methodological issues and challenges in subsequent presentations in the symposium. Consistent with the widespread use of physical activity records to assess physical activity is the misinformed assumption that simple self-report instruments and questionnaires to measure physical activity are objective. Questionnaires have inherent limitations, mainly because they are subjective in nature. Such approaches to assessment will not be considered in this paper. However, particular attention will be given to a number of novel applications to measurement, including Differential Global Positioning Systems (GPS), and wearable motion analysis systems combining accelerometers and heart rate monitoring devices. Examples will be presented from recent research with specific population groups, in particular the overweight and obese.

SY05-02

Objective instruments for measuring physical activity – one size does not fit all
Nuala M Byrne
Queensland University of Technology, BRISBANE, Australia

Measurement of physical activity is complex and influenced by a range of factors specific to the individual and the measurement tool utilised. Variables relating to the individual include age, gender, height and weight, and potentially body composition. Factors relating to the measurement system or instrument include validity and reliability. The applicability of different measurement tools will depend on the aspect of physical activity we wish to measure. Different instruments are suited to measuring the energy cost of movement and substrate utilised, the time spent at specific levels of intensity or even time spent inactive. Validity of physical activity measurement will be enhanced if the strengths and weaknesses of an instrument are well understood, ensuring that a wholesale 'one size fits all' approach is not perpetuated. For example, simple mechanical devices such as pedometers have inherent limitations and at best may only provide a crude estimate of physical activity level. Many pedometers register counts (steps) based on random movement not necessarily reflecting total body movement. Similarly, most devices do not account for individual differences in height and particularly leg length and its impact on step counts. While accelerometers enable more sophisticated movement sensing, these tools also have limitations that need to be acknowledged. In order for accelerometer data to be of maximal value, devices should be calibrated to the individual user. The relative merit of using generalised cut-offs or thresholds of accelerometer counts to represent intensity categories needs to be determined. Global positioning systems may overcome some of the limitations of both pedometers and accelerometers. Heart rate monitors provide valuable data pertaining to individual physiological responses to changes in mechanical work demands. However, the capacity to convert this physiological data to estimates of energy expenditure at low and high intensities of effort requires clarification.

Understanding the impact of physical activity on total daily energy expenditure is critical to quantifying the dose-response relationship between physical activity and health status. Quantifying the 'dose' of exercise/physical activity requires the intensity of the physical activity to be assessed relative to each individual's physiologic capacity. Commonly, the intensity of physical activities is referenced to resting metabolism or maximal aerobic capacity. Therefore, choice of appropriate protocols for measurement of these resting and maximal physiologic reference points is vital. This paper reinforces the need to comprehend the shortcomings of a blanket 'one size fits all approach' in the employment of instruments to measure physical activity. Examples of approaches to maximise the relevance of data to the individual client or research participant will be provided.

Assessment of daily physical activity with accelerometers, an evaluation against doubly labeled water

Klaas Westerterp[1], Guy Plasqui[2]
[1]Maastricht University, MAASTRICHT, The Netherlands
[2]University of Wollongong, WOLLONGONG, Australia

The complex nature of physical activity makes it difficult to accurately measure its aspects and assess the impact on outcome parameters like energy expenditure. Here, the focus was on the ability of different accelerometers to assess daily physical activity as compared with the doubly labelled water technique, which is considered the golden standard to measure energy expenditure under free-living conditions. Six different accelerometers were identified: Lifecorder; Tritrac-R3D; Caltrac; Actigraph/CSA/MTI; Actiwatch AW16; and Tracmor. Many accelerometers have been tested under laboratory conditions during standardized activities, in field settings against portable calorimeters or in the controlled environment of a whole room calorimeter. Most accelerometers show good to very good correlations (r = 0.74 – 0.95) with energy expenditure during walking and running on a treadmill or with other defined activities. An increasing number of accelerometers has also been validated against DLW under unconfined conditions in daily life. The Actigraph/CSA/MTI and the Tracmor were the two most extensively validated accelerometers. The best results were found for the Tracmor, however, this accelerometer is not commercially available yet. Of those commercially available, only the Actigraph/CSA/MTI has been proven to correlate reasonably with doubly labelled water derived energy expenditure.

Calculations of total energy expenditure by means of a questionnaire - an improved procedure

Marie Löf[1], Elisabet Forsum[2]
[1]Karolinska Institute, STOCKHOLM, Sweden
[2]University of Linkoping, LINKOPING, Sweden

Introduction: When evaluating relationships between diet and health total energy expenditure (TEE) is often estimated using the MET system which, however, tends to produce too low figures in obese and overweight subjects. Therefore, a modification of this system has been proposed recently. Design: In 37 healthy Swedish women (BMI: 18-32 kg/m2, age 21-41 years) total body fat and TEE were measured using the doubly labelled water method (TEEref). Questionnaire data on physical activity were converted to TEE using both the standard (TEEstandard) and the proposed (TEEprop) MET system. These calculations were based on basal metabolic rate measured using indirect calorimetry. Results: TEEstandard was 9940±1850 kJ/24h and significantly (P<0.05) lower than TEEref, (10610 ±1380 kJ/24h). TEEprop was 10880 ± 2080 kJ/24h and not significantly different from TEEref. A significant (P<0.01) relationship between the average of TEEref and TEEprop(x) and TEEprop-TEEref (y) was found. Conclusion: The results show that the proposed calculation improves the accuracy when calculating TEE of groups having a BMI typical for contemporary western women. The findings also indicate that physical activity tends to be overestimated by active subjects and underestimated by more sedentary individuals.

SY05-05

Validity of the ActiReg system in assessing energy requirement in chronic obstructive pulmonary disease patients.

Daniel Arvidsson, Frode Slinde, Anita Nordenson, Sven Larsson, Lena Hulthén
Sahlgrenska Academy, GÖTEBORG, Sweden

Background & aims: Malnutrition and weight loss are common in patients with chronic obstructive pulmonary disease (COPD) and effective nutritional support relies on accurate assessment of energy requirement. This could only be performed by measuring energy expenditure using objective methods. The aim of this study was to examine the validity of the ActiReg system in assessing energy requirement in non-hospitalized patients with severe COPD, using doubly labelled water (DLW) as criterion method.
 Methods: Total energy expenditure (TEE) was assessed from 14 days DLW analysis in 13 patients. During the first 7 days TEE was simultaneously assessed using the ActiReg system, combining measured resting energy expenditure (REE) with physical activity monitoring.
Results : A difference of -88 (782) kJ?d-1 (P=0.69) was observed between the ActiReg system and DLW. REE explained 52% of the variation in TEE from DLW. Adding physical activity energy expenditure from the ActiReg system (PAEEAR = TEEAR–REE) increased the explained variation in TEE from DLW with 16%.
Conclusions The ActiReg system is valid in assessing energy requirement in non-hospitalized patients with severe COPD.

SY06-01

Mini-course: Statistical methods in nutrition for the non-mathematician
Laurence Freedman[1], Victor Kipnis[2], Rudolf Kaaks[3]
[1]Gertner Institute for Epidemiology, TEL HASHOMER, Israel
[2]National Cancer Institute, BETHESDA, United States of America
[3]Int. Agency for Research into Cancer, LYON, France

This mini-course is intended to give nutritionists an intuitive understanding of the statistical problems and solutions that attend studies aimed at finding relationships between dietary intakes and disease outcomes. The course will consist of three half-hour lectures as follows:

1. Laurence Freedman, Gertner Institute for Epidemiology, Israel
Bias and random variation in dietary assessment
Different types of variation: within-person, between-person.
The difference between error and bias. Error as a source of variation.
Types of error associated with the 24 hour recall and the food frequency questionnaire.
Measurement error models
(a) classical model
(b) errors correlated with true intake
(c) person-specific bias
(d) which model is relevant to which instrument?
Why does the measurement error model matter?

2. Victor Kipnis, National Cancer Institute, US
Dietary measurement error and its effect on nutritional epidemiology
Impact of measurement error in dietary exposure on
·   Estimating the exposure effect (attenuation)
·   Testing the exposure effect (loss of power)
·   Example (simulated cohort of total fat & colorectal cancer)
Adjustment for measurement error
·   Removal of bias if attenuation factor is known (estimated)
·   Loss of power could only be compensated by increased sample size
·   Why attenuation matters
Categorization of continuous intake into quantiles and its effect

Multivariate analysis (exemplified using bivariate risk model)

·   Estimating the exposure effect (distortion bias due to attenuation of true RR for main exposure and contamination by true RR for adjusting covariate due to residual confounding)

·   Testing the exposure effect (invalid tests and/or confidence intervals)

Multivariate analysis: energy-adjustment

·   Examples using simulated cohort for relating energy-adjusted fat intake to colorectal cancer

3. Rudolf Kaaks, International Agency for Research into Cancer, France
        Calibration and validation studies

Definitions
       Design issues
       Validation instruments
       Role of biomarkers

SY07-01

Plasma volume expansion: implications for pregnancy biomarkers in population studies

Nancy Potischman
National Cancer Institute, NIH, BETHESDA, United States of America

During pregnancy, the maternal circulation is expanded to accommodate the demands of fetal nutrition. This includes an increase in the volume of plasma, which provides enhanced blood flow to the uterus and other organs, particularly in relation to fetal needs for oxygen and nutrients. Change in plasma volume can range from 2265-2908ml mean 2564ml) in the nonpregnant state to 3309-4245ml (mean =3662ml) in the pregnant state, with a mean increase of 43%. For clinical purposes, the change in plasma volume or 'hemodilution' has been accommodated with modification of normal ranges for va-rious factors. Thus, although the concentration of biomarkers is lower because of the hemodilution, the cut-points for clinically significant conditions have been modified to address this change in concentration. E.g., the cut-point for anemia or iron deficiency, which is defined as <12g/dl (5th percentile cut-point) in the nonpregnant state, is changed to <11.0g/dl for first trimester, <10.5g/dl in second trimester and <11.0g/dl in the third trimester corresponding to estimated increases in plasma volume in these trimesters. In population studies, however, investigators may relate biomarker concen-trations to pregnancy outcomes or to characteristics of pregnancy (such as hypertension, preeclampsia and gestational diabetes), or compare biomarkers across populations. It may be pro-blematic to conduct such studies if there is large variation in plasma volume expan-sion across individuals or across populations, or if a pregnancy condition, such as preeclampsia, is also associated with modified plasma volume expansion. Ideally, one would like to factor out the variable hemodilution that occurs across individuals and population roups. The methods used to quantify plasma volume expansion, the Evans blue dye dilution technique and radioactive iodinated serum albumin, are clinically intensive and not amenable to population studies. Thus, there is a need for other proxies of plasma vo-lume expansion that may correct for any apparent difference between groups that may merely reflect a difference in hemodilution. Aside from gestational age, several factors are associated with plasma volume expansion including pre-pregnancy weight, pregnancy weight gain, hydration, height, and birth weight. In this talk, examples of how the issue has been addressed in population studies for various nutrients and how it may be relevant to other serologic factors, such as circulating hormones and growth factors will be discussed

SY07-02

The assessment of diet during pregnancy

Anna Maria Siega-Riz
University of North Carolina School of P, CHAPEL HILL, United States of America

The pregnancy period is a critical time window for many epidemiological studies that focus on maternal and child health outcomes. It is unique in that the exposure time window is relatively short to study in comparison to other disease outcomes. However, it has its own set of problems for assessing dietary intake which include large intra individual variation due to pregnancy complications which may alter eating habits (i.e. nausea and vomiting, constipation, bed rest), metabolic and physiological processes that change over the course of pregnancy, and the prescription of supplements, as well as the time period of interest can vary (i.e. preconceptional, by trimesters or by critical windows for fetal organ/tissue development). Although the importance of the maternal diet has been well established, measuring dietary intake during pregnancy remains a challenging area of study. This talk will review the studies that examined the validity of the various dietary methods used to assess diet during pregnancy, identify the gaps that still exist in the literature and suggest new ways to improve methods for this time period.

SY07-03

Comparison of dietary assessment tools employed in two large Nordic pregnancy cohorts

Tina Broby Mikkelsen[1], Margaretha Haugen[2], Anne Lise Brantsaetter[2], Helle Margrete Meltzer[2], Vibeke K Knudsen[1], Jan Alexander[2], Sjurdur Frodi Olsen[1]
[1]Statens Serum Institut, KØBENHAVN S, Denmark
[2]Norwegian Institute of Public Health, OSLO, Norway

Background: We compared the maternal dietary assessment tools employed in the Danish National Birth Cohort (DNBC) and the Norwegian Mother and Child Cohort Study (MoBa), to examine their compatibility with respect to future coordinated analyses. DNBC and MoBa represent the largest cohorts of their kind, with 100,000 women recruited in DNBC and 60,000 currently recruited in Norway.
Material and methods: We described and made qualitative comparisons of the overall structures and the items in the dietary questionnaires.
Results: The Danish questionnaire covered gestation weeks 21-25, whereas, the Norwegian covered the start of gestation until weeks 16-20. Both questionnaires were self-completed mailed FFQs, with similar time scales for each food item included. The Danish questionnaire included 360 and the Norwegian included 320 food items. More than 50% of all food items were identical or near-identical in both questionnaires.
Conclusion: The greatest discrepancy was that the Danish FFQ covered mid-pregnancy and the Norwegian first three-four months dietary intake. We believe that the dietary data from the two birth cohorts can be joined for many purposes, particularly for items that are relatively commonly ingested and do not depend upon season, e.g. milk.
Supported by EU-FP6 (EARNEST contract number 7036) and March of Dimes.

Self-reported lifestyle determinants and measured physical activity in 2nd trimester of pregnancy.

Anne Lise Brantsaeter[1], Margaretha Haugen[2], Hein Stigum[2], Wenche Nystad[2], Jan Alexander[2], Helle Margrete Meltzer[2]
[1]Norwegian Institue of Public Health, OSLO, Norway
[2]Norwegian Institute of Public Health, OSLO, Norway

Background: In the Norwegian Mother and Child Cohort Study (MoBa) women report leisure exercises, occupational and other lifestyle determinants in the first trimester by questionnaire.
Objective: To identify self-reported correlates of measured physical activity energy expenditure and exercise duration.
Methods: The motion sensor ActiReg® was used to measure physical activity energy expenditure (PAEE) and minutes of moderate to high exercise (exercise minutes) in 112 pregnant women participating in MoBa. Multivariable linear regression was used for each of these outcome measures to examine the impact of various self-reported factors.
Results: Correlates with a positive impact in PAEE were aerobic exercises, having more than 12 years of education, and standing at work, while being on sick-leave and smoking had negative impact (R2=0.50). For 'exercise minutes' the only positive correlate was brisk walking, while performing heavy lifts at work, having children, and smoking were negative correlates (R2=0.30).
Conclusion: Smoking was a negative predictor of PAEE and of exercise minutes while having children was a positive predictor of PAEE and a negative predictor of exercise minutes. Working posture was an important predictor of PAEE, but did not influence exercise minutes.

Total energy intake and physical activity in pregnancy: Lower energy intake among physically active women

Marin Strøm, Tórhallur Ingi Halldorsson, Sjúrður Fróði Olsen
Maternal Nutrition Group, KBH S, Denmark

Background: Studies indicate a close coupling between levels of physical activity and energy-intake, which is apparently lost among sedentary individuals. We explored the association between total energy-intake and physical activity (PA) in the Danish National Birth Cohort.
Methods: Dietary intake was assessed in mid-pregnancy by a FFQ (70.189 observations). PA was assessed around week 12 of gestation by telephone interview. Duration (<150minutes/week; =150minutes/week) and preferred type (moderate; vigorous) were combined into 4 groups of PA.
Results: Around 38% of the women reported being physically active. Mean daily energy-intake for women preferring vigorous PA<150minutes/week was 320KJ (95%CI: 230-400) lower than for inactive women; women preferring moderate PA<150minutes/week had 210KJ (135-280) lower intake. Augmenting duration of PA slightly increased energy intake, but not reaching the intake of inactive women. Results were consistent through different strata of weight-gain in pregnancy and pre-pregnant-BMI, apart from underweight women. Smoking and socioeconomic-status did not alter these results. The difference in enery-intake is explained by (approximately 5-10g/day) lower intake of fat by active women, which is substituted by protein and carbohydrates.
Conclusion: Physically active pregnant women had lower energy-intake compared to those inactive. This is partly explained by a lower intake of fat among physically active women.

SY08-01

Effect of energy density of food and drinks on short-term and long-term energy intake

Magriet S. Westerterp-Plantenga
Maastricht University, MAASTRICHT, The Netherlands

An important question that has been raised recently is whether it is mainly the energy density of the food consumed or its' macronutrient composition that determines daily energy intake. In this scope, the effect of energy density on energy intake has been assessed in short-term as well as long-term experiments, using laboratory experiments as well as accurately completed food intake diaries validated with energy expenditure being measured as resting metabolic rate, physical activity using the validated TRACMOR, and with water loss estimated with deurerium labelled water. Over the short-term, i.e. during a meal, it was found that energy density (ED) affects energy intake (EI) directly; then subjects mainly monitor the weight of the food ingested. Over the long-term, the effects of ED on EI are modulated. Average daily energy intake (ADEI) does not only consist of meals but also includes snacks and drinks. ADEI appears to be related to energy density (ED) of the food and drinks where ED is at least determined by specific macronutrients (primarily fat and carbohydrate), but not when ED is determined only by the weight of water. With respect to the separate effects of the ED of foods and of drinks on average daily EI, only ED from foods had a significant relationship with total energy intake. Moreover, during daily food intake subjects seem to adapt their portion sizes to estimated energy densities.

Long-term studies have shown that dietary restraint compensates for the effect of increases in energy density on ADEI, whereas unrestrained eaters compensate for the effect of decreases in energy density on ADEI.

In conclusion, energy density determines short-term energy intake. This cannot be extrapolated to the long-term because only the ED of food, and not the ED of drinks, determine total energy intake. In addition, over the long-term, the short-term effect is modulated by dietary restraint and adapted portion sizes. Energy density is not a universal concept that determines energy intake yet rather a characteristic of the macronutrients: mainly fat and carbohydrate contributing to variation in energy intake.

SY08-02

OPEN about obesity: recovery biomarkers, dietary reporting errors, and BMI

Lauren Lissner[1], RP Troiano[2], D Midthune[2], Berit Heitmann[3], V Kipnis[2], A Subar[2], N Potischman[2]
[1]Sahlgrenska Academy, GÖTEBORG, Sweden
[2]National Cancer Institute, BETHESDA, MD, United States of America
[3]Institute of Preventive Medicine, COPENHAGEN, Denmark

Obesity-related underreporting is one of the most persistent sources of bias in nutritional epidemiology. The aim of this paper is to characterize dietary reporting errors in obese and non-obese individuals, using energy and protein recovery biomarkers.

This report employs data from the OPEN study (Observing Protein and Energy Nutrition). Analyses are based on stratified samples of 211 (57 obese) men and 170 (50 obese) women who completed 24-hour recalls (24HRs), food frequency questionnaires (FFQs), doubly labelled water, and urinary nitrogen assessments.

In obese and non-obese subgroups, the FFQs yielded lower energy intake estimates than 24HRs, although distributions for both dietary methods indicated underreporting, relative to biomarkers. Obesity-related energy under-reporting could be observed clearly for both instruments in men, and for 24HRs in women. Obese women did NOT underreport energy significantly more than non-obese women by FFQ. Correlations between energy expenditures and intakes tended to be weaker in obese than non-obese subjects, particularly for 24HRs.

In conclusion, 24HRs did not capture energy (or protein) surfeits in obese subjects. FFQs captured part of the expected excess energy in obese women, but not in men. This work adds to existing evidence that commonly used dietary methods inadequately measure consumption in obese groups.

Accuracy of food intake reporting in obese subjects with metabolic risk factors

Mette Svendsen[1], Serena Tonstad[2]
OSLO, Norway
[2]Department of Preventive Cardiology, Cen, OSLO, Norway

Aim: To determine the accuracy of reported energy intake according to a food frequency questionnaire (FFQ) and dietary records (DR).
Methods: Twenty-three men and 27 women aged 24-64 years with BMI 35.7 (SD 3.3) kg/m2. Total energy expenditure (TEE) was measured with the DLW method.
Results: Under-reporters (one-half of the sample) had lower median intake of sweets/desserts/snacks than non-under-reporters (100 g/d versus 161 g/d, P=0.0008 and 61 g/d versus 128 g/d, P=0.0002 according to the FFQ and DR, respectively). The DR showed lower energy density (6.7 kJ/g [SD 1.3] versus 7.9 kJ/g [SD 1.6], P=0.0064), lower intake of sugary drinks (0 g/d versus 167 g/d, P=0.0063) and higher scores for dietary restraint (9.0 [SD 5.0] versus 6.1 [SD 3.5], P =0.0285) in under-reporters. Energy density was associated with accuracy according to the FFQ (RS= 0.406, P=0.0034) and the DR (RS=0.537, P<0.0001). In multivariate analysis consumption of bread and sweets/desserts/snacks measured by the FFQ was positively associated with accuracy (R2adjusted=0.46 [95% CI 0.32, 0.70]). According to the DR consumption of sweets/desserts/snacks was associated with accuracy as was dietary restraint (inversely) (R2adjusted=0.67 [95% CI 0.54, 0.83]).
Conclusion: In obese subjects intake of sweets/desserts/snacks, bread and dietary restraint were determinants of reporting accuracy.

Bias in self-reported data on adolescents' weight, height and BMI. The COMPASS study.

Finn Rasmussen
Karolinska Institute, STOCKHOLM, Sweden

The aim was to assess bias in self-reported data on height, weight and body mass index (BMI) among 15-year-old boys and girls from Sweden with special attention to body dissatisfaction.
 In 2000-2002 a population-based study was conducted in the South-western parts of Stockholm. This presentation includes 2,969 adolescents with self-reported and measured data on height and weight. Validated questions were posed about perceived body size and degree of body satisfaction.
A larger proportion of girls (73%) than of boys (51%) under-reported their weight. Obese subjects under-reported their weight and over-reported their height to a larger extent than overweight subjects. Non-overweight boys over-reported their weight but reported their height without bias. Non-overweight girls, however, under-reported their weight and over-reported their height. The boys and girls who were dissatisfied with their body weight under-reported their weight to a larger degree than those who were satisfied with their weight.
Adolescent boys and girls showed different patterns of bias in self-reported data on body size. The girls under-reported their weight regardless of level of BMI. In contrast, the non-overweight boys over-reported their weight. Larger bias in self-reported weight was observed among boys and girls who were dissatisfied with their weight.

SY08-05

Electronic food logging methods reviewed on accuracy and ease of use

FM Wagemakers, AHC Goris
Philips Research, EINDHOVEN, The Netherlands

Food logging in weight management systems should be both accurate and easy to use by the consumer. The aim of the current test was to compare three electronic food logging methods: memorecorder, photocamera and computer log system, on ease of use and accuracy of input by participants.

Twelve participants were assigned at random to one of the food logging methods for a period of three days. The ease of use and the experience with the food logging was determined by standardized interviews after the food-logging period. The memorecorder was rated best on ease of use. The accuracy of food logging was determined during a test-lunch. Participants were invited and everything they ate/drank during the lunch was recorded by the test leader. The participants were unaware of this fact. Data from the memorecorder and the photographs was analyzed by a nutritionist on nutrition values. The average underreporting during the test-lunch with the memo-recorder was 11% and was (not significantly) lower than the 21% underreporting with the computer log and 14% underreporting with the photocamera.

This suggests that a memorecorder (possibly integrated in a watch or phone), would be the best solution to log food intake for a weight management system.

SY09-01

Estimating usual intake of episodically consumed foods from nutritional survey data and its use in evaluating diet-health outcome relations

Victor Kipnis[1], Laurence S Freedman[2], Douglas Midthune[3], Janet A Tooze[4], Kevin W Dodd[1], Patricia M Guenther[5], Susan Krebs-Smith[1], Amy F Subar[1], Raymond J Carroll[6]
[1]National Cancer Institute, USA, BETHESDA, MD, United States of America
[2]Gertner Institute for Epidemiology, TEL HASHOMER, Israel
[3]National Cancer Institute, BETHESDA, United States of America
[4]Wake Forest University School of Medicin, WINSTON-SALEM NC, United States of America
[5]US Dept of Agriculture, ALEXANDRIA, VA, United States of America
[6]Texas A&M University, COLLEGE STATION, United States of America

The issue of estimating usual intake of episodically consumed foods and food groups using information on few repeated 24-hour dietary recalls as collected by nationwide surveys is discussed. A general statistical model has been developed for this purpose, which can accommodate the large number of non-consumption days that arise for episodically consumed foods, and the correlation that usually exists between the probability of consuming a food and the amount consumed. Tooze et al (2006) describe how this model can be used to estimate the distribution of usual intake of such foods in the general population and in subpopulations. In this talk we provide methodology for adopting the model to estimate individual usual intake of episodically consumed foods and food groups and relate it to health outcomes using the regression calibration approach. One feature of the model is that covariates, such as gender, age and race may be used to refine the estimates of usual intake. Applying the method to data from the Eating at the American Table Study, we show that such estimates can also be enhanced considerably by including reported frequencies of intakes from a Food Frequency Questionnaire as an additional covariate in the model. We demonstrate the use of the developed methodology in evaluating the relationship between fish intake and mercury levels from data collected in the NHANES survey. Finally we present simulation results that demonstrate that the method provides practically unbiased estimates of relative risks when relating usual intake of a food to a disease outcome.

A comparison of two dietary instruments used in evaluating the relationship between dietary fat intake and breast cancer risk in the Women's Health Initiative Study

Laurence S Freedman[1], Nancy Potischman[2], Victor Kipnis[2], Douglas Midthune[2], Arthur Schatzkin[2], Fran Thompson[2], Richard Troiano[2], Ross Prentice[5], Ruth Patterson[3], Raymond Carroll[4], Amy Subar[2]
[1]Gertner Institute for Epidemiology, TEL HASHOMER, Israel
[2]National Cancer Institute, BETHESDA, United States of America
[3]Fred Hutchinson Cancer Research Center, SEATTLE, WA, United States of America
[4]Texas A&M University, COLLEGE STATION, TX, United States of America

Previous results1 suggest that food diaries may be more efficient than food frequency questionnaires (FFQ) in detecting a dietary fat-breast cancer relationship. We have assessed this further using 4-day food records (FR) and FFQs in a large sample. The participants were women admitted to the control group of the Dietary Modification (DM) component of the Women's Health Initiative Clinical Trial. The sample comprised 603 invasive breast cancer cases and 1206 controls matched on age, clinic and length of follow-up. The median length of follow-up was 83 months. Relative risks were estimated using unconditional logistic regression adjusted for the matching variables and for confounding by postmenopausal hormone use (current/former, never), family history in a first degree relative (yes/no), and biopsy for benign breast disease (yes/no), age at first birth, parity, BMI, and physical activity. Participants in the DM component of the trial were selected into the study on the basis of the percent of calories from fat reported on their FFQ, with all those reporting less than 32% being excluded. Statistical adjustment of the relative risk estimates was made also to avoid bias arising from this selection. A direct comparison of the power of the two instruments to detect a fat-breast cancer relationship was made using the standardized log relative risk in a Standard Model with continuous dietary intake variables.
Reference:
1. Bingham SA, Luben R, Welch A, Wareham N, Khaw KT, Day N. Are imprecise methods obscuring a relation between fat and breast cancer? Lancet 2003; 362:212-214.

A new approach to assess the prevalence of inadequate micronutrient intakes in a population

Patricia Waijers, Arnold Dekkers, Hendriek Boshuizen, Jolanda Boer
Nat. Inst. for Public Health and the Env, BILTHOVEN, The Netherlands

To estimate the prevalence of inadequate micronutrient intakes in a population, information on intakes and requirements is needed. We propose a new model in which nutrient intake adequacy is assessed as a function of age.
The model contains three steps. First usual intake distributions are estimated as a function of age by eliminating intra-individual variation. Today the Nusser method is often used to estimate the usual intake distribution from short-term measurements. One of its main limitations is that intake data are analyzed for subgroups of sex and age. However, intakes and requirements do not increase in steps, but gradually with age. Additionally, estimates from the Nusser method may depend heavily on the available data, especially when numbers are small. In the new model power of precision is lend from adjacent ages. In the next step the distribution of requirements for the micronutrient is described as a function of age. Finally the age dependent usual intake and requirement distributions are combined, resulting in estimates of the prevalence of inadequate intakes for each age.
In addition to the strengths mentioned above, the model allows intake inadequacy to be assessed in one analysis. This approach may offer new perspectives in micronutrient assessment.

Implications of different energy-adjustment methods in analyzing fat and breast cancer relationship in the NIH-AARP Diet and Health Study

Anne Thiebaut, Arthur Schatzkin, S-C Chang, V Kipnis
National Cancer Institute, BETHESDA MD, United States of America

The relationship between fat intake and breast cancer risk is one of the most controversial in nutritional epidemiology. While animal and ecologic studies suggest important relationship, so far most large cohort studies have failed to detect any association. One issue pertains to an appropriate energy-adjustment given that both fat and energy intakes are measured with substantial and highly correlated errors. The impact of measurement error on the estimates derived from different energy-adjustment methods remains unknown. We conducted an analysis of fat intake and breast cancer risk in 189,496 postmenopausal women enrolled in the NIH-AARP Diet and Health Study. From 1995-1996 when they completed a 124-item food frequency questionnaire to 2000, 3,528 women were diagnosed with invasive breast cancer cases. Before transforming dietary variables, the residual method yielded 1.19 hazard ratio (HR) comparing the highest to the lowest quintile of intake (95% confidence interval [CI] 1.07 to 1.32), similar to estimates derived from the standard method. However, after log-transforming dietary variables, corresponding HR was decreased to 1.12 (95% CI 1.01 to 1.24), becoming closer to estimates from the density method. We discuss the interpretation of such findings and provide further results from simulation studies to clarify the issue.

Case-control and case-only design to assess gene – environment interaction effect on cardiovascular disease risk

Leyla Nunez, Dag S Thelle
Sahlgrenska Academy, GÖTEBORG, Sweden

Objective:Assuming independence between susceptibility genotype and environmental exposure, case-only studies offer better precision for estimating gene-environment interaction (GEI) than traditional case-control studies. The case-only design might be viewed as a screening tool for identification of promising GEI in all areas of epidemiological research, including the nutritional epidemiology.
Methods and Results:The case-only approach has been used in a study of Apolipoprotein E (ApoE) polymorphism and cigarette smoking interaction effect on the risk of cardiovascular disease. The study population consisted of cases with acute coronary symptoms and healthy, unrelated controls, enrolled in INTERGENE research programme. The case-only approach revealed the presence of minor statistical interaction between ApoE e4 carriers and smoking, with an adjusted odds ratio of 1.59 (95% CI, 1.01-1.81, P = 0.047). There was no modifying effect of ApoE e4 on the smoking effect in the traditional case-control analysis, OR 1.12 (95% CI, 0.62-2.05).
Conclusion: The case-only approach does provide insight into possible effect modifications that are concealed in case-control data otherwise lacking power to uncover such modifications. The future goal is to implement the case-only approach to screen for possible gene-diet modifying effects in nutritional epidemiology.

SY10-01

Physical activity measured by pedometers in twin pregnancies: association with gestation length

Ruth Morley[1], Vivienne Moore[2,]
[1]University of Melbourne, MELBOURNE, Australia
[2]University of Adelaide, ADELAIDE, Australia

On average, twins have shorter gestation length than singletons. A variety of studies of singleton pregnancies have investigated whether maternal physical activity influences offspring birth weight, but there has been no such study of gestation length in the higher risk twin pregnancy. We measured mean steps per day using pedometers for up to 4 days at 18-20 weeks and at 31-33 weeks of gestation, and hypothesised that number of steps taken per day would be associated with gestation length.

128 women with twin pregnancies wore pedometers for up to 4 days at both time points. Median number of steps per day was 9067 at 18-20 weeks and 5152 at 31-33 weeks. Skewness and kurtosis were 1.3, 5.3 and 1.7, 7.6 respectively, so we calculated log values and used these in regression models. We found a negative association between steps/day at 18-20 weeks and gestation length (p=0.03).This remained after adjustment for height, concurrent weight or mean (weighed) daily energy intake over 4 days. There was no evidence of association with steps/day at 31-33 weeks.

Our findings could be confounded because women who were at higher risk of early labour or felt more uterine contractions may have rested more.

SY10-02

Level of agreement between child and parent reports of the child?s consumption and family environment of fruit and vegetables

Nannah Tak[1], Saskia Te Velde[1], Jeanne De Vries[2], Johannes Brug[1]
[1]Erasmus Medical Center, ROTTERDAM, The Netherlands
[2]Wageningen University and Research Centr, WAGENINGEN, The Netherlands

Objective: To determine the level of agreement between child and parent reports of the child?s consumption of fruit and vegetables. This was investigated in two different periods of time.
Methods: Participating schoolchildren of the project Schoolgruiten (mean age 9.9 years at baseline) and their parents completed parallel questionnaires at baseline and at follow-up about usual fruit and vegetables consumption of the child, potential determinants and general demographics. Only matched couples were included in the analyses (baseline = 527 and follow-up = 425). Different techniques were used to assess level of agreement between child and parent reports, namely dependent samples t-test, correlation coefficients, weighted Cohen?s kappa coefficients and Bland-Altman plots including limits of agreement.
Results: Both at baseline and at follow-up, the mean intake of fruit and vegetables reported by the children was significantly higher than reported by their parents, but the differences were smaller at follow-up. Correlation coefficients (0.29 ? 0.44) and weighted Cohen?s kappa coefficients (0.24 ? 0.30) were weak to moderate. Limits of agreement were wide.
Conclusion: The agreement between parent and child report is weak to moderate and may depend on the age of the child. Children seem to overestimate their own intakes of fruit and vegetables.

Supplement use in 4-6 year old children and its relation to dietary intake

Leone Craig, Geraldine McNeill
University of Aberdeen, ABERDEEN, United Kingdom

There is little information on the intake of supplements in young children, however, there has been an increase in the number of supplements specifically targeted at this age group. The aim was to investigate supplement use in 4-6 year old children.
1728 mothers taking part in a birth cohort were asked to complete a food frequency questionnaire for their child at age 4-6 years.1156 questionnaires were returned, of which 136 were excluded after quality checks. Of the remaining 1020, 285 (28%) children were taking some sort of supplement with 66% taking a supplement daily. Of those taking supplements, 85% were taking multivitamins, 7% vitamin C, 6% fatty acid supplements, 2% vitamin D or calcium supplements and 7% other supplements. 8% were taking 2 or more of these supplements.
Energy adjusted dietary intakes of vitamins A, C, D and E, ß-carotene, iron and calcium were divided into tertiles. The use of supplements containing these vitamins and minerals was compared across the tertiles. There was no significant difference in supplement use between the tertiles of intake of any of the nutrients apart from vitamin D in which more children in the highest tertile of intake were also taking supplements containing this vitamin.

A confirmatory factor analysis strategy to measure 'usual' diet and physical activity: application to a DACV children's study

Patrick Horan
Institute for Behavioral Research, ATHENS, GA, United States of America

Measurement error in dietary and physical activity self-reports will attenuate relationships between diet, physical activity and health. Much measurement error in such reports is behavioral - deriving from discrepancies between the time-specific behaviors (for days, weeks) on which individuals can readily report, and the 'usual' behaviors that are of primary theoretical interest.
Confirmatory factor analysis (CFA) methods can estimate measurement constructs for usual behaviors, using data from time-specific reports. A CFA measurement strategy for usual diet or physical activity behavior provides a psychometric profile for self-report instruments. It can also estimate latent constructs for usual behavior that are free of random measurement error. Such constructs can be used to estimate disattenuated empirical relationships between usual dietary or physical activity behaviors and indicators for health outcomes.
This presentation will apply this CFA strategy to a DACVS sample of African-American children in the South. First, it will examine the psychometric profiles derived from replications of two popular dietary instruments (FFQ, 24H). Second, it will illustrate the use of latent variable constructs obtained from CFA to analyze empirical relationships between diet and BMI. Third, it will illustrate the extension of this CFA measurement strategy to the analysis of replicated physical activity reports.

SY10-05

The relation between a simple ranking of physical activity, energy intake and body mass index

Guri Skeie, Vegard Andersen, Eiliv Lund
Institute of Community Medicine, TROMSØ, Norway

In large epidemiological studies like the Norwegian Women and Cancer study (NOWAC) it is desirable to reduce the number of questions asked. We used one short question to rank present physical activity of the participants. The aim of this study is to compare our ranking of physical activity with energy intake and body mass index (BMI). A nationally representative sample comprising 68518 women born 1927-57 included in the NOWAC study have answered a questionnaire on lifestyle and dietary habits. Daily energy intake and BMI were calculated. Participants were asked to report on a scale ranging from one to ten, how physically active they regard themselves. If this way of recording physical activity reflects the 'true' picture, our measurements should be positively correlated with energy intake, and negatively correlated with BMI. These assumptions have been checked graphically, and p-values for trends (linear) were calculated using the plotmeans and abline functions in R.
The results are in support of our ranking method of physical activity. They clearly indicate that physical activity is correlated positively to energy intake, and negatively to BMI. Our ranking discriminates well between the NOWAC study participants' levels of physical activity. Underreporting can potentially compromise these results.

SY10-06

The psychosocial and behavioral predictors of underreporting energy intake in overweight middle-aged women

Jaclyn Maurer[1], Cynthia Thomson[1], Douglas Taren[1], James Ranger-Moore[1], Timothy Lohman[1], Pedro Teixeira[2]
[1]University of Arizona, NEW BRUNSWICK, United States of America
[2]Technical University of Lisbon, LISBON, Portugal

This study attempted to extend the knowledge of predictors of underreporting self-reported energy intake in 155 overweight middle-aged women participating in a 4-month lifestyle-based weight loss intervention. At baseline all subjects completed questionnaires assessing diet and weight history, life status, weight loss readiness, psychology, eating behavior, physical activity, and self-image. Based on baseline self-reported intake from 3-d dietary records, 71 women were categorized as energy underreporters (UDR), using the cut-off values for the energy plausibility equation defined by Goldberg. Logistic regression models were used to predict variables distinguishing UDR and from energy accurate reporters. Characteristics most predictive of UDR included more years of education, more realistic weight loss goals, higher exercise perceived competence, more social support to exercise, and better body shape and image. These results can assist in future development of sensitive prediction models useful in screening middle-aged female overweight study participants for probability of energy underreporting based on baseline measures. With this information researchers and clinicians could target at risk women with education and training to improve the accuracy of their self-reported energy intake. Improving accuracy of self-reported intake would improve the validity of energy and nutrient intake relationships with health and disease in this population.

Underreporting in a metabolic chamber – with focus on fat and fatness

Lena Gripeteg
Göteborg university, GÖTEBORG, Sweden

Aim: To compare reported versus observed food intake in men and women confined for 24 hours in a metabolic chamber.
Methods: Subjects were 100 men and women in two age groups, 26-32 and 57-62 years. Mean DXA body fat in men and women was $22\pm8\%$ and $32\pm8\%$ respectively. Energy expenditure was measured during 24 hours in a metabolic chamber. In the chamber subjects selected foods from a menu. Every item was served in abundance, and weighed in and out. When subjects had left the chamber, a 24-hour dietary recall was performed.
Results: Both men and women were in significant positive energy balance in the chamber, consuming an excess of 59% and 43%, respectively. In the recall, subjects significantly underreported their true energy intake; on average they reported 93% of the energy consumed. Women significantly underreported carbohydrate, whereas men underreported both carbohydrate and fat. No clear obesity-related bias could be detected. However, fat intake was significantly underreported by overweight and obese subjects, but not by normal weight subjects.
Conclusions: Both men and women overate due to unlimited access to food and no exercise. Concerning reporting accuracy, the experimental setting with overt observation of food intake, may in part explain our findings.

Alkylresorcinols as biomarkers for whole grain intake of wheat and rye

Rikard Landberg, A-M Lindo, H Adlercreutz, B Vessby, A Kamal-Eldin, B Åman
Inst. för LMV, UPPSALA, Sweden

Regular intake of wholegrain foods has been associated with many positive health effects such as decreased risk for obesity, hearth disease diabetes, and certain cancers. One of the obstacles for current epidemiological research on the link between diet and health is the lack of reliable biomarkers for specific foods. Alkylresorcinols (ARs) represent a group of phenolic lipids found in high contents in the outer parts of wheat and rye kernels. Chemically, they comprise 1, 3-dihydroxy-5-alkylbenzene homologues with odd numbered, mainly saturated hydrocarbon side chains containing 15-25 carbon atoms. Since they are only found in whole grain or bran of wheat and rye and not in any other commonly consumed foods, they can be regarded as a specific biomarker for intake of foods containing these ingredients. ARs are stable during food processing, absorbed by humans, and methods for their analysis in cereal foods, plasma and erythrocytes have been developed in recent years. Alkylresorcinols seem to meet many of the general criteria that could be put on a useful dietary biomarker. In this poster, we will present our current research within this topic.

SY11-03

Urinary thiamine as a biomarker for estimates of thiamine intake

Shirley A Runswick[1], Natasa Tasevska[2], Sheila Bingham[1]
[1]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom
[2]Kings College, LONDON, United Kingdom

To investigate the use of 24-h urinary thiamine as a potential biomarker for thiamine intake, 7 males and 6 females were fed their usual diet (assessed beforehand from four consecutive self-completed 7-d food diaries) for 30-d under controlled conditions in a metabolic suite. 24 h urine collections were made, verified for completeness with PABA1. 30-d mean (±SD) calculated thiamine intake was 2.22±0.55 mg/d. 30-d mean (±SD) urinary excretion of thiamine was 526.5±193.0 µg/d (24.7±8.10% of intake). Despite a high day-to-day variability of thiamine excretion (intraclass correlation = 0.58) a highly significant correlation was found between individuals' 30d means of thiamine intake and their mean excretion level (r=0.720; p=0.006). 16-d of dietary data and 8-d of urine data are used in validation protocols so the correlation between individual means of randomized 16-d of thiamine intake and 8-d of thiamine excretion data were compared. The correlations remained significant (r=0.60; p=0.035), although lower than that obtained with the means of 30-d measurements. Dietary thiamine is widespread in foods and urinary thiamine can be used as a general comparative biomarker in validation studies of dietary methods.

1 Bingham, S.A et al (1988) Annals of Clinical Biochemistry 25, 610-619.

SY11-04

Comparison of women's diet assessed by FFQs and 24-hour recalls with and without underreporters: association with biomarkers.

Inga Thorsdottir[1], Anna Sigridur Olafsdottir[2], Ingibjorg Gunnarsdottir[3], Holmfridur Thorgeirsdottir[4], Laufey Steingrimsdottir[4]
[1]University of Iceland, REYKJAVIK, Iceland
[2]Unit for Nutrition Research, REYKJAVIK, Iceland
[3]Unit for Nutriton Research, Landspitali-, REYKJAVIK, Iceland
[4]Public Health Institute, REYKJAVIK, Iceland

Two methods were compared to assess women's diet, and association with biomarkers. Methods: Under free-living conditions, 60 women were recruited, 53(88%) participated. Diet was assessed by two 24-hour recalls and a food frequency questionnaire (FFQ). Blood was analysed for retinol, ß-carotene, vitamin C and S-ferritin, and 24-hour urine for N, K and Na. Underreporting was evaluated with N-excretion vs. intake, and energy intake vs. BMR.
Results: Energy percent (E%) from macronutrients was similar from FFQ and 24-h recalls, but total intake was higher from 24-h recalls. Intakes of vitamin C and K (both methods) correlated with their biomarkers. Underreporters (20%) had higher BMI (27.7±5.5 vs. 23.8±3.7 kg/m2,p<0.05), reported lower E% total fat (32±5 vs. 38±6 E%,p<0.01), higher E% carbohydrate (49±4 vs. 45±7 E%,p<0.05), higher intake of fibre, vitamin C and ß-carotene. Correlation between intake and biomarkers increased after exclusion of underreporters.
Conclusion: For women's diet, FFQ and 24-h recalls give similar E% and most nutrients, but FFQ gives lower intake values. Underreporters have higher BMI and diminish the correlation between calculated intake and biomarkers. This has to be taken into consideration when intake data are associated with weight management, disease and life-style factors.

Physical activity measured by accelerometers in the National Health and Nutrition Examination Survey (NHANES) 2003-2004

RP Troiano[1], David Berrigan[1], Louise Mâsse[1], Timothy Tilert[2], Margaret McDowell[2]
[1]National Cancer Institute, BETHESDA, MD, United States of America
[2]Centers for Disease Control &Prevention, HYATTSVILLE, MD, United States of America

PURPOSE: To describe physical activity of a nationally representative sample of the United States population as measured by the Actigraph accelerometer. METHODS: Data were collected from 6830 participants of NHANES 2003-4 ages 6+ years. Participants were requested to wear the monitor for 7 days during waking hours. RESULTS: Approximately 74% of participants wore the monitor for at least 10 hours on 4-7 days. Compliance was lowest in adolescents (age 12-19 y, 59%) and highest in the elderly (60+ y, 87%), similar in men (75%) and women (74%), and somewhat lower in non-Hispanic blacks (64%). Mean accelerometer counts/day as well as time spent above count thresholds selected to indicate moderate and vigorous intensity activity will be presented for age, gender, and race-ethnicity groups. CONCLUSIONS: Accelerometers remove error in physical activity assessment due to difficulty in recall and desirability bias. However, they do not provide complete measures of physical activity or energy expenditure. Analysis of this data set also presents some challenges because of its size (>70,000,000 records) and the paucity of information concerning count thresholds for activity levels, particularly in the elderly. Nevertheless, objective data on physical activity in a nationally representative sample provide valuable insights into behavior.

How can habitual dietary intake been assessed if only two 24h recalls are available and the sample is not homogeneous

Kurt Hoffmann, Jennifer Ray
German Institute of Human Nutrition, NUTHETAL, Germany

Background: Usual dietary intake distributions can be estimated from repeated short-term measurements by eliminating the intra-individual variance component of the observed means of the individuals. However, the proposed statistical methods, like the Nusser and the simplified Nusser method, can lead to inconsistent and biased results if the sample is heterogeneous. Objective: The objective of this study was to illustrate this failure and to describe an alternative approach for overcoming the limitation. Data: We used intake data for 399 adults (198 men, 201 women) that were obtained from two 24h dietary recall interviews in the EPIC-Potsdam calibration study carried out in 2004. Heterogeneity of dietary intake between men and women and between two age groups was considered. Results: Usual intake of men was underestimated and of women overestimated by using the simplified Nusser method. In contrast, the means of usual intake obtained by using the new approach corresponded to the observed means for both gender and age groups. Conclusion: Food consumption surveys that utilize repeated short-term measurements like 24h dietary recalls and aim to describe usual intake distributions in the total sample and some subsamples should apply a statistical method that retains the mean intake in the subsamples.

SY12-02

Dietary changes over time as an etiological risk factor for chronic diseases
Flora Lubin
Gertner Institute, TEL HASHOMER, Israel

Introduction: Adults often change their diet in response to life events or to advice. Dietary assessment in case-control studies relating nutrition to diseases with long latency should therefore deal with a person's long-term dietary history.
Aim: To evaluate in a case-control study the relation between past changes in nutrient intake and ovarian cancer.
Method: The Two-Step Quantified Food Frequency Questionnaire provides the structure to record a person's diet one year prior to interview and all conscious changes in diet that were made before that time, going back 20 years .This design allows reconstruction of an individual's mean daily intakes at several time points in the past.
Results: Cases reported reducing their mean energy intake over the period from seven to two years previous to interview by 55 kcal compared to 136 kcal among controls. Mean percent calories from animal intake decreased by 1.3% in cases versus 1.9 % in controls (p=0.003) over this period. Substitution of non-animal fat in preference to animal fat was associated with a decreased risk of ovarian cancer controlling for hormonal factors (OR=0.65 per 100 kcal, CI 0.50-0.85).
Conclusion: Our assessment of long term dietary habits has identified a possible effect of diet change on disease.

SY12-03

Substituting missing values in food frequency questionnaires (FFQs): effects on energy intake in the Norwegian Women and Cancer Study (NOWAC)
Christine Parr[1], Anette Hjartåker[2], Ida Scheel[3], Petter Laake[2], Eiliv Lund[4], Marit Veierød[2]
[1]University of Oslo, OSLO, Norway
[2]Institute of Basic Medical Sciences, UNIVERSITY OF OSLO, Norway
[3]Department of Mathematics, UNIVERSITY OF OSLO, Norway
[4]Institute of Community Medicine, TROMSØ, Norway

Objective: Missing values are common in FFQs used in large epidemiological studies and must be handled when calculating energy intake. We compare results from different methods for substituting/imputing missing values using NOWAC data.
Methods: A FFQ was mailed twice (test-retest) to 1995 women aged 46-75 y from the NOWAC cohort in a reproducibility study (75% response). Missing answers in the test were imputed as follows:
1. Frequencies=0 (null intake) and portion sizes=smallest
2. Mode values
3. Median values
4. Retest values. Remaining missing values were treated as in method 1
5. K-nearest neighbors imputation using a weighted average of the values for the same question from the K=10 most similar respondents within the same dataset.
Results: After imputation of the test FFQ (17% missing data) with the different methods, estimated mean energy intake (MJ/day) with 95% CI was:
1. 6.43 (6.34, 6.53)
2. 6.92 (6.83, 7.01)
3. 7.16 (7.06, 7.25)
4. 6.93 (6.84, 7.03)
5. 7.52 (7.42, 7.62)
Conclusion: Exclusion is not practical when most respondents have missing values. However, the calculated energy intake is influenced by the imputation method. Treating missing as null intake may not be correct for all foods and may lead to underestimation of energy intake.

SY12-04

Conventional nutrient analyses overestimate reporting accuracy and mask the complexity of accurate and erroneous aspects of dietary reports

Albert Smith[1], Suzanne Baxter[2], Michele Nichols[2], James Hardin[2]
[1]Cleveland State University, CLEVELAND, OHIO, United States of America
[2]University of South Carolina, COLUMBIA, SC, United States of America

Evaluation of reporting accuracy in dietary validation studies involves comparing two sets of information—reported and reference—each of which consists of food items and their respective amounts. Reported items are either matches—items actually eaten—or intrusions—items not actually eaten. For matches, some (or all) of the reported amount corresponds to the reference amount; any remaining reported amount is overreported. (Amounts of matches may also be underreported.) For intrusions, reported amounts are necessarily overreported. Conventional approaches to evaluating reporting accuracy typically fail to distinguish between matches and intrusions, and between corresponding and overreported amounts: Reference and reported information are energy- and nutrient-transformed, and then compared using t-tests, correlation coefficients, and report rates (reported amounts/reference amounts). We show that when reported items are classified as matches or intrusions before reported information is transformed to energy and nutrients, one can compute an accuracy measure (corresponding amount/reference amount) and an error measure (overreported amount/reference amount); these measures—the correspondence rate and inflation ratio, respectively—sum to the conventional report rate. Using examples, we show how conventional analyses overestimate reporting accuracy and mask the complexity of both accurate and erroneous aspects of children's dietary reports. Funding: 43-3AEM-2-80101 (USDA/ERS/FANRP) and R01HL63189 (NIH/NHLBI).

SY12-05

The effects of absolute and calorie-adjusted nutrients in the presence of measurement error

Lynne Wilkens
Cancer Research Center of Hawaii, HONOLULU, United States of America

In the study of diet and disease, nutrients are commonly adjusted for energy intake. Common reasons for energy-adjustment are to separate the effects of a macronutrient from its energy contribution and to determine if the nutrient effect varies with energy intake. However, energy adjustment also appears to lessen the bias caused by measurement error in dietary variables. Many investigators have found that individuals were better able to accurately recall nutrient densities than absolute nutrients, when the intakes from food frequency questionnaires were compared against dietary records, 24-hour recalls, or biomarkers. When an energy-adjusted nutrient has a stronger association with disease than the absolute nutrient, it is generally assumed that it is the contribution of the nutrient to the diet that is important. While this is the most likely scenario, this is not necessarily true when both the intakes of the nutrient of interest and energy are measured with error. It is possible for the true absolute nutrient to be more strongly related to disease risk than the true energy-adjusted nutrient, and yet for the opposite relationships to hold using observed error-prone values. This phenomenon will be described mathematically and numerical examples will be given.

Considerations in the meta-analysis of epidemiologic studies of diet and cancer

LH Kushi[1], Elisa Bandera[2], Dirk Moore[2], Dina Considine[2], Marjorie McCullough[3]
[1]Kaiser Permanente, OAKLAND, CALIFORNIA, United States of America
[2]Cancer Institute of New Jersey, NEW BRUNSWICK, NEW JERSEY, United States of America
[3]American Cancer Society, ATLANTA, GEORGIA, United States of America

In meta-analyses of published reports of dietary exposures and disease risk, summary dose-response estimates are a valuable complement to summary risk estimates contrasting high vs. low exposure categories. While conducting endometrial cancer meta-analyses for the WCRF/AICR Second Report on Food, Nutrition, Physical Activity and the Prevention of Cancer, inconsistent reporting of information presented challenges in selecting relevant analyses. We thus developed several inclusion strategies. If confidence limits were missing, we estimated the risk estimate variance from the number of cases and controls (or population at risk) in the relevant category of exposure. As exposures may be reported in different units (e.g., nutrient intake may be reported as g/day, g/1,000 kcal, or % of energy), we placed these on a common scale when possible. If data such as category cutpoints were available, we estimated mean dose levels for each category, from which we calculated a single continuous dose-response risk estimate for each study. We combined these study-specific estimates into a summary risk estimate across studies. When dose-response estimates could not be calculated, sometimes high vs. low exposure category meta-analyses were possible. We conclude that consistency in reporting results from observational studies would facilitate future meta-analyses and suggest guidelines for this purpose.

Does the future of nutritional epidemiology depend on biomarkers? Yes

Sheila A. Bingham
MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

Concerns about the accuracy of dietary assessment methods used in the epidemiology of chronic disease continue to be raised 1,2,3 Measurement error in all, methods of dietary assessment attenuate estimates of disease risk and reduce statistical power so that a relation between diet and disease may be obscured. The effect of this error on regression dilution and estimated sample size is compounded when attempts are made to assess the interaction between dietary and genetic polymorphisms in assessing risk. Traditionally, repeat results from the method used in a cohort, usually a food frequency questionnaire, are compared with those from another assumed more accurate method. However, errors between methods may be correlated so that results from the reference method are not independent of those derived from the test method, thus violating a critical requirement of this procedure. Recognising the need for an independent uncorrelated technique of assessing the accuracy of dietary methods we previously used biomarkers to assess the accuracy of different techniques of measuring diet and consequently incorporated several into our cohort study 4. When using a method which had previously been shown to be more accurate using biomarkers, a 7 day food diary, the hazard ratio for breast cancer for each quintile increase of energy adjusted fat was strongly associated with saturated fat intake. There was no association with breast cancer risk and saturated fat measured using a food frequency questionnaire 5. This finding is soon to be confirmed in another cohort. Since that time, other biomarkers have been developed under carefully controlled conditions 6, and data using two or more methods and a biomarker has accumulated. The relationship between intake from diet assessed by different methods with nutritional biomarkers collected in the same individuals on recruitment, and the relationship between biomarkers and disease risk will be presented 7,8. Biomarkers are needed for the dual roles of assessment of measurement error, and to complement existing methods for estimatation of exposure from diet and risk of disease. Future achievements depend on their routine use in nutritional epidemiology. Ref.: 1.Day NE et al Int. J. Epidemiol.,2001,30: 309-31, 2.Kipnis V et al A JEpidemiol.,2003,158 14-21, 3. Kristal AR, et al,2005, CEBP 14 2826-2828, 4.Bingham, S., et al,2001 Pub Health Nutr 4, 847-858, 5Bingham, S.A., et al2003, Lancet 362 212 –214 , 6. Tasevska, N., et al,2005,CEBP14 1287 –94, 7Khaw. K.T, et al,2001,Lancet 357, 657-663, 8. Grace, P,B, et al (2004) , CEBP 13 698-09

PL03-02

Does the future of nutritional epidemiology depend on biomarkers? No

Walter Willett

Harvard School of Public Health, BOSTON, United States of America

Biochemical indicators of dietary intake can play a useful role in dietary assessment, especially for components of foods that are highly variable within different samples of the same food; selenium provides a classical example. On the other end of the spectrum, for many dietary factors there are no available biomarkers, often because body levels are tightly regulated, and intake must be thus be estimated by food intake. Sucrose is one example. In between, many nutrients and other dietary constituents can be assessed by either dietary intake or biochemical indicators.

Although limitations of dietary assessment methods have been discussed extensively, biochemical indicators, even when available, also have many limitations. First, most biochemical indicators are not directly proportional to intake because the levels are regulated by at the level of absorption, metabolism, or binding. For example, serum cholesterol levels are well measured but only slightly reflect cholesterol intake. Second, many biomarkers have large within-person variability so that a single measure provides a poor reflection of intake; this applies for example to 24-hour urinary sodium. In such cases, many repeated 24-hour collections are needed to characterize individual intake, which is impossible in most epidemiologic studies. Third, biomarkers, although seemly highly specific, are usually just as confounded by other dietary factor as are measures of dietary intake. For example, both plasma vitamin C levels and calculated intakes of vitamin C will be correlated with intakes of most other nutrients contained in fruits and vegetables. However, if vitamin C is estimated by dietary intake, the potential for confounding can be more readily addressed because intakes of the other nutrients can be calculated from the same data. Further, biochemical indicators can often be confounded by additional factors that do not influence measures of intake; stress, details of smoking behavior, and inflammation can influence vitamin C levels, and these may also be risk factors for the disease being studied. Some of these confounding factors may be difficult or impossible to control, so that dietary intake may sometimes be the preferred measure. Biochemical indicators can also be influenced by preclinical manifestations of disease, so they are more susceptible to reverse causation. Fourth, true dietary intake usually varies over longer periods of many months or years so that even a perfect assessment of medium term intake provides a poor measure of long term intake. In this case, repeated measures over time are desirable to characterize a person's long term diet or change in diet. Because the costs of specimen collection and biochemical analysis are usually far greater than dietary assessments by mailed questionnaires, the ability to measure diet repeatedly can provide superior information compared to a single or small number of biochemical measurements. Finally, we are often interested in intake of specific foods, food groups, or dietary patterns, and biomarkers are ill suited for this purpose.

In summary, both dietary intake measurements and biochemical indicators of intake can contribute importantly to nutritional epidemiology. The advantages and limitations of each must be carefully considered in any specific application, but the mainstay of nutritional epidemiology will remain assessments of dietary intake

Dietary patterns and indices
Kathrine Tucker
Tufts University, BOSTON, United States of America

As the failures of individual nutrient supplement trials have accumulated, along with studies where vitamins or minerals from food but not supplements appear protective against chronic disease, there has been a growing appreciation for the complexity of nutrient-disease relationships. Dietary pattern analysis has become popular as a way to look at overall dietary intake, as opposed to a focus on the protective effects of specific vitamins or minerals. Early approaches to dietary patterns included indices of nutrient intake adequacy or dietary diversity; simple counts of nutrient intake requirements met or foods consumed. More complex, and widely used, indices include the Healthy Eating Index and Mediterranean diet score. Most recently, computer driven methods have been used to describe dietary patterns within population groups. The most common approaches include factor and cluster analysis. Factor analysis yields linear combinations (factors) of correlated variables resulting in scores that describe the degree to which each individual adheres to the defined pattern. The scores are calculated by multiplying individual intakes of each food group by their factor weights, summing these products and applying a z-score standardization. Clusters, on the other hand, separate individuals into dietary pattern groups that maximize the, usually, Euclidean distance between defined centers of food intake groupings while minimizing these distances within the cluster. Despite some early concerns about subjective inputs into these procedures, accumulating results have shown them to be quite reproducible, even across populations. The growing numbers of interesting publications that show associations with health outcomes also support their validity. Newer extensions to these methods include the use of confirmatory factor analysis, where the covariance structure of the initial factor output is used to recreate the factors using only those input variables with high loadings-to confirm their stability once the extraneous variables are removed; and reduced rank regression (RRR), where combinations of food intake variables are determined by a model that explains as much variation as possible for a specified outcome variable. Although impressive progress has been made in the use of these methods, important questions remain. The presentations in this session each advance our knowledge on these methods. They will address: a comparison across three methods-a diet index score, factor analysis and RRR; the simultaneous consideration of more than one factor score on risk of MI; dietary patterns in China and their relationship to anemia; changes in factor scores over time and relationship to mortality; and the use of reduced rank regression to identify dietary patterns that predict glycemic index and load.

Three methods of deriving dietary patterns and their relation with risk of incident CHD: the ARIC study

Lyn Steffen[1], Jennifer Nettleton[1], Xia Zhou[1], June Stevens[2]
[1]University of MN School of Public Health, MINNEAPOLIS, MN, United States of America
[2]University of North Carolina, CHAPEL HILL, NORTH CAROLINA, United States of America

Dietary pattern analysis is a valuable method for assessing the relation between dietary intake and disease. However, it is not clear whether different methods of deriving diet patterns will yield similar results. We studied the associations of three diet patterns with risk of incident coronary heart disease (CHD) among 9,318 white and African American adults enrolled in the Atherosclerosis Risk in Communities (ARIC) cohort. Dietary intake was assessed by a food frequency questionnaire and thirty-two food groups were created according to established criteria. Derived diet pattern methods include the diet index score (DIS), principal components analysis (PCA), and reduced rank regression (RRR). In separate proportional hazards regression analyses, the relations between quintiles (Q) of each diet pattern were assessed with risk of incident CHD, adjusting for demographics, lifestyle factors, and metabolic syndrome risk factors. Over 12 years of follow-up, there was an increased risk of incident CHD across increasing quintiles of intake for each diet pattern. The hazard ratio (HR) (95% confidence intervals) for each diet pattern for Q5:Q1 is: DIS: 1.34 (0.99, 1.83); PCA: 1.64 (1.15, 2.36); and RRR: 1.56 (1.13, 2.15). Thus the 3 approaches yielded similar HR's and confidence intervals.

Prospective study of major dietary pattern and risk of myocardial infarction in Swedish women

Agneta Åkesson[1], Christoph Weismayor[1], PK Newby[2], A Wolk[1]
[1]Karolinska Institutet, STOCKHOLM, Sweden
[2]Tufts University, BOSTON, United States of America

Few studies investigating the effect of diet on the risk of myocardial infarction (MI) have considered the actual eating behavior in the population. We examined the association between major dietary patterns, derived using factor analysis, and the risk of MI in 24,363 women in the prospective population-based Swedish Mammography Cohort. Four major dietary patterns were derived, named Healthy, Western/Traditional, Sweets and Alcohol. During 6 years of follow-up, 300 cases of myocardial infarction were ascertained. After multivariate adjustment comparing extreme quintiles, there were statistically significant inverse dose-response associations between both the Healthy (fruit and vegetables) and the Alcohol dietary patterns and the risk of myocardial infraction (Hazard ratio [HR], 0.57; 95% confidence interval [CI], 0.38-0.85; P for trend=0.005 and HR, 0.58; 95% CI, 0.38-0.89; P for trend=0.003, respectively). The combined effect of top two quintiles of Healthy and Alcohol patterns, corresponding to ~4 servings of vegetables and ~2 servings of fruits per day and ~5.5 weekly servings of alcoholic beverages, was associated with a 61% lower risk (HR, 0.39; 95% CI, 0.24-0.64). In conclusion, in 18% of the study population, we identified an eating behavior associated with 61% reduction of the risk of myocardial infarction.

Food patterns derived by factor analysis can predict prevalence of anaemia: An example from Jiangsu Province in China

Zumin Shi[1], Baojun Yuan[2], Gerd Holmboe-Ottesen[1]
[1]University of Oslo, OSLO, Norway
[2]Jiangsu Provincial CDC, NANJING, China

Purpose: To develop food patterns based on FFQ for use of epidemiologic study.
Methods: In a cross-sectional study, 2849 adults were interviewed. Food patterns were developed using factor analysis based on a FFQ. Differences in nutrient intake measured by a 3-day weighing method were compared between the different food patterns. Anemia was used as an outcome evaluation index.
Results: We derived four food factors which explained 30.5% of the variance in intake of foods. There were significant differences of protein, fat, carbohydrate, energy intake among quartiles of each food patterns. After adjusting for socio-demographic factors, 'traditional rice food' pattern (rice, vegetable and meat), 'sweet tooth' food pattern (drinks and cake) and 'healthy food' pattern (whole grains, fruits and vegetables) were independently associated with anaemia. No association was observed between 'macho' food pattern (meat and alcohol) and anaemia. These differences in prevalence of anaemia were in accordance with the differences in iron intake and/or vitamin C intake.
Conclusions: The food patterns derived by factor analysis can predict prevalence of anaemia. This association with anaemia can be explained by intake of iron and vitamin C. Factor analysis can be useful in determining the relationshop between food patterns and disease in epidemiologic studies

Dietary patterns and longevity: results from the health and lifestyle survey (HALS).

SA McNaughton[1], GD Mishra[2], MJ Whichelow[3], BD Cox[3]
[1]Deakin University, MELBOURNE, Australia
[2]University of Queensland, BRISBANE, Australia
[3]University of Cambridge, CAMBRIDGE, United Kingdom

Background: Research suggests that certain dietary patterns are associated with risk of chronic disease.
Methods: Analysis was based on 5352 adult members of a nationally-representative cohort surveyed in 1984-85 (HALS1) and in 1991-92 (HALS2), and all deaths reported until May 2005. Diet was assessed using a food frequency questionnaire with dietary patterns determined by factor analysis. Cox proportional hazards survival analysis was used to estimate the all-cause mortality hazard ratios associated with increasing scores on four measures of dietary patterns (dietary pattern scores at HALS1 and HAL2; change in pattern scores; average dietary patterns scores) with adjustment for relevant confounders.
Results: Four dietary patterns were identified (high fat, high sugar; light-healthy; traditional with vegetables; puddings and sweets). Higher scores on the high fat, high sugar pattern at each time-point (HR, 95%CI: 1.10, 1.00-1.20; 1.10, 1.02-1.19) and their average (1.13, 1.03-1.24) were associated with increased mortality hazard ratio. Dietary change (HALS1 vs HALS2) was only significant for the traditional with vegetables pattern, with a lowered mortality hazard ratio associated with increased consumption (0.90, 0.84-0.96). There were no associations for the light-healthy or the puddings and sweets patterns (p>0.05).
Conclusion: Specific dietary patterns identified among this cohort were independently associated with mortality.

SY13-06

Dietary patterns related to glycemic index and load and risk of pre- and postmenopausal breast cancer

Susan McCann[1], William McCann[1], Chi-Chen Hong[1], James Marshall[1], Stephen Edge[1], Maurizio Trevisan[2], Paola Muti[3], Dominica Vito[2], Jo Freudenheim[2]
[1]Roswell Park Cancer Institute, BUFFALO, United States of America
[2]University at Buffalo, BUFFALO, United States of America
[3]National Cancer Institute, ROME, Italy

Issues with glycemic index (GI) as a predictor of dietary glycemic effects may partially explain inconsistent relationships between GI and load (GL) and disease outcomes. Recently, reduced rank regression (RRR) has been used to identify dietary patterns that predict variation in a selected risk factor, contrary to principal components analysis which predicts variation in food use. We used RRR to identify dietary patterns predicting GI and GL in a breast cancer case control study: 1166 cases and 2105 controls, the Western New York Exposures and Breast Cancer Study. Odds ratios (OR) and 95% confidence intervals (CI) were estimated with unconditional logistic regression. Three food groups (sweets, refined grains, and salty snacks) explained 34% of the variance in GI and 68% of GL. Whereas GI and GL alone were unrelated to risk, postmenopausal women with high GL pattern scores had a suggestion of decreased risks (OR 0.78, 95% CI 0.56-1.08). Premenopausal women with BMI > 25 had increased risks associated with high GL pattern scores (OR 2.28, 95% CI 1.07-4.86). RRR may be useful in refining GI for studies of diet and disease as a limited number of foods may optimally explain the glycemic effect of diet on cancer risk.

SY14-01

Is the 24-hour diet recall a promising reference dietary method for between population comparisons? - Reported experience from the EPIC study

Nadia Slimani[1], P Ferrari[1], M Ocké[2], A Welch[3], V Pala[4], A Agudo[5], Connie Stripp[6], H Boeing[7], A Trichopoulou[8], MY Niravong[9], I Matisson[10], G. Skei[11], Sheila Bingham[12], Elio Riboli[13] on behalf of the EPIC group
[1]IARC WHO, LYON CEDEX 08, France
[2]RIVM, BILTHOVEN, The Netherlands
[3]Institute of Public Health, CAMBRIDGE, United Kingdom
[4]InsitutoNazionale die Tumori, MILAN, Italy
[5]Catalan Institute of Oncology, BARCELONA, Spain
[6]Danish Cancer Society, COPENHAGEN, Denmark
[7]German Institute of Human Nutrition, POTSDAM-REHBRÜCKE, Germany
[8]University of Athens Medical School, ATHENS, Greece
[9]Institut Gustave Roussy, VILLEJUIF, France
[10]Swedish National Food Administration, UPPSALA, Sweden
[11]University of Tromsø, TROMSØ, Norway
[12]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom
[13]Imperial College London, LONDON, United Kingdom

Background: There is increasing interest in collecting dietary measurements in a standardised way across countries or different population/ethnic groups. The open-ended 24-hour diet recall (24-HDR) has features facilitating its adaptation and standardisation across populations with different dietary habits. A highly standardised computerized programme (EPIC-SOFT) has been used as a reference calibration method across the 10 European participating countries participating in The European Prospective Investigation into Cancer and Nutrition (EPIC).
Aim: To report on the standardisation and validation of the EPIC-SOFT 24-hour diet recall measurements used in EPIC as well as on the major strengths and limitations of using the 24-HDR in an international setting.
Methods: A single 24-HDR was collected from a sub-sample of EPIC (N= ~37,000). The validity of the EPIC-SOFT measurements was evaluated using independent urinary and plasma biomarkers and an empirical approach using the Goldberg cut off points.
Results: The participation rate ranged from 55% to 92% with mean interview duration of 31 ± 13 minutes. Despite underestimation on the mean energy intake on basal metabolic

rate (EI/BMR), the differences between centres were relatively small in both men (4%) and women (7.4%), after adjustments and exclusion of extreme values (< 10%) and 2 centres. High ecological correlations were reported between centre mean intakes and mean urinary nitrogen (r = >0.85%) and different plasma carotenoids (r=0.70-0.90). Conclusion: Overall, the 24-HDR is a promising method for between population comparisons. The EFCOSUM working group recommends the 24-HDR for future pan-European monitoring surveys.

SY14-02

The evaluation of the diet/disease relation in the EPIC study: considerations for the calibration and the disease model
Pietro Ferrari[1], Nicholas E. Day[2], Hendriek C. Boshuizen[3], Andrew Roddam[4], Kurt Hoffmann[5], Anne Thiebaut[6], Guillem Pera[7], Kim Overvad[8], Eiliv Lund[9], Antonia Trichopoulou[10], Rosario Tumino[11], Bo Gullberg[12], Teresa Norat[1], Nadia Slimani[1], Rudolf Kaaks[1], Elio Riboli[1] on behalf of the EPIC group.
[1]IARC WHO, LYON CEDEX 08, France
[2]University of Cambridge, CAMBRIDGE, United Kingdom
[3]RIVM, BILTHOVEN, The Netherlands
[4]University of Oxford, Headington, OXFORD, United Kingdom
[5]German Institute of Human Nutrition, POTSDAM-REHBRÜCKE, Germany
[6]Institut Gustave Roussy, VILLEJUIF, France
[7]Catalan Institute of Oncology, BARCELONA, Spain
[8]Aalborg Hospital, Aarhus University Hosp, AALBORG, Denmark
[9]University of Tromsø, TROMSØ, Norway
[10]University of Athens Medical School, ATHENS, Greece
[11]Cancer Registry, Azienda Ospedaliera, RAGUSA, Italy
[12]Lund University, MALMØ, Sweden

Background: Multi-centre/country epidemiologic studies on diet and cancer provide methodological challenges for evaluating the association between dietary exposures and disease outcomes, both of which are heterogeneous across geographical regions. One approach is to standardize and calibrate dietary measurements at the food and nutrient levels.
Aim: To describe the data calibration/analysis approaches used in the European Prospective Investigation into Cancer and Nutrition (EPIC).
Methods: Within EPIC, a calibration study was established to express individual dietary intakes according to the same reference scale. A linear regression calibration model was used to correct the diet-disease association for measurement errors in dietary exposures. Here, the association between fish intake and colorectal cancer incidence is used as an example.
Results: Country-specific attenuation factors ranged from 0.090 to 0.690, with higher overall values overall for men compared to women. HR estimates of colorectal cancer for 10 g/day increase in fish intake were 0.966 (95%CI: 0.947–0.985) and 0.925 (0.872–

0.981), before and after calibration respectively.

Conclusions: In multi-centric studies, the diet/disease association can be evaluated by exploiting the whole variability of intake over the entire study. Calibration may reduce between-centre heterogeneity in the diet-disease relationship caused by differential impact of measurement errors across cohorts.

Standardization of dietary energy supply statistics for international comparisons

Marie Claude Dop, Terri J. Ballard
FAO, ROME, Italy

Dietary energy supply (DES) statistics are used for assessing food security and ranking countries, and for international comparisons of diet when nationally representative data on food consumption are lacking. The per capita dietary energy supply (pcDES) is available for most countries and time series exist since 1960 (FAOSTAT database). Because pcDES is national energy supply divided by total population, estimates are not independent of country population demographics. In order for comparisons of pcDES across countries to be valid, standardization is needed to make the DES independent of demographics.

Two methods that use the recently updated recommendations for human energy requirements are proposed to standardize DES to adjust for differences in population characteristics. The standardized dietary energy supply (sDES) is the DES for an adult male equivalent of the country. The energy adequacy ratio (AR) is a ratio of pcDES to per capita energy requirements.

We standardized DES for 125 countries and found that country DES ranking changes considerably after standardization, in particular in countries with young populations. Some countries with a pcDES less than 2100 kcal/day (often used as a standard minimum requirement) have an AR of 1 or more, indicating a sufficient energy supply at national level.

SY14-04

The influence of design characteristics of food frequency questionnaires on their validity to assess energy and protein intake in adults.

Marja Molag[1], Jeanne de Vries[1], Piet van den Brandt[2], Pieter Dagnelie[2], Margje Jansen[3], Marga Ocke[4], Pieter van het Veer[1], Wija van Staveren[1]
[1]Wageningen University, WAGENINGEN, The Netherlands
[2]Maastricht University, MAASTRICHT, The Netherlands
[3]TNO Quality of Life, ZEIST, The Netherlands
[4]RIVM, BILTHOVEN, The Netherlands

Aim: To investigate in literature which design characteristics of FFQs influence their validity to assess both absolute and relative levels of energy and protein intake in adults with western food habits, and to rank them according to these intakes. This information is required in harmonizing FFQs for multi centre studies.
Methods: Studies investigating the validity or reproducibility of FFQs, published since 1980 were selected. The included studies validated questionnaires against doubly labeled water (energy expenditure) or urinary nitrogen (protein) as gold standards, or against food records or 24 hour recalls for assessing relative validity. The design characteristics we studied were the number of food items, the reference period, the administration mode, and inclusion of portion size questions.
Results and conclusion: For this review we included 36 articles representing the validation of 38 questionnaires. Three questionnaires were validated against DLW, ten questionnaires against urinary N and 25 against 24-hour recalls or food records. A positive linear relationship ($r=0.57$, $p<0.0001$) was observed between the number of items on the FFQ and the reported mean energy intake. Details about the influence of other design characteristics on validity and application in multi-centre studies will be discussed at the conference.

SY14-05

A new tool for dietary assessment in adolescents across Europe in the HELENA* Project

Carine Vereecken[1], Marc Covents[2], Lea Maes[1], Laurent Beghin[3], Mathilde Kersting[4], Orsolya Kovács[5], Catherine Leclercq[6], Yannis Manios[7], Luis Moreno[8], Katharina Phillipp[9], Maria Plada[10], Eric Poortvliet[11], Stefaan De Henauw[1]
[1]Ghent University, GHENT, Belgium
[2]Private consultant, ZELE, Belgium
[3]Université de Lille 2, LILLE, France
[4]Research Institute of Child Nutrition, DORTMUND, Germany
[5]Université of Pécs, PÉCS, Hungary
[6]Istituto nazionale di ricerca per gli al, ROMA, Italy
[7]Harokopio university, ATHENS, Greece
[8]Universidad de Zaragoza, ZARAGOZA, Spain
[9]University of Vienna, VIENNA, Austria
[10]university of Crete school of medicine, HERAKLION, Greece
[11]karolinska Institutet, HUDDINGE, Sweden

There is generally a lack of standardized procedures and instruments for monitoring dietary intake among adolescents in Europe.
The HELENA Project (Healthy Lifestyle in Europe by Nutrition in Adolescence) has the objective – amongst others - to develop and harmonise innovative methods for the assessment of dietary intake among adolescents from 10 European cities.
To this end, a Belgian validated self-administered computer-based 24-hour dietary recall (YANA-C: Young Adolescents' nutrition Assessment on Computer) is being adapted for cross-cultural use. In general, this tool includes over 1500 food and portion size pictures and is interactively structured according to six meal occasions. Subjects' attention is captured through visual effects and memory-supportive questions.
A standard protocol has been developed for the purpose of tailoring food groups, food items, portion sizes and other relevant aspects, to the local eating culture and language and will be centrally followed-up for quality assurance. This protocol also includes instructions for a standardized validation study. Optimisation of comparability is envisaged through linkage with the know-how from another ongoing EU-FP-6 project – EUROFIR (A European Food Information Resource Network) on food composition databases.

SY14-06

Fat consumption in mesoamerica: findings from the Concordance project

Roxana Valdes-Ramos[1], Evelyn Mayorga[2], M Vossenaar[3], Noel Solomons[3], Annie Anderson[4]
[1]Universidad Autonoma Estado de Mexico, TOLUCA, ESTADO DE MEXICO, Mexico
[2]CESSIAM, GUATEMALA, Guatemala
[3]CeSSIAM, GUATEMALA CITY, Guatemala
[4]University of Dundee, DUNDEE, United Kingdom

Background: According to the WCRF/AICR 1997 report, fats and oils should provide 15-30% total energy to populations, whereas individuals should 'limit their consumption, particularly of animal origin, choosing modest amounts of appropriate vegetable oils.'
Objective: To evaluate natural/background concordance of Mexican and Guatemalan populations with WCRF/AICR lipid consumption recommendations.
Methods: Population-specific FFQs were administered to 823 Mexican and 875 Guatemalan 18-70y/old adults from rural (RU), urban marginal (UM) and urban elite (UE) communities. We calculated percentage of total energy from fat, using open-ended questions to determine fat type preference.
Results: Fat contributed means of 38.5±7.5% (Mexico) and 27.2±6.8% (Guatemala) (p<0.001), significant differences (p<.001) were found between countries in RU and UM, but not in UE, who had the highest intakes in both countries. With respect to type of fat, margarine was consumed by 86.4%, vegetable-oil by 40.9%, butter by 16.7%, spray-oils by 8.8%, vegetable-lard by 5.6%, and pork-lard by 4.3% of Mexicans. Among Guatemalans, the corresponding participation in fat-source consumption was: 91%, 41.7%, 6.1%, 6.4%, 0.3% and 5.6%, respectively.
Conclusions: Fat intake exceeds the recommended contribution in the Mexican sample. With hardened vegetable-fat sources (margarines, shortening) in abundance, concerns are raised regarding overall trans-fatty acid exposure.
Funded by the WCRF.

SY15-01

Statistical issues in physical activity assessment

Diane Catellier[1], Richard Troiano[2]
[1]University of North Caroline, CHAPEL HILL, United States of America
[2]National Cancer Institute, BETHESDA, United States of America

This mini-course symposium will provide an overview of issues encountered in the analysis of physical activity measurement data. Different methods of assessment will be described with comparison of their measurement properties and sources of error. The primary focus of the session will be on issues related to the assessment of physical activity with accelerometers, which provide objective data to assess physical activity. The resulting data sets can provide large volumes of data that present unique logistical and analytic issues. Although objective data collection addresses concerns about reporting and recall bias inherent in self-report instruments, other sources of error that reduce validity and reliability remain. Topics to be covered include: determination of wear- and non-wear time, classification of valid data for analysis, procedures to address non-adherence and participant drop-out, and issues related to the assessment of physical activity patterns. An overview of study design and analytic strategies that minimize the sample size or improve power to test research hypotheses will be presented. These strategies include choices about the scale of the outcome (continuous, ordinal, nominal), the number of days of monitoring, the number of measurement occasions, the benefit of stratification, and the analytic approach (e.g., parametric or nonparametric, control for baseline). The impact of these various decisions on power will be illustrated for designs that are most pertinent to research on physical activity. Examples from the cross-sectional National Health and Nutrition Examination Survey 2003-2004 and the Trial of Activity in Adolescent Girls will be presented.

SY16-01

Justifications, gaps and needs for new dietary and physical activity assessment methods for children under two years of age

Douglas Taren
University of Arizona, TUCSON, ARIZONA, United States of America

Collecting dietary and physical activity data for children less than 2 years of age need to account for all the issues associated with adults and numerous additional factors such as the use of proxy reporters. As can be seen by the submission of papers to this international conference, there is currently a limited amount of research being conducted on improving methods to measure dietary and physical activity patterns of children less than 2 years of age. Additional information for this young pediatric population is important in industrialized countries in order to understand any early programming that may occur that relates to obesity and other chronic diseases. In less industrialized countries, especially in Africa and Asia, better measures will support current studies on under-nutrition and on how infant feeding behaviors are related to mother-to-child HIV transmission. Historically, studies have been limited to clinical situations using a small number of subjects and were not applicable for large epidemiological studies such as those that measured the amount of breastmilk a child received using weighing before and after feedings. We now need methods that are applicable to large cohort studies. Similarly, there are few studies on factors related to energy expenditure of toddlers once they start crawling and walking. Developing new state-of-the-art methods to measure dietary and physical activity in this population will help determine how the nutrition transition in many countries is affecting the youngest children. In developing countries, better quantification of viral exposure will be obtained with validated methods on infant feeding. Finally, these methods are needed for longitudinal studies that will account for the dynamic physiological changes that occur over a few months within this age group. The methods from these studies should also be applicable for creating outcome measures for large intervention studies.

Validity and reproducibility of a semi-quantitative food frequency questionnaire for estimating calcium intake in Belgian pre-school children

Inge Huybrechts, Dirk De Bacquer, Christophe Matthys, Guy De Backer, Stefaan De Henauw
Ghent University, GHENT, Belgium

Objective: To determine relative validity and reproducibility of a semi-quantitative food frequency questionnaire (FFQ) to assess usual calcium intake of pre-school children, using parents/guardians as a proxy.
Methods: Three-day estimated diet records (EDR's) were used as reference method. Reproducibility was measured by repeated FFQ administrations five weeks apart.
Subjects: A total of 509 children (2.5 – 6.5 years) were included in the validity analyses. A separate sample of 60 children was included in the reproducibility analyses.
Results: Mean (SD) calcium intakes were 838 (305) and 777 (296) mg/day for EDR's and FFQ's respectively, indicating a mean difference of 60.9 (294.4) mg/day (p<0.001). Pearson's correlation was 0.52. Cross-classification analysis classified 83% of the subjects in the same/adjacent category and 2.4% in extreme quartiles. Actual values for surrogate FFQ quartiles showed an increase in calcium intake (p<0.001). Specificity for the age-specific RDA was 77%.
For the reproducibility-test, no significant differences were found in mean calcium intake of repeated administrations. The correlation was 0.79 and 93.4% of the subjects were classified in the same/adjacent category, none in the extreme categories.
Conclusion: This FFQ tended to underestimate pre-school children's calcium intake, demonstrated good repeatability and fairly good ability to classify subjects into extremes of intake.

Development of a novel computer based method of measuring portion size with children.

Emma Foster[1], Julie Harris[2], Piers Cornelissen[1], Ashley Adamson[1]
[1]University of Newcastle, NEWCASTLE, United Kingdom
[2]St Andrews University, ST ANDREWS, United Kingdom

Where nutrient intakes are of interest, dietary assessment methods must include a measure or estimate of amount consumed. Weighing foods is burdensome, indeed obtaining weighed records for young children is particularly difficult when the child spends a large part of the day away from their parents.
An interactive portion size assessment system (IPSAS), developed specifically for use with children, was tested with 209 children aged 4 to 16 years. The tool uses a computer display to depict commonly consumed foods and a range of portions consumed (data obtained from a prior national sample of children in age groups 4-6, 7-10,-11-14 and 15-16 years). Children were served foods of known weights and asked to estimate the amount served and leftover using IPSAS.
Mean ratios of estimated:actual weight were 1.05 and 1.36 for 4-6 year olds , 0.94 and 1.17 for 7-10 year olds, 0.91 and 1.17 for 11-14 year olds and 0.92 and 0.94 for 15-16 year olds for weight served and consumed respectively.
The data indicate that children are able to estimate portion size served with reasonable accuracy using IPSAS. The over-estimation of foods eaten suggests there may be outstanding problems relating to the accuracy with which young children report leftovers.

SY16-04

Confabulations or stretches: intrusions (items reported but not actually eaten) in a dietary validation study with multiple interviews from fourth-graders

Suzanne Domel Baxter[1], Albert Smith[2], Michele Nichols[1], Caroline Guinn[1], James Hardin[1]
[1]University of South Carolina, COLUMBIA, United States of America
[2]Cleveland State University, CLEVELAND, OHIO, United States of America

We investigated the source and reported amounts of intrusions which are common reporting errors in validation studies. Children were observed eating school meals for one day (n=12), or for two (n=13) or three (n=79) nonconsecutive days separated by >4 weeks, and interviewed the morning after each observation day about intake the previous day. Intrusions were categorized as confabulations (not on tray) or stretches (on tray but observed uneaten). There were 725 intrusions across 275 interviews, with 616 confabulations (85%) and 109 stretches (15%). Mean amount reported was greater for confabulations than stretches (0.83 ± 0.31 versus 0.61 ± 0.30 servings); =1 serving was reported more often for confabulations (60%; n=372) than stretches (29%; n=32) [$p<.0001$; Fisher's Exact Test]. Interview sequence (first, second, third), race (Black, White), sex, and weekday were not significant predictors of confabulations, but serving period ($p=.0027$) and meal component ($p=.0031$) were (logistic regression). Confabulations accounted for 87% of 394 breakfast intrusions and 82% of 331 lunch intrusions. Confabulations ranged from 70% of 71 vegetable intrusions to 95% of 80 combination entrée intrusions. Further analyses will investigate whether intrusions were available at school meals other than the day for which children were to report intake.
Funding: R01HL73081 and R01HL63189 (NHLBI/NIH).

SY16-05

Adolescents' preferences for dietary intake methods in the United States: a qualitative and quantitative evaluation.

Carol Boushey[1], Deborah phd Kerr[2], Janine msc Wright[2], Berdine phd Martin[1], Connie phd Weaver[1]
[1]Purdue University, WEST LAFAYETTE, United States of America
[2]Curtin University of Technology, PERTH, Australia

Dietary assessment among adolescents is problematic. Our purpose was to determine adolescents' preferences for reporting dietary intake. Over an 8 wk period, 15 males and 14 females (11 - 15 years) completed 6 different dietary assessment methods: pen and paper food record (FR), 5-pass 24-hour dietary recall (24HR), FR using a Personal Digital Assistant (PDA) with tree-structure, FR using a PDA with search function, a FR with a camera PDA, and a FR with a disposable camera. Open-ended interviews about preferences were conducted and two focus group sessions. For boys, the 24HR, was described as 'boring' and 'tedious'. Girls commented the FR was a 'hassle'. The PDA methods were described as 'better than the interview', 'high technology', and 'easier'. Comments about using a camera included: 'lot easier', and 'fun'. Responses to a questionnaire about preferences were consistent with the interviews and focus groups. Methods using technology were preferred over the pen and paper FR (vs PDA-search, $p=0.003$; disposable camera, $p<0.001$; PDA-camera, $p=0.002$). There was a strong preference for using methods that incorporate technology such as capturing images of food. For adolescents, dietary methods that incorporate technology may improve cooperation and accuracy, thus methods incorporating innovative technologies need to be explored.

Evaluation of the performance of a semi-quantitative food frequency questionnaire for Bolivian Adolescents

Federico Perez-Cueto Eulert, Dominique Roberfroid, Patrick Kolsteren
Prince Leopold Institute of Tropical Med, ANTWERPEN, Belgium

Introduction: Dietary patterns and lifestyle consolidate in adolescence and they have an impact in health latter in life. Therefore, it is pertinent to monitor and document dietary patterns in adolescents.
Objective: To develop and evaluate the performance of a semi-quantitative food frequency questionnaire for Bolivian adolescents.
Setting: La Paz, Bolivia, September – October 2004.
Methodology: A convenience sample of 40 girls and 42 boys (mean age 15.7; SD 1.31) from a secondary school participated in the study. A semi quantitative food frequency questionnaire was applied twice with one month interval (Q1 and Q2). A 3 days dietary record (3R) was also obtained from 32 of the students.
Results: Using the prevalence and bias adjusted kappa statistic 87% of all individual food items agreed substantially, 9% agreed moderately and only 2% fell into the category of slight agreement. Quantities obtained from both applications of the questionnaire (Q1 and Q2) yielded similar results (P>0.05). Nutrient estimates obtained from the Q1 and Q2 and the 3R were not statistically different (P>0.05).
Conclusion: The semi - quantitative food frequency questionnaire is apparently reliable and valid for the measurement of food and nutrients intake in Bolivian adolescents.
Acknowldegements: Nutrition Tiers Monde partially sponsored the Study

An adolescent web-based food frequency questionnaire: validity and reproducibility

Christophe Matthys[1], Ilse Pynaert[1], Willem De Keyzer[2], Stefaan De Henauw[1]
[1]Ghent University, GENT, Belgium
[2]Department of Health Care, Hogent, GENT, Belgium

Background: To develop a cost-effective, easy-to-administer tool to monitor food habits of adolescents.
Objective: To determine the validity of a web-based food frequency questionnaire (FFQ).
Methods: The FFQ is an anonymous self-administered tool. In total 104 adolescents (12 – 18 y) living in Ghent, Belgium, completed the FFQ and a 3-day estimated dietary record. A second FFQ administration was completed one month later. Analyses were done for all participants and for consumers-only (consumer in both FFQ and dietary record).
Results: For all participants, the intake of water, fruit, breakfast cereals, fish/eggs/meat, pasta/rice and potatoes was not significantly different between the two methods. The Spearman correlation was on average 0.38 (ranging from 0.20 for pasta/rice to 0.64 for breakfast cereals). For consumers-only, the FFQ showed a significantly higher estimate for soft drinks, sweet and savoury snacks/fillings, sauces & fat spreads, cheese, pasta/rice and vegetables. A significantly lower milk & milk products estimate by the dietary records was found. Spearman's correlations were on average 0.30.
The reproducibility-test resulted in an average test-retest Spearman correlation coefficient of 0.62.
Conclusions: The FFQ has shown good reproducibility and a good estimate of four (out of the six) food triangle food groups (water, fruit, bread and fish/eggs/meat).

Risk assessment methods and diet: Contaminants and upper safe levels of nutrients

Barbara Burlingame, Ruth Charrondiere
FAO, ROME, Italy

Methodologically, there is no fundamental difference between assessments for dietary adequacy and assessments for and dietary risk/exposure. Determining the intake of food should be identical whether the expected endpoint is deficiency, adequacy or toxicity. Yet dietary assessment and risk assessment activities are almost invariably conducted independently from each other; the former by the nutrition community and the latter by the toxicology community. To further develop the dialog between these two professional groups, FAO and WHO convened a two international workshops in May 2005: Intake Assessment for Chemicals in Food, and Nutrient Risk Assessment: A model for establishing upper levels of intake for nutrients and related substances .

The need for a scientific process and methodologies to address 'risk' as it relates to food, particularly within the context of supporting the establishment of nutrient upper levels, has become increasingly apparent in the international arena. For example, in developing international standards for several food products (e.g., vitamin-mineral/food/dietary supplements, fortified foods, infant formulas, dietetic foods/foods for special dietary uses), the need for an international science-based risk assessment process has been identified by Codex Alimentarius and others. Classic risk assessment consists of four general tasks or steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, and (iv) risk characterization. Exposure assessment is equivalent to dietary assessment. Two key difficulties were highlighted for utilizing a dietary assessment survey for risk assessment: the compositional databases by which consumption surveys are evaluated, and the consumption methodologies that deliberately and accidentally omit ingestants such as supplements.

Most national food composition databases do not contain data on supplements and other foods for special dietary uses. This makes risk assessment in the area of tolerable upper limits for vitamins and minerals nearly impossible. Furthermore, the compositional databases often do not contain data on contaminants in the food supply, which also limits the ability to assess certain types of dietary risk. Nevertheless, separate data sets and databases for supplements and contaminants do exist internationally and in many countries, and if international standards for compiling these data were applied, they would then be compatible with conventional nutrient databases and readily used in evaluating intake data.

Some dietary assessment methods exclude intakes of supplements, other foods for special dietary uses, and even foods consumed outside the home. This practice provides a bias and prevents assessment of both nutrient adequacy and risk. These methods should not be defended for most dietary survey work. When resources are scarce and costs are high, linking dietary assessment and risk assessment should be undertaken as a simultaneous activity, both in the areas of food composition and consumption.

SY17-02

Contribution of Functional Food consumption to dietary intakes at community level

Sigrid Beer-Borst, Michael C. Costanza, Alfredo Morabia
Geneva University Hospitals, GENEVA 14, Switzerland

Background: Community consumption of Functional Food (FuFo) may have serious impacts on a populations' nutritional balance, but evidence for regulation is lacking.
Methods: 639 Genevans ages 35-74 completed self-administered qualitative FuFo and semi-quantitative Food Frequency questionnaires in 2003-2004. Consumption of five typical FuFo-food groups was estimated by a standardized, multistage assessment.
Results: About half of 285 FuFo-consumers ate FuFo from one or more food groups at least monthly. The majority ate FuFo-milk/dairy products the most (women 3.5/week, men 2.5/week), followed by FuFo-cereal products (women 2/week, men 1.5/week). FuFo contributed 20-30% of the total dietary intake of both milk/dairy and cereal products. FuFo-fat spreads came third (13%). Mean intakes of 18 functional ingredients ranged from 2% (iron) to 62% (biotin) of recommended dietary allowances (RDA). For 5% of all consumers, FuFo provided >=100% of RDA for vitamins A, C, B2, B6, biotin and folic acid intakes, 30-40% of tolerable upper intake levels (UL) for vitamin A and folic acid, and 20-30% of UL for calcium, zinc, and phytochemicals; FuFo-magnesium intakes exceeded the UL in men by 11%.
Conclusion: The growing FuFo-market may result in further increased FuFo-consumption, which could potentially be harmful for certain population subgroups.

SY17-03

A general methodology for simulation of Fortified Food intake

Janneke Kloosterman, Martine Bakker, Nynke De Jong, Marga Ocké
RIVM, BILTHOVEN, The Netherlands

Because of the increasing fortification practices populations are exposed to higher amounts of micronutrients, to different ratios of micronutrients, and to several novel compounds. Our aim was to develop a methodology to simulate the population distribution of micronutrient intake as a result of different scenario's of fortification practices (realistic, trends towards the future, worst-case scenario's). The simulated distributions give information about which part of the population will have an optimal, a too low, or a too high intake. Hitherto, no general methodology has been developed for this. Important factors that contribute to intake assessment are, among others, the selection of carrier products and fortification levels, the inclusion of dietary supplements, the availability and type of consumption data, and the availability of food composition data. We have defined and assessed intake scenarios for three functional ingredients: i.e. vitamin B6, folate/folic acid, and phytosterols. Case-specific problems do arise e.g. lack of data on bioavailability or background dietary intake, and have to be solved on a case-by-case basis. In conclusion, a general methodology is underway and will help to simulate the intake of functional ingredients in a comparable way, even though case-specific adaptations and assumptions are necessary.

Computational method to discover the optimal food fortification practice
Tero Hirvonen, Harri Sinkko, Liisa M Valsta, Pirjo Pietinen
KTL, HELSINKI, Finland

Objective: To develop a method to find the optimal food fortification practice.
Materials and methods: The FINDIET 2002 survey (48-h recall and 3+3 day food records and data on supplement use, n=247) was used as a test data. The proportion of the population whose intake is between the recommended intake (RI) and the upper tolerable intake level (UL) was plotted against fortification level per energy for sum of all potentially fortifiable foods. The fortification level that maximized the proportion of the population between RI and UL was used as a seed value for iterative models in search for fortification levels for individual food items. Nutritionally recommended food items (e.g. wholemeal bread, low fat milk products) were included in the models.
Results: The proportion of the population between the RI and UL was increased from 34% with no fortification to 99% by optimal fortification for vitamin D and from 34% to 95% for folate, respectively.
Conclusions: With this method it is possible to find an efficient and safe food fortification practice, at the same time promoting healthy food choices.

Estimated acryl amide (AA) intakes from foods and tobacco, and haemoglobin AA-adducts in the Malmö Diet and Cancer cohort (Sweden).
Elisabet Wirfält[1], Margareta Törnkvist[2], Birgit Paulsson[2], Anna Axmon[1], Bo Gullberg[1], Lars Hagmar[1]
[1]Lund University, MALMÖ, Sweden
[2]Stockholm University, STOCKHOLM, Sweden

The acryl amide (AA) intakes from foods and tobacco were estimated in a sample of women and men (n=142) of the Malmö Diet and Cancer cohort (n=28 098), combining data on food and tobacco habits with published data on the contribution of AA from Swedish foods and from tobacco. Non-smoking and smoking individuals were selected to maximize the variation in Hb-adduct levels of AA, measured in non-fasting blood samples (i.e., none, random or high intake of food items with estimated high content of AA). Estimated mean AA-intakes from foods (56 µg) were lowest in non-smoking women, and similar and higher (68-70 µg) in non-smoking men, and smoking men and women, respectively. Linear regression examined associations between haemoglobin (Hb)-adducts of AA and estimated AA-intakes. Associations between AA from foods and Hb-adducts were significant (p=0.001) in non-smoking men, but not in non-smoking women (p=0.68). When examining AA-intakes from foods and tobacco in the same model in smoking men and women, tobacco only was significantly (p=0.001) associated with AA-adducts in men. In women both AA-intakes from foods (p=0.01) and tobacco (p=0.04) showed significant associations with Hb-AA adducts. The implications for epidemiological studies examining disease risks associated with acryl amide exposures will be discussed.

Dose-response measurement: The influence of how we measure physical activity on estimates in clinical trials and for public health purposes

Adrian Bauman
Center for Physical Activity and Health, University of Sydney, SYDNEY, Australia

Methods of assessing physical activity (PA) vary from small studies to large population groups, and from time and cost-intensive physiological measurements to broad and generic self-report questionnaires. All PA measurement methods are amenable to reliability and validity testing, but no clear gold-standard [criterion] measurement exists, as sometimes we are interested in total energy expenditure due to PA, at other times in total volume of PA, and at other times in accumulating increments of incidental or health-enhancing PA. The different research purposes of PA assessment are outlined, and used to define scoring protocols, assess PA as ordinal or ranked categories for surveillance or epidemiological studies, but requiring more continuous measures for physiological or behavioural outcomes in smaller trials. Examples from epidemiological studies illustrate that remarkably robust relative risk estimates for disease emanate from relatively crude PA measures, which accurately classify the population into very broad groups of 'sufficient' or insufficient activity. Most of these measures, and others used in population surveillance, are not appropriate for small clinical studies. For weight loss interventions, for example, a detailed understanding of the volume, intensity and duration of physical activity is essential. Overall, different questions or instruments lead to vastly different PA estimates, and very small changes to measurement instruments or protocols may produce larger variation than the maximal effect sizes anticipated in interventions. The conclusions are to be context specific, to be aware of the pitfalls of both objective and self report PA measures, and to use validated measurement methods, often direct behavioral monitoring, for assessing changes in PA in smaller trials.

Translating physical activity dose into public health recommendations: evidence-based approach

Estelle V. Lambert
MRC/UCT/University of Cape Town, NEWLANDS, South Africa

While there is unequivocal evidence that physical activity (PA) is associated with a reduced risk for most non-communicable diseases, there remains uncertainty regarding the optimal dose required to bring about these effects. The dose-response relationship is comprised of changes in exercise intensity, frequency, duration and the type of activity. Moreover, much of the epidemiological evidence for the impact of physical activity on morbidity and mortality outcomes is based on self-reported activity levels, and perceived relative exercise intensity (e.g. 'moderate' or 'vigorous'). Public health recommendations for physical activity have changed dramatically from prior to the mid-1990's where individuals were encouraged to exercise 'vigorously' for 20-60 minutes at least 3 times per week, to the current recommendation to 'accumulate 30 min of moderate activity on most, preferably all days of the week'. Moderate exercise in this context is defined as an absolute exercise intensity of 3-6 METS, and vigorous exercise of > 6 METS. Recent evidence suggests that relative intensity, based on perceived exertion, may provide similarly robust relative risk estimates for morbidity and mortality outcomes, despite the fact that absolute energy expenditure may be different at the same relative intensity. Moreover, relative intensity may be a more appropriate target for exercise prescription in persons with low starting levels of fitness or in an older population. Additionally, there is evidence that public health messages concerning, for example, '10000 steps per day' need to be contextualized within total daily ambulatory activity, with studies demonstrated that 30 minutes of moderate activity may translate to approximately 3000 steps. While it is important to aim for harmonization of the various public health recommendations concerning physical activity for health, it is clear that the various and specific health benefits of physical activity are not isolated to a single 'cut point' of duration and intensity, nor do they account for accumulated lifetime physical activity levels. The practical relevance of translating evidence into public health recommendations relates to the fact that relative exercise intensity and duration may play a role in the affective response to exercise, and as such, may become a mediator in the enjoyment of exercise, as well as the uptake and adoption of a physically active lifestyle.

SY18-03

**Impact of a nutrition education and exercise programme for the elderly:
a case study from the Vaal Triangle, South Africa**

Wilna Oldewage-Theron, Noloyiso Matiwane
Vaal University of Technology, VANDERBIJLPARK, South Africa

The objective of this study is to maintain the quality of life and independence of older adults by living longer and better lives by means of weight loss and lowered blood pressure. The baseline measurements included pre-tested socio-demographic and health questionnaires, completed by 170 randomly selected elderly people (=60 years old). A 24-hour recall was administered by trained enumerators. Other measurements included height, weight, body fat percentage, MUAC and blood pressure. Data were statistically analysed for means and standard deviations after which a nutrition education and walking programme was implemented for a period of six months. Each subject received a pedometer to record weekly distances. The majority (52 %) of the subjects were obese (BMI > 30) at baseline and most of the subjects (78 %) were at risk of overnutrition (MUAC > 21.7 cm). Sixty-eight percent of the subjects suffered from hypertension. The baseline findings confirmed low income, household food insecurity and risk factors associated with malnutrition. During the first month, the mean distance walked was 10 km. This improved to 15 km for the second month. This paper will focus on the impact of a nutrition education and walking programme on hypertension, weight and dietary intake of elderly.

SY18-04

The relationship between energy expenditure and energy intake after advice to walk an extra 2000 steps daily

William Tigbe[1], Alexandra Koulouri[2], William dr. Tigbe[1], Michael professor Lean[2]
[1]Glasgow Caledonian University, GLASGOW, United Kingdom
[2]University of Glasgow, GLASGOW, United Kingdom

OBJECTIVE: To establish whether a small, acute increase in physical activity would lead to compensatory change in energy intake and nutrient balance, and to provide power analysis data for future research in this field.
METHOD: Twelve participants were each studied over seven days of habitual activity and two weeks after instruction to increase physical activity by 2000 steps/day. Physical activity was assessed using a diary and the 'activPAL' activity monitor, and daily step count using a pedometer. Dietary analyses from prospective food diaries were compared between the first and third weeks.
RESULTS: Subjects increased number of steps (+2600 steps/day, p=0.008) and estimated energy expenditure (+300-1000 KJ/d, p=0.002) but did not significantly change their energy intake, diet composition or number of meals per day. From reverse power analysis 38 subjects would be needed to exclude a change in energy intake of 400 KJ/day with power 90% at p<0.05 which would compensate for a similar increase in physical activity.
CONCLUSION: These results did not demonstrate any compensatory increase in food consumption when physical activity was increased by walking an extra 2600 steps/day. Reverse power analysis indicates that a larger study (n=38) will be necessary to exclude such an effect with confidence.

SY18-05

Does quality of physical activity measurement explain differences in study results? A review of endometrial cancer studies

Anne Cust[1], Christine Friedenreich[2], Bruce Armstrong[3], Nadia Slimani[1], Adrian Bauman[3]
[1]IARC, LYON, France
[2]Alberta Cancer Board, ALBERTA, Canada
[3]SPH, The University of Sydney, SYDNEY, Australia

Background: Physical activity (PA) may reduce the risk of endometrial cancer, but the observed risk reduction varies considerably across studies and there is limited evidence for a dose-response relationship.
Aim: To assess the contribution of differences in the quality of PA measurement to inconsistencies in published studies of endometrial cancer risk.
Methods: We reviewed all studies on PA and endometrial cancer risk published to October 2005 and assigned each a quality score for PA measurement (maximum score = 17) using seven criteria (definition, data collection, individual level data, domain, dose, time span, accuracy) modified from those developed by Powell (1987).
Results: Of 18 studies reviewed, six (33%) showed a convincing protective effect of PA and eight (44%) found a suggestive protective effect. A dose-response relation was observed in eight studies. The attributes of PA measures differed considerably across the studies. Quality scores of published papers ranged from 4-13 (median = 8), and tended to improve over time (p=0.02), but could not explain differences in strength of association or dose-response.
Conclusion: The heterogeneity of results observed across studies of PA and endometrial cancer risk is not explained by the differences in quality of PA assessment methods.

SY18-06

Potential impact of a physical activity recommendation-based intervention on energy expenditure in the community

Sigrid Beer-Borst, Michael C. Costanza, Alfredo Morabia
Geneva University Hospitals, GENEVA 14, Switzerland

Objective: Estimate the amount of physical activity required to expend an additional 100 kcal/day to achieve energy balance at the population level.
Methods: Total daily energy expenditures for a 1997-2003 random sample of 8,528 Geneva, Switzerland adult residents who completed a self-administered physical activity frequency questionnaire developed and validated in the same target population were employed to simulate the impacts of typical physical activity 'pyramid' recommendations on the average population energy expenditure for varying activity intensities and rates of population compliance with the recommendations.
Results: To achieve an average 100 kcal/day increase in energy expenditures, and assuming 100% compliance with the recommendations, the bottom tier of the physical activity pyramid must comprise everyday physical activities performed at moderate to high intensity (>=3.9 times the basal metabolic rate), such as at least moderate walking or biking. For 50% compliance, the expected population gains are only between 40 and 60 kcal/day.
Conclusions: Achieving energy balance by increasing energy expenditure through physical activity alone would require profound structural changes to promote more active ways of life and work in Western populations.

SY19-01

Fruits, vegetables and genes

Dag S Thelle
Sahlgrenska Academy at Göteborg Universi, GOTHENBURG, Sweden

Fruits and vegetables contain biologically active compounds that are known to have health effects – yet it has been difficult to document these using epidemiologic techniques. Two plausible reasons for this are measurement error and susceptibility factors. This overview lecture will focus on the latter. Any biological function can be assessed as a consequence of the interaction between external factors and genetic disposition. A consequence of this is that the difference in disease incidence between populations is only to a limited extent determined by solely genetic factors, and rapid changes in the incidence rates are unlikely to be caused by genetic mutations. The variation in environmental factors (including diet) and the interaction with genetically determined susceptibility might be a key to understand why populations differ with regard to disease incidence, and why changes occur over time. The identification of interactions may also contribute to our understanding of disease mechanisms. The rapid changes in cardiovascular mortality and the incidence of diabetes mellitus, and chronic obstructive pulmonary disease suggest that strong environmental factors are operating. The failure to consider environmental components of the disease, in addition to measurement of the susceptibility genotype, may lead to erroneous inferences concerning the role of genes in disease aetiology. It is therefore essential to search for the genetic contribution to increased risk in genes coding for increased susceptibility towards external factors such as diet, smoking, physical inactivity, psychological stress and external factors. Total plasma homocysteine levels as well as folic acid have long been associated with risk of cardiovascular diseases and reproductive hazards. Both folate and tHcy levels are reflecting exposure to diet, other lifestyle habits, and genetic constitutions. A detailed analysis of the influence of lifestyle habits in the Hordaland Homocysteine Study showed that low intake of vegetables, and smoking and coffee consumption were associated with low tHcy levels. The association between coffee intake and tHcy levels has been confirmed in randomised intervention trials. The mechanism is so far unknown but Strandhagen el showed that folate but not B6 neutralises the effect of coffee. Strandhagen et al also showed that the methylenetetrahydrofolate reductase C677T polymorphism was a major determinant of this coffee-induced increase of plasma homocysteine. This implies that only a minor proportion of the population will experience a substantial increase in homocysteine levels when exposed to coffee, and that folate-containing foods may further modify this effect.

Relative validity of a short food frequency questionnaire assessing the intake of legumes in Scottish women

Jane Scott[1], Angeliki Papadaki[2]
[1]Unviersity of Glasgow, GLASGOW, United Kingdom
[2]University of Glasgow, GLASGOW, United Kingdom

The aim of this study was to assess the relative validity of a five-item, semi-quantitative, short food frequency questionnaire (SFFQ) designed to estimate daily legume consumption against the results obtained from 7-day estimated food diaries. Subjects were 119 healthy, Scottish females aged 25-55 years. The SFFQ required subjects to indicate the number of times they ate any of five legume containing dishes/meals in the previous week and what size portion of each dish they consumed. Daily legume intake (g/day) was calculated and subjects were classified into tertiles of intake for each method. Agreement between the two methods was assessed using Spearman's rank correlation, percentage of subjects correctly or grossly misclassified and weighted kappa statistic. The two methods produced a similar mean daily intake of legumes [24.6 (95% CI 19.9-29.2) v. 23.1 (95% CI 19.1-27.2) g/d] and the Spearman correlation coefficient was 0.521 (p<.005). Exact agreement within tertiles and gross misclassification (into opposite tertiles) were 56.3% and 8.4%, respectively. The weighted kappa indicated fair agreement between the two methods (? = 0.344). The SFFQ is an acceptable instrument for estimating legume consumption and ranking individuals on the basis of intake of this food group.

Validation of a food frequency questionnaire to assess fruit and vegetable intake adults, Isfahan, Iran.

Nasrin Omidvar[1], Nooshin Mohammadifard[2], Tirang Reza Neyestani[3], Gholamreza Naderi[2], Anahita Houshiar-rad[3]
[1]Faculty of Nutrition and Food Technology, TEHRAN, Iran
[2]Isfahan Cardiovascular Research Center, ISFAHAN, Iran
[3]National Nutrition and Food Technology R, TEHRAN, Iran

Background: Adequate intake of fruits and vegetables (FV) are associated with reduced risk of certain chronic diseases. Developing appropriate tools to screen high risk individuals with regard to these food items is a priority. This study aimed to validate a semi-quantitative food frequency questionnaire for assessment of FV intake using vitamin C and beta-carotene biomarkers.

Methods: This cross-sectional study was performed on 123 healthy adults, living in Isfahan. FV intake was assessed using a 110-item semi-quantitative food frequency questionnaire. Data collection was performed twice: autumn-winter (cold season) and spring-summer (warm season). In each phase, FFQ was completed and plasma vitamin C and beta-carotene were measured. Unadjusted and adjusted correlation was examined.

Results: Lipids, sex, and age adjusted partial correlation of FV with vitamin C and beta-carotene were .69 and .52 (P<0.0001) in cold season, and .57 and .48 (P<0.0001) in warm season, respectively. Unadjusted correlation of FV with vitamin C and beta-carotene were .71 and .52 (P<0.0001) in cold season, and .66 and .56 (P<0.0001) in warm season, respectively.

Conclusions: The designed FFQ had a good ability to identify persons with inadequate fruit and vegetable intake as well as those with low and high levels of the studied nutrients.

New and validated biomarker for intake of fruits and vegetables

Kirstine Struntze Krogholm[1], Lea Poulsen[1], Mette Kristensen[1], Anne Lise Brantsaeter[2], Salka Elbøl Rasmussen[1]
[1]Danish Institute for Food and Veterinary, SOEBORG, Denmark
[2]2Norwegian Institute of Public Health, PO BOX 4404 NYDALEN. N-0403 OSLO, Norway

Reliable biological markers for intake of vegetables or fruits are greatly warranted. Polyphenolic compounds are ubiquitously found in fruits and vegetables. We recently developed a sensitive LC/MS methodology to measure levels of 12 different dietary polyphenols in urine samples. We have validated the polyphenol biomarker in several human intervention studies and demonstrated that it correlates with both dietary polyphenol exposure and intake of fruits and vegetables. Latest, we have implemented the biomarker in the validation of food registration methods used in large cohort studies, the Norwegian Mother and Child study (Moba, n=119) and a Danish life style study (INTER99, n=260). Data from both studies are currently being evaluated, and will be presented at the meeting. Preliminary data from the Norwegian study shows, that the citrus polyphenols correlate significantly with the intake of oranges and orange juice determined by 4-days weighed food registration (r=0.640, p<0.0001). This study also shows that phloretin is a specific marker of fruit intake and that isorhamnetin is a marker for vegetable consumption. Kaempferol was found to be a specific marker for tea intake. In conclusion, we have demonstrated the validity of polyphenols as a new biomarker for intake of dietary polyphenols and for fruits and vegetables.

Intakes and sources of soya foods and isoflavones in a UK population cohort study (EPIC-Norfolk)

Angela Mulligan[1], Ailsa Welch[1], Alison McTaggart[1], Amit Bhaniani[1], Sheila A Bingham[2]
[1]EPIC, CAMBRIDGE, United Kingdom
[2]Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

Introduction: Phytoestrogens may be protective against a number of chronic diseases but there is little available intake data on the UK diet. This study was carried out on approximately 12000 men and women in the Norfolk arm of the European Prospective Investigation into Cancer and Nutrition (EPIC) (1), to estimate the intake of soya foods and isoflavones by food group.
Methods: Dietary daidzein and genistein intakes were obtained from 7-day food diaries and calculated from an in-house food composition database (2).
Results: Average daily isoflavone intakes for both men and women were less than 1mg (range 0-88.9mg). However, in soya-consumers, average daily intakes were higher: 8.6mg in women and 7.5mg in men. In both men and women, bread and bread rolls made the highest contribution to isoflavone intake - 62.5% and 53.0% respectively. In soya-consuming males and females, vegetable dishes and milks were the main contributors - 25.0% and 38.5% in men and 38.5% and 26.0% in women, respectively.
Conclusion: Isoflavone intake is low in the UK and is primarily derived from additives used in bakery products.
(1)   Bingham, S., et al (2001). Public Health Nutrition 4, 847-858.
(2)   Welch, A.A., et al (2001).. Public Health Nutrition 4, 1253-1265.

SY19-06

Dietary predictors of plasma total homocysteine: the hordaland homocysteine study (1997-1999)

Svetlana Konstantinova[1], SE Vollset[2], CA Drevon[3], PM Ueland[4], Helga Refsum[5], GS Tell[2]
[1]University of Bergen, ISF, BERGEN, Norway
[2]University of Bergen, Dep.of PH and PHC, BERGEN, Norway
[3]University of Oslo, IBMS, Dep.of Nutr., OSLO, Norway
[4]University of Bergen, IM, Sect.of Pharm., BERGEN, Norway
[5]University of Oxford, Dep.of Pharm., OXFORD, United Kingdom

Objective: To examine associations between food groups and plasma tHcy level in a population-based sample.
A total of 4578 men and women in the age group 47- 49 and 71-74 years (non-users of vitamin supplements) completed a 169-item food frequency questionnaire.
In separate regression models adjusted for age, sex, energy intake, smoking and coffee consumption, vegetables, fruits, cereals, eggs, fish and milk intake were inversely associated with tHcy level. Mean difference in tHcy concentration per increasing quartile of food group intake was - 0.32 (95% CI: - 0.42, - 0.22) µmol/L for the intake of vegetables, - 0.24 (- 0.34, - 0.14) µmol/L for fruits, - 0.13 (- 0.25, - 0.01) µmol/L for cereals, - 0.22 (- 0.33, - 0.11) µmol/L for fish, - 0.26 (- 0.36, - 0.17) µmol/L for eggs, and - 0.11 (- 0.21, - 0.01) µmol/L for milk. Positive associations were found for sweets and cakes/cookies, respectively 0.16 (0.06, 0.26) µmol/L and 0.14 (0.03, 0.24) µmol/L per quartile. In a prediction model with all 13 food groups present, vegetables, fruits, eggs, bread, cereals, fish, milk and sweets were the strongest predictors of tHcy concentration.
Conclusion: Plasma level of tHcy is associated with food group intake.

SY20-01

Rural indigenous peoples' food diversity, animal/plant species and nutrient adequacy

Harriet Kuhlein[1], Barbara Burlingame[2]
[1]CINE/McGill University, STE. ANNE DE BELLEVUE, Canada
[2]Food and Agriculture Organization, ROME, Italy
HV Kuhnlein, Members of the IUNS Task Force on Indigenous Peoples' Food Systems and Nutrition, ML Roche and Irma Tuesta

Diversity in food species and varieties is an important consideration when evaluating dietary quality in nutritional assessment protocols. Species diversity consumed in locally-produced food may vary within a culture, especially according to in rural vs. urban residence. We documented local food systems in 10 groups of Indigenous Peoples living in rural settings in 8 countries (Canada, Peru, Federated States of Micronesia, Kenya, Nigeria, Colombia, India, Thailand). The number of locally available food species varied from 35 (Maasai, Kenya) to 250 (Pohnpeian, Micronesia). Depending on accessibility of purchased food, these local, often unique, foods contributed from 10% to >95% of total dietary energy and nutrients. Three examples illustrate these principles. Dene adults and children and Inuit adults in Arctic Canada had primarily animal species as traditional food in 24-hour recalls (20-30% if total dietary energy as traditional food with the balance from market purchased food); using just one item from the local food system improved nutrient density for macro- and micronutrients. For the Aguaruna in the Peruvian Amazon, >95% of dietary energy was from traditional food, 201 local food species were identified, and species diversity (number of species reported in adult 24 hr. recall data) was positively correlated with dietary adequacy for several nutrients. These data demonstrate the accumulating evidence that ensuring access to food diversity for rural Indigenous peoples will enhance dietary adequacy. (Supported by the Canadian Institutes of Health Research, Institute of Aboriginal Peoples' Health, the International Development Research Centre of Canada, and the United Nations Food and Agriculture Organization)

SY20-02

Igbo indigenous knowledge of local food diversity to improve nutrition

EC Okeke[1], HN EneObong[1], AO Uzuegbunam[1], AO Ozioko[1], Harriet Kuhlein[2]
[1]University of Nigeria, NSUKKA, Nigeria
[2]CINE/McGill University, MONTREAL, Canada

The Igbo live in SE Nigeria and number over 23 million, with population densities from 300 to >1000/km, the highest in West Africa. Agriculture is the occupation of heritage, and stunting and micronutrient deficiencies are prevalent. Therefore, as a first step towards solving stunting and micronutrient deficiencies with food based intervention, this study sought to document Igbo traditional foods, their availability in seasons, and their use. Eight communities selected from four States were used for the study. Key informant interviews, focus group discussions and questionnaires were used to ascertain use of local foods by households. Nutrient analyses on foods not available in food composition tables were completed. Results showed that several varieties of maize and rice were the major cereals consumed, along with 21 varieties of starchy roots and tubers, 10 legumes, 15 nuts/seeds, 53 vegetables, 15 mushrooms and 30 fruits. Milk and milk products were not mentioned. Availability and seasonality were important determinants of consumption of micronutrient rich and other foods by children and mothers. Laboratory analysis of some important traditional vegetables showed Portulaca oleracae with highest protein content (23g/100g), Bryophyllium purinata highest calcium (1928mg/100g) and zinc (12mg/100g), Psychotria spp highest iron (44mg/100g), while Verbenaceae had the highest ß-carotene content (70mg/100g), and some mushrooms had high iron content (50mg/100g). In all Igbo communities, foods are eaten not only for their nutritional values but also for their medicinal and socio-cultural significance. Detailed studies on diversity, use and effects of traditional foods of the Igbo culture help determine objectives for food-based interventions, which must include women's education on nutrient composition of their local food and food combinations.

SY20-03

Dietary diversity and nutrient adequacy: progress in validating simple indicators for developing countries

Marie Ruel
Int. Food Policy Research Institute (IFPRI)., WASHINGTON DC, United States of America

Dietary diversity (DD) is a key element of healthy diets. Increasing the variety of foods/food groups is thought to increase the likelihood that individuals meet their daily nutrient requirements, and promote good health. Simple indicators of DD have been developed and used to assess the quality of diets (defined as nutrient adequacy) in developing countries, without prior validation. This presentation reviews recent progress in validating simple indicators of DD for such uses. It describes the processes used to develop standard protocols and carry out analyses using existing data sets from different contexts to test the performance of DD indicators in predicting nutrient adequacy in different age groups. The overall objectives of the validation research were: 1) to provide empirical evidence that DD is indeed associated with diet quality across age groups and contexts; 2) to identify for each age group the DD indicators that perform best across countries in predicting diet quality; and 3) to determine, based on the consistency of the findings, whether or not universal cut-off points can be recommended to define low vs. adequate DD within age-groups. The validation was restricted to the use of DD indicators for assessment. Additional research is needed to test the usefulness of DD for monitoring and evaluation.

SY20-04

Dietary diversity as a predictor of the nutrient density of young children's diets in Madagascar

Mourad Moursi[1], Mary Arimond[2], Serge Trèche[1], Francis Delpeuch[1], Marie Ruel[2]
[1]Institute of Research for Development, MONTPELLIER CEDEX5, France
[2]IFPRI, WASHINGTON, United States of America

The development of indicators of appropriate complementary feeding is needed to translate new knowledge into action. There is evidence suggesting that dietary diversity indicators could be appropriate measurement tools of nutrient adequacy of children's diets in the age range of 6-23 months. However, progress in that area has been hampered by a lack of consensus on what dietary diversity represents and how to measure it. This study is part of an international effort led by IFPRI, UC-Davis and WHO which aims at developing and validating indicators of nutrient density for young children in developing countries. During our study in Madagascar which took place within the Nutrimad programme jointly led by GRET and IRD, data on complementary food intake was collected using 24-hour recalls on an urban sample of 702 children aged 0-17 months at start and followed up 3 and 6 months later. Nutrient density was estimated by the Mean Nutrient Density Adequacy method. This approach is based on the desired nutrient density of complementary foods according to pre-determined levels of breast-milk intake. Different dietary diversity indicators, with and without restrictions on quantities consumed, were computed and validated against nutrient density. Detailed results will be presented at the conference.

SY20-05

Validation study of dietary diversity score as an indicator of adequate micronutrient intake in Filipino children

Gina Kennedy[1], Guy Nantel[1], Maria Regina Pedro[2], Chiara Seghieri[3]
[1]Food and Agriculture Organization, ROME, Italy
[2]Food and Nutrition Research Institute, MANILA, Philippines
[3]ISTAT, FLORENCE, Italy

Dietary diversity has been recognized as a fundamental dietary tenet to ensure adequate nutritional status and in particular, adequate micronutrient intake. The objective of this study is to assess whether the expression of dietary diversity score using a 10 g minimum food intake cut-off (DDS-10), or without any cut-off (DDS), are good predictors of adequate micronutrient intake. Descriptive statistics, Pearson's correlation, Chi-square, linear regression and receiver-operating characteristic (ROC) analysis were used to assess the utility of DDS and DDS-10 in predicting adequate intake of eleven micronutrients. Despite a relatively high DDS, the mean probability of adequate nutrient intake (MPA) was .34 (± 0.18). Pearson's correlation coefficient for MPA and DDS was 0.34, while for DDS-10 this was 0.41. Intake of all micronutrients was significantly correlated to DDS except for intake of calcium. ROC analysis for the best DDS cut-off to maximize sensitivity and specificity was 4 for DDS and 3 for DDS-10. In this population of non-breastfed children 24-70 months of age in the Philippines, DDS was a fair, but not exceptional predictor of adequate micronutrient intake. DDS-10 was a significantly better predictor of MPA.

SY20-06

Diet diversity and quality among urban and rural Mexican men

Xochitl Ponce[1], Hélène Delisle[1], Estanislao Ramirez[2]
[1]Université de Montréal, MONTREAL QC, Canada
[2]Instituto Mexicano del Seguro Social, OAXACA, Mexico

We examined dietary diversity and other dimensions of dietary quality in a total of 326 Mexican men aged 35-65y according to socio-economic status and urban/rural residence. Two 24-hour food recalls were conducted in person with each respondent within a fortnight. WorldFood was used to compute energy and nutrient intakes. The food diversity score was based on consumption of 24 different food groups, defined according to subjects' food consumption patterns. A micronutrient adequacy score was constructed from the recommended intakes of 13 vitamins and minerals. A 'prevention' score pertained to adherence to WHO dietary recommendations for the prevention of chronic diseases. Dietary diversity as well as micronutrient adequacy scores were significantly and positively associated with socio-economic level of urban subjects; they were also significantly higher among urban poor compared with rural poor. In contrast, the prevention score tended to be higher among the urban and rural poor respondents. There was a positive correlation between diet diversity and micronutrient adequacy ($r=.34$ $p<0.01$), whereas the correlation between dietary diversity and the prevention score was negative ($r=-.21$ $p<0.01$). The findings suggest that in the study setting, higher food diversity may not predict a healthier diet for the prevention of chronic diseases.

SY21-01

Measurement and surveillance in physical activity

Fiona Bull
Loughborough University, LOUGHBOROUGH, United Kingdom

A core function of a public health system is the systematic collection of information regarding the health of the population. These data are used to create policies, plan and deliver interventions and communicate recommendations to the general public to prevent disease and promote health. Physical inactivity meets all the criteria for inclusion in a national health monitoring system. It has a high prevalence, an association with high rates of morbidity and mortality, places extreme burden on the health care system and it can be influenced and changed. Having an effective surveillance system allows the tracking of trends in physical activity and sport participation can be used to justify the building and modification of environments and facilities that are conducive to physical activity, help direct efforts in developing interventions and enable comparison with other states, territories and nations. However, to-date few countries have robust surveillance systems on physical activity.

Monitoring levels of physical activity in large population groups is usually undertaken using self-reported recall, often in the form of a questionnaire. Until recently there has been no agreement or consistent use of any instrument for physical activity resulting in few data by which to compare progress and compute costs and burden within and between countries.

The International Physical Activity Questionnaire (IPAQ) and the Global Physical Activity Questionnaire (GPAQ) are two instruments developed and tested in a diverse set of populations and countries and found to be suitable for use in surveillance systems. The development of these instruments will be presented along with a comparison of their strengths and examples of current usage.

SY21-02

Measuring habitual physical activity levels in butajira, ethiopia: concurrent validation against dietary energy intake

Fikru Tesfaye
Addis Ababa University, ADDIS ABEBA, Ethiopia

Physical inactivity is an important risk factor for cardiovascular diseases. The lack of valid instruments constrains its measurement at a population level. This study examines relative validity of the habitual physical activity interview method for measuring levels of physical activity among adults in Butajira District, Ethiopia.

A semi-structured questionnaire assessed pattern and duration of activities over a 24-hour period on a usual day, separately for the rainy and dry seasons. The basal metabolic rate (BMR) was estimated separately for men and women using regression equations. Physical activity ratios (PAR) were assigned to each activity and the total energy expenditure (TEE) was calculated over a 24 hour period by multiplying PAR with the corresponding duration. Physical activity level (PAL) was calculated by dividing the TEE by BMR. A dietary history method was used to estimate dietary energy intake (DEI), and was used for concurrent validation of the habitual physical activity instrument. Food intake level (FIL) was calculated by dividing the DIE to the BMR.

A total of 619 adults, aged 18-65, participated in the study. Over 36% of them had BMI<18.5. The mean (S.D.) BMR was 1457.1(123) kcal (males) and 1248.7(94.4) kcal (females). Mean TEE (S.D) among men was 2160.1(480) in the rainy season and 2088.1(724.0) in the dry season. The corresponding values for women were 1914.6(493.5) and 1935.7(701.2) respectively. The PAL in men were 1.48(0.3) and 1.43(0.46) in the rainy and dry seasons, respectively. For women, the PAL were 1.53(0.35) and 1.54(0.53) for the rainy and dry seasons, respectively. The dietary energy intake, mean (S.D.), was 1993.0(907.0) (men) and 1751.34(752.3) (women) in the rainy season, and 1870.2 (911.0) (men) and 1688.6(705.4) (women), in the dry season. The FIL was 1.33(0.63) in men and 1.41(0.62) in women during the rainy season and, 1.29(0.65) in men and 1.36(0.58) in women during the dry season. There were significant correlations (P<0.001) between the rainy and dry seasons in the TEE (r=0.41), PAL (r=0.31), DEI (r=0.56), and FIL (r=0.56). However, there were no correlations between the PAL and FIL. The mean PAL was significantly higher (P<0.001) than FIL. Over 45% of the population had a PAL below 1.4, which is an extremely low level, not compatible with long-term nutrition and health. About 32% had a PAL between 1.40 and 1.69, which corresponds to a sedentary or light activity lifestyle. About 14% of the participants have a PAL between 1.70 and 1.99, corresponding to an active or moderately active lifestyle. PAL is positively correlated with BMI (r=0.15, P<0.001), while FIL is inversely correlated with the BMI (r=-0.19, P<0.001). Consequently, mean PAL increased along increasing BMI quintiles while the mean FIL decreased. The findings revealed low levels of habitual physical activity and dietary energy intake in a largely peri-urban population. Underreporting of both behaviors is a possible explanation. DIE may be underreported at higher BMI quintiles, while habitual physical activity may be underreported at lower BMI quintiles. The inverse pattern of underreporting, with the resultant 'flat slope', may contribute to the lack of a linear correlation between FIL and PAL.

SY21-03

Measurement error in the NHANES physical activity questionnaire: Validation in the OPEN Study

Janet Tooze[1], Victor Kipnis[2], Douglas Midthune[2], Richard Troiano[2]
[1]Wake Forest University School of Medicin, WINSTON-SALEM, NC, United States of America
[2]National Cancer Institute, BETHESDA, MD, United States of America

Self-reported measures of physical activity may have measurement error similar to self-reported diet. Although physical activity questionnaires have been validated with doubly labeled water (DLW), these studies have been small, and have not quantified the measurement error properties of the instruments. The physical activity questionnaire (PAQ) used in the 1999-2004 US National Health and Nutrition Examination Survey (NHANES) was administered to 484 participants aged 40-70 years in the Observing Protein and Energy Nutrition (OPEN) Study. Total energy expenditure (TEE) of the participants was measured using DLW. To estimate activity energy expenditure from the PAQ, time spent in transportation, household, leisure, and usual daily activities was multiplied by associated MET values. Basal energy expenditure (BEE) was calculated with the Mifflin equation, and the time spent sleeping was assumed to be 8 hours. Physical activity level (PAL) = TEE/BEE, was calculated from the PAQ and compared to DLW/BEE as the estimate of truth after transformation to the log scale. Measurement error models estimated correlations between PAQ and truth of 0.28 for men and 0.17 for women. These estimates vary depending on the assumptions in the calculations, but indicate sufficient measurement error to attenuate the true relationships between physical activity and health.

SY21-04

The built environment and walking/bicycling for transportation: two approaches to identifying environmental correlates of behavior

D Berrigan[1], Jennifer Dill[2], Lan Huang[1], David Stinchcomb[1], William Davis[1], Linda Pickle[1]
[1]National Cancer Institute, USA, BETHESDA, United States of America
[2]Portland State University, PORTLAND, United States of America

Characteristics of the built environment involving density, diversity and design could influence physical activity.
We used data from the 2001 California Health Interview Survey (n = ~50,000; http://www.chis.ucla.edu), to examine associations between built environment and walking/bicycling for transportation. There were 12,196 respondents from LA (71.5 % geocoded) and 2,672 from San Diego (73 % geocoded) counties. The survey contained data on walking/bicycling, gender, age, race/ethnicity, education, income, and health status. Overall, 41% of respondents in LA and San Diego Counties reported walking/bicycling.
We contrast two approaches to understanding associations between the built environment and walking/bicycling. First, we examined regression analyses of walking/bicycling vs. street connectivity in 0.5 km radius buffers around intersections nearest to respondent's homes. Second, we used spatial scan statistics to identify areas with higher prevalence of walking/bicycling compared to other areas (http://www.satscan.org). Satscan searches for circular sub-regions with statistically significant excesses of respondents reporting any transportation walking/bicycling.
Spatial scan analysis identifies geographic regions with increased prevalence of walking. These areas may have features that were not anticipated in the design of regression approaches. In this case, both approaches indicated small but statistically significant correlations between walking/bicycling and environmental characteristics.

PL4-01

Geographic information systems for assessing diet and physical activity environments

James F. Sallis
San Diego State University, SAN DIEGO, CA, United States of America

There is growing scientific and policy interest in understanding the role of built environments in shaping eating and physical activity behaviors, as well as obesity. Though the WHO's global strategy for improving diet, physical activity, and obesity emphasizes environmental and policy change, the evidence base to guide these interventions is limited. The purpose of this talk is to describe how Geographic Information Systems (GIS) can be a valuable tool in policy-relevant research on the environment, nutrition, and physical activity. Much development is needed to conceptualize, measure, and analyze environmental variables that may be related to eating and physical activity, and GIS can contribute to progress in this area. GIS is now widely used in many areas of public health and is being increasingly used in diet and physical activity research. GIS is based on computer software that combines spatial representations (including mapping) with databases. By using multiple layers of data, GIS can integrate information from many sources and allow each layer to be related to every other layer. Common features used in physical activity research include street layout, land use, topography, parks and trails, crime incidents, and vegetation. Features of relevance to nutrition research include locations of food stores and restaurants, billboards with food ads, demographic characteristics, outdoor cafes, community gardens, and restaurant signage. Each object or location can have a database of attributes attached. Thus, it is possible to integrate data on the availability and price of fruits and vegetables in each restaurant, the amenities available at each park, and survey responses for each participant. GIS can be used to characterize areas so the distribution of fast food restaurants across low- and high-income neighborhoods can be studied. GIS can be used to compute measures for individual people, such as the distance to the nearest park or supermarket from each participant's home, or for specific locations, such as the density of convenience stores around schools. Using GIS in research requires appropriate study questions, adequate conceptualization of environmental characteristics of interest, adequate data, and staff with GIS expertise. GIS is a powerful analytic tool, but its mapping capabilities can make results more accessible to policy makers and the general public.

Evaluation of a food frequency questionnaire with multiple-day recalls and biomarkers among low-income women in Sao Paulo, Brazil

Marly Cardoso[1], Elaine Laguna[1], Luciana Tomita[1], Vania D'Almeida[2]
[1]University of Sao Paulo, SAO PAULO, Brazil
[2]School of Medicine, Federal University o, SAO PAULO, Brazil

We assessed the validity of a 76-item food frequency questionnaire (FFQ) completed by 93 low-income women (20-65 years). The study population was a random sub-sample of participants in a case-control study on micronutrients and cervix cancer. Three 24-hour dietary recalls (DR) and two FFQ interviews (12 months apart) were conducted between 2003 and 2004 to estimate dietary intake during the past year. Energy-adjusted dietary intakes were calculated by residual method. Fasting blood samples were collected for 55 participants and serum was analysed for vitamins A, E, B6, B12, and folate. Energy-adjusted intra-class correlation coefficients between FFQ1 and FFQ2 ranged from 0.41 (iron) to 0.72 (vitamin A). Energy-adjusted, attenuation-corrected Pearson validity correlations between FFQ and DR ranged from 0.18 (potassium) to 0.75 (calcium). Spearman correlation coefficients (r) were calculated between each of the dietary methods and biomarkers. Significant correlations were found only for folate: r = 0.23 between FFQ and serum folate; r = 0.34 between DR and serum folate; r = 0.33 between FFQ and DR. Overall, our FFQ performed similarly to FFQ used in previous studies and the serum folate levels should be used as a biomarker to complement FFQ validation studies.
Sponsorship: Fapesp and CNPq.

Physical activity influence metabolic profiles and sex hormone levels in young women. The Norwegian EBBA I study

Aina Emaus[1], Sissi Espetvedt[2], Anne Sofie Furberg[3], Marit Bragelien Veierod[4], Christine Friedenreich[5], Peter Ellison[6], Inger Thune[2]
OSLO, Norway
[2]Ullevaal University Hospital, OSLO, Norway
[3]University Hospital of North Norway, TROMSOE, Norway
[4]IMB, University of Oslo, OSLO, Norway
[5]Alberta Cancer Board, ALBERTA, CALGARY, Canada
[6]Harvard University, BOSTON, United States of America

The Aim of the study was to elucidate how physical activity, assessed by a detailed questionnaire, influence metabolic profiles, heart rate, and sex hormone levels.
Material/Methods: Among 206 women, we assessed physical activity during the last year and throughout life, by self-report and interview, in leisure time physical activity (LPA), household, work and transport physical activity. Total average energy expenditure per week was estimated expressed in metabolic equivalents (MET). We used DEXA scan (Lunar) in measuring body composition. Ovarian steroids hormones were assessed by daily salivary samples and blood samples were drawn.
Results: The women were on average; 30.7 years, had truncal fat of 34.1 % and resting heart rate 69 beats per minute (bpm). We observed an improved metabolic profile with increasing LPA. Comparing low vs.. heavy LPA we observed respectively; HDL-chol; 1.45 vs.. 1.64 (mmol/L), Fat %; 36.4 vs.. 29.3 bpm; 71 vs.. 60. A favorable metabolic profile was found with increasing total MET by LPA and not by work, household and transport. Sex hormone levels were associated with some metabolic profile-factors.
Conclusion: A self reported detailed physical activity questionnaire may be a valid method, when studying physical activity in relation to metabolic profiles and sex hormones.

P01-03

Factors influenced the glycemic index value of rice food

Yan-Jiun Huang

Providence University, TAICHUNG, Taiwan

The glycemic index (GI) is used to be a reference index for food choice. This study was to evaluate the effect of rice on GI. Healthy young adults were recruited to eat different race and cooked rice food as breakfast. Blood sample was collected for fasting and postprandial 30,60,90,120 min by intravenous or capillary collection. Results showed the GI value of refined rice was greater than whole grain rice food. While rice food prepared as dry cooked or gruel cooked showed different influence by blood collecting method. The structure and composition of starch and its absorption in gastrointestinal tract determined the GI value. Blood collecting method is another factor should be concerned when GI was assayed and applied.

P01-04

Calorie intake misreporting by diet record and food frequency questionnaire compared to doubly labeled water among postmenopausal women

Somdat Mahabir[1], David Baer[2], Carol Giffen[3], Amy Subar[4], William Campbell[2], Terry Hartman[5], Beverley Clevidence[2], Demetrius Albanes[4], Philip Taylor[4], William Campbell[2], David Baer[2], Carol Giffen[3], Amy Subar[4], Terry Hartman[5], Beverley Clevidence[2], Demetrius Albanes[4], Philip Taylor[4]
[1]UT MD Anderson Cancer Center, HOUSTON, TEXAS, United States of America
[2]USDA Beltsville, BELTSVILLE, United States of America
[3]IMS, SILVERSPRING, MD, United States of America
[4]NCI, BETHESDA, MD, United States of America
[5]Dept. Nutrition, Penn State Univ, PENNSYLVANIA, United States of America

Objective: We assessed the extent of energy misreporting from the use of a self-administered 7-day diet record (7-DDR) and a widely used food frequency questionnaire (FFQ) compared to total energy expenditure from doubly labeled water (DLW) in a group of postmenopausal women.
Design: At baseline, 65 healthy postmenopausal women were instructed to fill out the National Cancer Institute's (NCI) FFQ and a 7-DDR. Average total energy expenditure using the DLW method was also performed at baseline.
Results: On average, the women underestimated total energy intake compared to total energy expenditure assessed from DLW by 37% on the 7-DDR and 42% on the FFQ.
Conclusions: These findings suggest that the interpretation of findings from the 7-DDR- and FFQ-based energy-disease association studies in postmenopausal women needs further evaluation.

Relationship between fatty acid intakes and the fatty acid compositions of erythrocyte phospholipids.

Satoko Matsuzaki[1], Yuri Okano[1], Tomoko Hirayama[1], Hiroko Takei[1], Terue Kawabata[1], H Kawashima[2], Y Kiso[2]
[1]Kagawa Nutrition University, SAITAMA, Japan
[2]Suntory Ltd., OSAKA, Japan

Object: We investigated the relationships between the pattern of intake of polyunsaturated fatty acids over a period of 28 days and the FA composition of erythrocyte phospholipids.
Subjects and Method: Thirty young women (20.0±1.5 years) participated in the present study. Subjects were selected from among the students at our university. The FA intake pattern of these young women was evaluated on the basis of digital photographic records for 28 days. On the morning following the last day of the survey, fasting blood samples were collected, and the FA compositions of plasma triglycerides, cholesteryl esters and phospholipids, as well as of the erythrocyte phospholipids, were analyzed by gas chromatography.
Result: The mean (±S.D.) daily FA intake during the 28- day period was 9.9±1.9 g/day of ?n-6 PUFA, 1.9±0.4 g/day of ?n-3 PUFA, 137±31 mg/day of arachidonic acid (AA), 137±71 mg/day of eicosapentaenoic acid (EPA), and 275±115 mg/day of docosahexaenoic acid (DHA).
The mean intakes of EPA and DHA were positively and significantly associated with the composition of the erythrocyte phospholipids: EPA (r=0.827, p<0.01), DHA (r=0.504, p<0.01).
Conclusion: We concluded that the amount of n-3 PUFA intake over the long-term influences the composition of the erythrocyte phospholipids.

Validation of the food frequency questionnaire used in the Danish National Birth Cohort

Tina Broby Mikkelsen[1], Merete Osler[2], Salka Erbøl Rasmussen[3], Sjurdur Frodi Olsen[1]
[1]Statens Serum Institut, KØBENHAVN S, Denmark
[2]University of Southern Denmark, ODENSE, Denmark
[3]Danish Institute for Food and Veterinary, COPENHAGEN, Denmark

Background: In the Danish National Birth Cohort a food frequency questionnaire was mailed to all participants. The validity of the estimated intake of protein, retinol, folate, n-3 fatty acids and fruit and vegetables was assessed with a weighed 7-days food diary and with biomarkers as gold standard. The following biomarkers were measured: nitrogen and flavonoids in 24-h urine, retinol and b-carotene in plasma, folate and n-3 fatty acid fraction in the erythrocyte membrane. Materials and methods: In the present study, 88 pregnant women completed one 7-days weighed food diary, a fasting blood sample and a 24-h urine sample. Results: Statistically significant correlation coefficients were found for all comparisons between the two dietary methods. The average correlation coefficient was 0.41 for the nutrients and 0.48 for the foods. Plasma retinol and protein in urine was not correlated with retinol and protein intake respectively, but all other comparisons with biomarkers reached statistical significance. The sensitivity of being correctly classified I quintile 1 was 0.58 for the nutrients and 0.60 for the foods. Conclusion: The correlation coefficients found were in the same range as those found in other studies. The correlation coefficients seemed to be stronger at food level than at nutrient level.

P01-07

Comparison of habitual fatty acid composition between dietary intake and serum phospholipids: The EPIC-Potsdam Validation Study

J Ray[1], MB Schulze[1], T Pischon[1], E Riboli[2], H Boeing[1], K Hoffmann[1]
[1]German Institute of Human Nutrition, POTSDAM-REHBRÜCKE, Germany
[2]IARC-WHO, LYON, France

Background: The evaluation of the validity of dietary assessment instruments with fatty acid (FA) concentrations in blood specimens is hampered by intra-individual variation in both dietary and biological measurements.
Objective: We compared the FA compositions between dietary intake and serum phospholipids, taking intra-individual variance into account.
Methods: Dietary FA intake was assessed by 12 repeated 24-h dietary recalls and 1 food frequency questionnaire (FFQ) applied within a 1-year period among 54 men and 47 women in the EPIC-Potsdam Validation Study. Blood samples were taken twice within this year.
Results: The proportion of saturated FA in phospholipids (42.4%) was similar to that from dietary instruments. In contrast, monounsaturated and polyunsaturated FA differed markedly in their proportions between dietary intake and serum phospholipids.
Proportions of FA from the FFQ were highly correlated with those from 24-h recalls (r>0.6). The strongest correlations between diet and phospholipids, deattenuated for intra-individual variance, were observed for the n-3 polyunsaturated FA (FFQ:0.42, 24 h recalls: 0.87) and monounsaturated FA (FFQ: 0.35, 24 h recalls: 0.68).
Conclusion: FA composition differed markedly between intake and phospholipids except for the group of saturated FA.
The group of n-3 polyunsaturated FAs seemed to be most suitable for validating dietary assessment methods.

P01-08

24-h urinary potassium as a biomarker for potassium intake

Natasa Tase vs.ka[1], Shirley A Runswick[2], Sheila A Bingham[2]
[1]King's College London, LONDON, United Kingdom
[2]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

To investigate validity, reproducibility and the level of inter-individual variability of 24-h urinary potassium (K) as a biomarker for K intake, 7 males and 6 females were fed known intakes of food based on their habitual diet (assessed beforehand from four consecutive 7-d food diaries) for 30-d in a metabolic suite. All daily urine samples were collected, verified for their completeness with PABA, and K measured. Dietary duplicates were collected and K measured. Stool K was determined in 5-d pooled samples. 30-d mean (SD) analyzed K intake was 122.7(28.6)mmol/d. The within-subject to between-subject variance ratio was 0.8 for dietary and 0.99 for urinary K. On average 78.0 (8.0)% of K in the diet was excreted in urine and 18.0 (5.0)% in stool. A significant correlation was found between dietary and urinary K (r=0.89; p<0.001). The correlations from a shorter protocol using randomly selected 16d of intake and 8d of urine collections remained highly significant K (r=0.86; p<0.001). The high correlations between urinary K with K in the diet show that 24-h urinary K is a reliable recovery biomarker for use in studies of dietary measurement error. This work was funded by the Medical Research Council and World Cancer Research Fund.

P01-09

Use of cariogenic bacteria as biomarkers for sugar intake

Karin Vagstrand[1], Anna-Karin Lindroos[2], Yvonne Linné[1], Dowen Birkhed[3]
[1]Karolinska Institute, STOCKHOLM, Sweden
[2]Sahlgrenska University Hospital, GÖTEBORG, Sweden
[3]Sahlgrenska Academy, GÖTEBORG, Sweden

Introduction: There is a need for biomarkers of sugar intake, since sugar often is under-reported. Reviewing the literature imply that sugar intake is associated to the number of cariogenic bacteria in saliva.
Methods: Whole saliva from 407 teenagers (16-17yr; BMI: 21.3±3.2 kg/m2) and their mothers (35-65yr; BMI: 24.5±4.2 kg/m2) were cultured on selective media for mutans streptococci (MS) and lactobacilli (LB). Eating habits were assessed by dietary questionnaire. Suspected under- and over-reporters of energy intake were excluded (children: 37%, mothers: 50%).
Results: Total intake of sugar explained 9% (p=0.002), while sugar excluding lactose explained 10% (p<0.001) of the variation in MS counts in a regression model (controlling for total energy intake, gender and generation). Food groups with a significant positive relationship with the bacteria were sweets, light meals and non-alcoholic beverages. Intake of cooked meals and milk had a negative association. Total sugar intake explained 4% (p<0.001) of the variation in LB counts and sugar excluding lactose 3% (p=0.002). Among women, but not children, there were a positive relationship between bacteria counts and BMI.
Conclusion: MS counts are an indicator for sugar intake. LB counts do also indicate sugar intake but that relationship is relatively weak in this study.

P01-10

Comparative prediction of bone density and estimates of potential renal acid load (PRAL) using two dietary methods

Ailsa Welch[1], KT Khaw[1], Sheila A Bingham[2]
[1]University of Cambridge, CAMBRIDGE, United Kingdom
[2]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

Introduction: Comparative prediction of disease risk by different dietary methods can be used to assess their relative validity. This study investigated the association between a dietary measure of acid-base balance, PRAL (Potential Renal Acid Load) calculated by two dietary methods, a 7-day diary and an FFQ (Food Frequency Questionnaire), and bone density measured by heel bone ultrasound attenuation (BUA) in women from a population in Norfolk UK. A more acidic diet (positive PRAL) is thought to lower bone density and increase risk of osteoporotic fractures.
Methods: BUA was measured using a CUBA clinical machine in 3903 women aged 42-81 years between 1997 and 2000. Dietary PRAL was divided into quintiles and mean BUA calculated for each quintile and adjusted for age, BMI, smoking behaviour, physical activity and HRT status. The ratio of intake of individual nutrients (comprising PRAL) from the FFQ was calculated in relation to the diary.
Results: PRAL was significantly, inversely related to BUA with both methods (FFQ p<0.007, diary p<0.015). Although individual mean nutrient intakes were higher with the FFQ, the difference between the two methods was proportional, around 125%.
Conclusion: Both dietary methods provided similar results in these analyses, possibly due to proportional differences between methods.

Effective health biomarkers to assess the impact of nutrition education and physical activity in older adults

Shahla Wunderlich, Charlotte McKinnon, Shannon Kane
Montclair State University, MONTCLAIR, United States of America

The purpose of this study is to identify the effective tools and parameters to asses the outcomes of nutrition education and physical activity (combined program) on the health status of an older population. Older adults who are participating in a government-sponsored meal programs received nutrition education and participated in an age-tailored; well planned exercise program for a period of 12 weeks. Demographic data and anthropometric measurements were obtained from participants. Forty individuals (72.5% female) with mean age ± standard deviation of 68.8 ± 10.7 years (female) 74.4 ± 8.7 years (male) participated in the study. Their Body Mass Index (BMI) was determined before and after the program and the mean BMI for the women was higher than men (28.1 ± 5.5 vs.. 25.9 ± 5.0). The t-test however, showed that blood pressure, both mean systolic and diastolic, (147.0/82.7 vs.. 132.9/74.0 mm Hg) were significantly improved in women ($p<0.001$) after the EP. In men, although there was an average improvement from 135/75.6 to 132.3/70.8 mmHg, it was statistically insignificant. Cholesterol levels also went down in both groups after the completion of the EP. The special effects of these programs on overall health of elderly people should be evaluated for a longer duration.

Validation of a food frequency questionnaire to assess folate intake of Dutch elderly people

Ondine Van de Rest[1], Ondine Van de Rest[1], Jane Durga[2], Petra Verhoef[2], Alida Melse-Boonstra[2], Saskia Meyboom[1], Henny Brants[3]
[1]Wageningen University, WAGENINGEN, The Netherlands
[2]WCFS/ Wageningen University, WAGENINGEN, The Netherlands
[3]TNO Quality of Life, ZEIST, The Netherlands

Folate is required for several aspects of human health such as prevention of neural tube defects and megaloblastic anemia. To investigate whether recommended daily allowances are met, habitual intake needs to be assessed reliably. We developed a food frequency questionnaire (FFQ) to specifically measure folate intake over the previous three months in elderly people in The Netherlands. Between 2000 and 2001, folate intake was estimated with this questionnaire in 1286 individuals aged 50 to 75 years. Concentrations of serum and erythrocyte folate served as biomarkers with which relative validity of the questionnaire was assessed. With another estimation of folate intake with the same FFQ after three years, the long-term reproducibility was assessed in 803 subjects. Mean folate intake was estimated to be 196 ± 69 microgram/day. Spearman correlation coefficients between folate intake and serum and erythrocyte concentrations were 0.14 ($p<0.01$) and 0.05 ($p<0.06$) respectively. Spearman correlations between folate intakes measured at baseline and after three years were 0.58 ($p<0.01$) and 47 % of the participants were classified in the same quartiles. The folate intake estimated with this newly developed FFQ showed a modest correlation with blood folate concentrations and it was acceptably reproducible over a period of 3 years.

P02-01

Challenges of assessing dietary intake in Kenya

Beatrice Ekesa
Maseno University, KISUMU, Kenya

Accurate assessment of diet intake is important for clinical care and research, for nutrition monitoring and evaluating nutrition interventions and for epidemiologic research. Various methodologies are in place for assessing diet intake but in Kenya this exercise remains a big problem. This paper is based on literature review, personal observations and informal interviews. The outher describes in details challenges of assessing dietary intake such as; uniqueness and complexity of Kenyan foods, lack of enough documentation on nutrient content of most indigenous Kenyan foods, unique cooking methods used by Kenyans, difficulty in portioning foods due to varied sizes and shapes of cups, plates and spoons used by most Kenyans and group eating (use of common plate by many people) a practice common to most Kenyan rural households. The outher also recommends strategies that could be put in place to overcome some of these challenges.

P02-02

Diet quality in relation to chronic disease in urban Senegalese women

Michelle Holdsworth, Edwige Landais, Sabrina Eymard-Duvernay, Francis Delpeuch, Bernard Maire
IRD, MONTPELLIER, France

Objective: To assess whether dietary intake conforms to food based dietary guidelines for the prevention of chronic disease and whether there appears to be a transition towards a more varied diet incorporating less traditional and more processed foods amongst urban Senegalese women.
Design: A cross-sectional, population study using an interviewer-administered qualitative food frequency questionnaire, developed for this study. The questionnaire consisted of 28 food items encompassing 6 food groups: fruit; vegetables; cereal foods; protein rich foods; dairy foods; and sugar/fat rich foods.
Subjects: A random sample of 301 women aged 20-50y.
Key findings: The findings suggest that consumption of vegetables, starchy foods and protein rich foods is in line with recommendations, but fruit and dairy food intake falls below guidelines. There is some evidence that whilst older women (40-49 years) rely more on a traditional diet of rice and fish, younger women (20-29 years) have a more varied diet, incorporating less traditional and more processed foods.
Conclusions: Further research is needed to estimate diet quality using a quantitative dietary assessment method so that appropriate guidelines can be developed that address both under-nutrition (underweight; micronutrient deficiencies), the risk for dietary related chronic disease and the cultural context of eating habits.

P02-03

An investigation into the food coping strategies practiced by women in farm worker households

Irene Moopa
University of Pretoria, PRETORIA, South Africa

Introduction: Households employ various food coping strategies (FCS) to enable them to put food on the table. FCS is used to cushion the hardship of food stress by altering diet, food rationing, food seeking, and altering household composition.
Aim: To describe the different FCS used and how they relate to the nutritional status of women in farmworker households.
Methods: A cross-sectional survey was conducted. Data was gathered from women (23-65 years) responsible for food provision, using quantitative 24-hour recalls and structured questionnaires. Dietary data were analysed and compared to standard nutrient requirements. A standardized FCS-index regarding the perceived severity of behaviours was used to measure FCS.
Results: The dietary intake analysis revealed normal mean macronutrient and low micronutrient intakes. The two most common FCS used were relying on low-cost food and food seeking strategies. Few women skipped meals or practiced food bartering. None borrowed food/money from friends/relatives. Most families received maize meal from the farmer. Food shortages experienced were relishes (protein-rich foods, vegetables).
Conclusion: Low household incomes lead to using FCS. These results indicate limited use of FCS that may impact positively on food security. Nutrition education programs should focus on increased utilisation of various FCS to improve food security.

P02-04

The role of nomadic women in the development of nutrition and health culture in ethnic tribe

Moosa Salehi Dehpagaei[1], Reza Rastmanesh[2]
[1]Public Health School, SHIRAZ, Isle of Man
[2]Nutrition School, TEHRAN, Iran

It has been recognized that the educational status of women plays an important role in improving the nutritional condition of their children and is therefore an indicator of development. Therefore, an educational programme containing basics of health and nutrition was designed for members of the Iranian Qashqa'i tribe, selecting 141 families randomly from the Qashqa'i population. A questionnaire was prepared and data from the subjects under study collected and recorded.
Because of restrictions for men in doing jobs such as those of shepherds, workers, tribe leaders, night guards, hunters and merchants on the one hand and the men's high caloric intake on the other hand, the men were overweight. But the women who, because of the low income of the family, had to do a lot of physical work to provide the basic necessities for their children, used up more energy and were underweight. The percentage of malnutrition in children under 6 years before and after program was significant difference (p<0.05), while it is higher than average in Fars Province. Therefore it is necessary to instruct literate female tribe members voluntarily participating in the education programs in subjects like hygiene and nutrition culture.

P02-05

Energy balance of Korean rural elderly women in farming season

Young Hee Park, Jung Sook Choi, Gwi Jung Han, Yang Sook Kim
Rural Resources Development Institute, SUWON, South-Korea

A number of studies have found that the energy intake of Korean elderly people in general is inadequate. In rural area, relatively higher physical activity due to farm working might deteriorate insufficient level of energy intake. To investigate the energy balance, dietary intake and physical activity diary of 57 elderly women over 65 years old in rural area of Kyonggi province was collected for 3 days in farming season.
Mean daily energy intake of younger age group (65-74y) was 1408 Kcal, which is higher than those of older group (over 75y), 1293Kcal. The energy expenditure of younger group was also higher than older group, 1880 Kcal and 1580 Kcal respectively. The proportion of energy expenditure to farm working contributed for 30% for younger group, nearly double of older group. Mean value of energy balance of each group was 78, 81. All subjects of younger group reported energy balance under 100. Energy balance of elderly women who do not farm working is lower than that of elderly women with 0-5 hour farm working because of significantly lower energy intake. In conclusion, rural elderly women in Korea are likely to have the risk of energy imbalance in farming season.

P03-01

Prevalence of vitamins E and B12 in dietary supplements reported in National Health and Nutrition Evaluation Survey (NHANES) survey

Joanne Holden[1], Cuiwei Zhao[1], Janet Roseland[1], Karen Andrews[1], Amy Schweitzer[1], Charles Perry[1], Wayne Wolf[1], James Harnly[1], Johanna Dwyer[2], Mary Picciano[2], Leila Saldanha[2], Kenneth Fisher[2], Joseph Betz[2], Elizabeth Yetley[2], Kathy Radimer[3], Jaime Wilger[3]
[1]USDA/ARS, BELTSVILLE, United States of America
[2]Office of Dietary Supplements/NIH, BETHESDA, United States of America
[3]USDHH, National Center Health Statistics, HYATTSVILLE, United States of America

Public health concerns regarding excessive Vitamin E and deficient Vitamin B12 intake warrant evaluation of total dietary intake for these nutrients. A Dietary Supplement Ingredient Database is being developed by the Nutrient Data Laboratory with the Office of Dietary Supplements and other federal agencies. During this project, dietary supplements containing Vitamin E or B12 were identified using label information from the 2001-2002 National Health and Nutrition Evaluation Survey (NHANES). Of the 2200 reported supplement products, 695 products contained Vitamin E and 692 products contained Vitamin B12. Approximately 36% of the U.S. population reported taking a supplement containing Vitamin E and about 34% of the population reported taking a Vitamin B12-containing supplement within the past 30 days. Distribution of nutrient label levels versus number of reported products indicated the major levels of Vitamins E and B12. The most commonly reported products containing Vitamin E had label levels of 30 and 15 International Units per serving. Most commonly reported products containing Vitamin B12 had label amounts, in ranked order, of 6, 25 and 4.5 micrograms. The most commonly reported products had label amounts for Vitamin E (30 I.U.) and B12 (6 micrograms) at 100% of the U.S. Daily Value.

P03-02

Nutrient assessment of dietary supplement and medicine (prescription and non-prescription)

Tomoko Imai, Mieko Nakamura, Fujiko Ando, Hiroshi Shimokata
National Institute for Longevity Science, OBU, Japan

Purpose: Some medicine contains considerable nutrients, which might influence nutrient assessment. The purpose of the study is to collect information on dietary supplement (DS) and/or medicine (prescription, or non-prescription: M), which contain some nutrients, and to calculate nutrient intakes from them.
Method: The subjects were 2,259 males and females aged 40 to 81 years. Information of DS and/or M use during previous one year was collected by questionnaire. Nutrient contents of DS and/or M were mainly verified by label information. Users were divided into 3 groups (DS only: D, M only: Mo, and both DS and M: D&M).
Result: The prevalence of D use was 50 %, Mo was 3%, and D&M was 5%. Some nutrient intakes in Mo and D&M were considerable amounts [i.e. magnesium (mean value: D; 4.1, Mo; 18.2, D&M; 19.5mg/day), vitamin K (D; 0, Mo; 625, D&M; 2,209µg/day), and vitamin B12 (D; 38, Mo; 266, D&M; 276µg/day)].
Conclusion: Prescription and non-prescription medicine users were relative few, but some vitamin and mineral intakes from medicine were more than those from dietary supplement. It is important to collect the information on medicine as well as dietary supplement for the assessment of nutrient intakes.

P03-03

Dietary supplement use in the Netherlands: current data and recommendations for future assessment

Marga Ocke, Marga Ocke, Elly Buurma-Rethans, Heidi Fransen
RIVM, BILTHOVEN, The Netherlands

Background: Vitamin/mineral supplements are used to increase the intake of one or more micronutrients. Whether supplementation really counteracts micronutrient deficiencies or leads to excessive intake is unknown.
Methods: Data on (specific) supplement use in the Dutch National Food Consumption Surveys and other Dutch surveys conducted after 1998 are presented.
Results: The use of supplements increased from 17% to 27% in the period 1987-2003, more women than men use supplements (about 30 vs. 20%) and the percentage of supplement users increases by level of education. The average micronutrient intake of supplement users was well below safe upper limits. Differences in study methods and lacking information on nutrient content of supplements hamper comparison of data.
Conclusion: On average there seems no need for concern for too high intakes of micronutrients, although this cannot be excluded for some supplement users.
Recommendations: To monitor supplement use and to estimate the usual intake distribution of total micronutrient intake from foods and supplements it is recommended to combine record or recall data from national food consumption surveys with specific questions on supplement use. In addition a detailed, reliable and actual data set of marketed supplements and their contents is needed.

P03-04

The Alberta Cohort Study: Characteristics of sub-categories of dietary supplement users.

Paula Robson, Ilona Csizmadi, Healther Bryant
Alberta Cancer Board, CALGARY, Canada

Regular users of dietary supplements have been reported to exhibit health and lifestyle characteristics that differ from non-users. This study aimed to determine whether differences also exist between sub-categories of supplement users. Men (n=5039) and women (n=7399) aged 35-69y, enrolled in the first five recruitment waves of the Alberta Cohort Study, completed lifestyle questionnaires and the NCI's Diet History Questionnaire (DHQ) modified for use in Canada. Regular supplement use was defined as consumption of at least one dietary supplement, once per week or more in the year prior to DHQ completion. Users (72.2%) were divided into seven discrete categories: multivitamins only (M; n=919); single nutritional supplements only (n=1665); herbals only (n=662); multivitamin and singles (MS; n=1723); multivitamin, singles and herbals (MSH; n=2290); herbals and multivitamin (n=333); herbals and singles (n=1389). Relative to non-users, MSH and MS subjects were more likely to be non-smokers, and to consume at least 5 servings/d of fruits and vegetables, <10% energy from saturated fat, and at least 3 servings/d of wholegrains. In contrast, the odds of subjects in the M group reporting these 'healthy' characteristics were not significantly different to non-users. Explorations of associations between supplement use, diet and lifestyle should undertake sub-group analyses.

P03-05

Vitamin intake from supplements and total diet in German children and adolescents: results from the DONALD study

Wolfgang Sichert-Hellert
Research Institute for Child Nutrition, DORTMUND, Germany

From the DONALD Study (1986 - 2003) we report on vitamin intake from supplements taking into account also vitamin intake from fortified and usual food. We identified 133 different vitamin containing supplements in 5990 3 day-weighed dietary records from 931 subjects (452 males, 479 females; 2-18 y). Slightly more males (8.0 %) than females (7.1 %) consumed supplements with highest frequencies in the 15-18 year olds (12 vs.. 10 %). For the majority (10/13) of vitamins (vitamin A, E, K, B1, B2, B6, B12, niacin, biotin, and C), intake from usual together with fortified food already reached or exceeded 80 % of the references in all age-groups. In the case of folate and pantothenic acid, intake from supplements was necessary to achieve at least 80 % of references for half of the age-groups, in the case of vitamin D, intake always failed to achieve 80 % of references. Intakes of vitamin A/folic acid from all sources exceeded the tolerable upper level (UL) most frequently and in the case of vitamin D, E and C in subgroups only. For the other vitamins no oversteppings were identified. Only with data of the impact of supplements to the total diet, benefits and risks form supplement consumption can be assessed.

P03-06

Assessment of dietary supplement use including determination of mean daily intake of vitamins, minerals and other constituents from supplements

Barbara Thorand, Beate Fischer, Angela Döring, Margit Heier
GSF National Research Center, NEUHERBERG, Germany

The use of dietary supplements has increased considerably during the last decades but the health effects of these supplements are not always clear. In order to be able to examine these effects, it is important to develop methods which allow, accurate assessment of dietary supplement use including information on its constituents.
Such a method has been developed and implemented in the follow-up examination of the third MONICA/KORA Augsburg Survey. Between 2004 and 2005, 3.176 men and women were questioned in a computer-assisted interview about the use of medication during the last 7 days prior to the interview. In this context, subjects were also asked whether they had consumed any dietary supplement including supplements sold in drugstores or supermarkets. The exact name, manufacturer and pharmaceutical form were recorded and for all supplements consumed on a regular basis, the consumed amount was also assessed. The information collected in the interviews will be connected with an Access-Database compiled by the GSF-National Research Center for Environment and Health which includes information on the composition (i.e. contents of vitamins, minerals, trace elements and n-3 fatty acids) of more than 1.600 dietary supplements, in order to determine the mean daily intake of these constituents from supplements.

P03-07

Use of vitamin/nonvitamin, mineral/ nonmineral dietary supplements among turkish and foreign asian university students

Nurhan Unusan
Selcuk University, KONYA, Turkey

The aim of the research was to investigate the use of vitamin/nonvitamin, mineral/ nonmineral dietary supplements among Turkish and foreign Asian university students in Konya, Turkiye. Turkish students' use of vitamin/nonvitamin, mineral/ nonmineral dietary supplements were found significantly higher than that of foreign Asian students (p<0.01). Vitamin/mineral supplements were preferred to nonvitamin /nonmineral dietary supplements. The most frequently used supplements were iron, vitamin E, ester C, pollen and garlic. Reasons for use most often noted were to improve energy, to have adequate vitamin and minerals and to improve immune system. As a result of this study campus health education efforts can be improved by identifying supplements to highlight in information campaigns.

P04-01

Component based input of composite foods in self administered dietary intake recordings

Tue Christensen, Anja Biltoft-Jensen
Danish Institute for Food and Veterinary, SØBORG, Denmark

The Danish dietary survey operates by a seven-day self-administered dietary intake recording. To increase the user friendliness, reduce the actual number of recipes and to get a good recording of what has been eaten a special design for one of the typical Danish dishes, the open sandwich, has been developed. The actual design of the dietary intake recording caters for more than 150,000 variations of Danish open sandwiches on just two pages in the food record. The component-based design of the dietary record is well accepted by the users and has increased the precision and detail-level of the data.

P04-02

Design and implementation of an Internet dietary assessment method for use in a student population.

Fiona Comrie, Nicola Cochrane, Lorna Aucott, John Lemon, Geraldine McNeill
University of Aberdeen, ABERDEEN, United Kingdom

Accurate and valid dietary assessment tools must be cost-effective and easy for participants to complete. In this study, we designed a nutrition questionnaire, including a new 24-hour diet recall checklist with 86 foods, for distribution via the Internet. Undergraduate students from the University of Aberdeen were recruited online. Data automatically entered a statistical analysis package when participants submitted their entries.

The study collected responses from 421 participants: 35% of total responses were returned within 24 hours and 80% within one week. Mean time taken to complete the survey was 10.6 minutes. 390 respondents (273f, 117m) completed the diet checklist: the mean energy intakes of 7.31 MJ/d in females and 9.52 MJ/d in males were not significantly different from values of 7.00 MJ/d (p=0.67) in females and 9.44 MJ/d (p=0.83) in males aged 19-24y in a national UK diet survey1. The financial costs were nominal.

The dietary assessment tool was less burdensome for the participant than typical dietary assessment methods and the automated nature of the survey greatly reduced the time needed to analyse the results. The study showed that an Internet questionnaire could be quick and cost-effective in obtaining a large number of responses to a dietary assessment questionnaire.

Reference: 1 'Henderson, L., Gregory, J., Irving, K. & Swan, G. 2003, The National Diet & Nutrition Survey: adults aged 19 to 64 years, Energy, protein, carbohydrate, fat and alcohol intake, Volume 2, 2003, The Stationary Office, London'

P04-03

The NCI method for estimating usual food intake distributions: application to complex surveys

Kevin Dodd[1], JA Tooze[2], D Midthune[1], V Kipnis[1], AF Subar[1], Laurence Freedman[3], SM Krebs-Smith[1]
[1]National Cancer Institute, BETHESDA, MD, United States of America
[2]Wake Forest University, WINSTON-SALEM, NC, United States of America
[3]Bar Ilan University, RAMAT GAN, Israel

A two-part statistical model has been developed for modelling usual food intake based on 24-hour recalls (24HR). The model can accommodate the large number of non-consumption days that arise for episodically-consumed foods, and the correlation that usually exists between the probability of consuming a food and the amount consumed. The model can also incorporate covariates related to food consumption. Model parameters are estimated via weighted maximum likelihood.
The National Cancer Institute (NCI) has developed a method for estimating the distribution of usual food intake in a population or subpopulation. The NCI method applies Monte Carlo methods to parameter estimates from the two-part model. Standard errors of percentiles of usual intake estimated in this fashion are difficult to derive analytically, especially when data are obtained under a complex survey design, as is the case of the US National Health and Nutrition Examination Survey (NHANES).
The balanced repeated replication (BRR) method of variance estimation is well-suited for approximating standard errors of non-smooth statistics such as the sample median, and we present results from several simulation studies that give empirical evidence that the BRR method produces appropriate standard errors for percentiles of usual food intake and other statistics estimated using the NCI method.

P04-04

Validation of the 'One-Minute Dietary Assessment' to assess the dietary behaviours and intakes of Hong Kong preschoolers

Georgia Guldan[1], Tracy Lo[1], May Au Yeung[1], CH Cheung[1], Maggie Kwok[1], Ruth Chan[2], Shirley Leung[2], Karen Tso[2]
[1]The Chinese University of Hong Kong, SHATIN, NT, Hongkong
[2]Family Health Service, DEPARTMENT OF HEALTH, Hongkong

This study evaluated a 19-question One-Minute Diet Assessment (OMDA) tool against 3 days' 24-hr dietary recall data from 242 Hong Kong Chinese preschoolers (51% female) to obtain a valid, rapid tool to assess diet quality. OMDA questions represented different daily and weekly dietary behaviours. The children ate, on average, less milk, vegetables, and grain and more meat and fruit than recommended. Most exceeded 30% energy from fat and 10% energy from saturated fat but ate inadequate fiber, calcium and percent energy from CHO. Caregivers reporting children eating 1-2 fruits daily had children with more fruit (86+37g vs.. 37+35g; $p<0.001$) and fiber (7.0 vs.. 5.3g; $p<0.001$) intakes, and were more likely to eat <10% energy from SFA (60% vs.. 44%; $p=0.018$) and <30% energy from fat (61% vs.. 40%; $p=0.023$). OMDA positive vegetable consumption reports also showed children eating more vegetables daily (101+71g vs.. 62+56g; $p=0.001$) than those not reporting this consumption. Other food and nutrient correlations were seen with reported OMDA milk or soymilk, deep fried food, and candy consumptions, but not all OMDA questions demonstrated good validity. A revised OMDA shows potential as a rapid dietary screener for assessing and counseling about imbalanced diets for Hong Kong preschoolers.

Investigating the relationship between meal patterns and obesity using an instrument describing meal types, frequency and temporal distribution

Gerd Holmboe-Ottesen, Zumin Shi, Annhild Mosdøl, Margareta Wandel
University of Oslo, OSLO, Norway

Purpose: It has long been known that obese people tend to under-report their food intake. This is also the case in regard to meal frequency; many studies have found negative/no association between meal frequency and obesity. However, Forslund *et al* (Eur J Clin Nutr 2002; 56: 740) found a positive relationship between meal frequency and obesity when using a new instrument for assessing meal patterns in obese women and a reference group. The aim of this study was to try out this new instrument in the Oslo Health Study taking place in Oslo 2000-2001.
Methods: A cross-sectional survey with a sample consisting of 5998 persons (30-60yrs) having filled in the questionnaire on meal patterns.
Results: Daily number of meals (eating events) were significantly higher among non-obese than obese and generally decreased with increasing BMI. This tendency was more pronounced among women than among men. A somewhat higher proportion of non-obese had meals at normal meal hours, while there was little difference in proportion of obese and non-obese eating outside meal hours.
Conclusions: The suggested instrument for assessing meal patterns did not yield different results in regard to eating events and obesity than what has been found in most other studies.

Endogenous versus exogenous exposure to N-Nitroso compounds and gastric cancer risk: EPIC-EURGAST study.

Paula Jakszyn[1], Sheila Bingham[2], Guillem Pera[3], Ailsa Welch[4], Robert Luben[5], Elio Riboli[6], Antonio Agudo[7], Carlos Alberto Gonzalez[8]
[1]Catalan institute of Oncology, L-HOSPITALET-BARCELONA, Spain
[2]Dunn Human Nutrition MRC, CAMBRIDGE, United Kingdom
[3]Catalan Institute of Oncology, BARCELONA, Spain
[4]Strangeways Research Laboratory, CAMBRIDGE, United Kingdom
[5]Strangeways research laboratory, CAMBRIDGE, United Kingdom
[6]IARC, LYON, France
[7]Catalan Institute of Oncology, BARCELONA, Spain
[8]Institute Catalan of Oncology, BARCELONA, Spain

In a large prospective study of diet and cancer, The EPIC (European prospective Study of Diet and Cancer) of 521,457 individuals in Europe, Baseline N- Nitroso compound (NOC) consumption was investigated in 314 incident cases of gastric cancer that had occurred after 6.64 average years of follow up. Intakes of preformed NOC in food as Nitrosodimethlyamine (NDMA) and an index of endogenous NOC formation (EN) were calculated from dietary data collected at recruitment. EN was estimated using data of the iron content from meat intake and faecal apparent total NOCs formation according to previous publishes studies Exposure to NDMA was les than 1 mg on average compared with 93 mg on average from EN. There were no significant associations with gastric cancer risk and NDMA, but EN was significantly associated with non cardia cancer risk (HR 1.42 (1.14-1.78) for an increment of 40ug EN). The association was particularly strong in HP infected subjects (OR 1.82 (1.32-2.51) for categorical trend), especially those with low plasma vitamin C. Endogenous NOC formation may account for the association between red and processed meat consumption and gastric cancer risk, especially when low amounts of vitamin C are consumed in HP infected individuals.

P04-07

Validity of the FFQ method including several kinds of tea

Kinuyo Kanbe[1], Hisao Nakajima[1], Mamoru Konno[1], Takako Yoshida[1], Etu Kohashi[1], Shimako Muto[2]
[1]Nihon University, SHIZUOKA KEN, Japan
[2]Kagawa Nutrition University, SAITAMA-KEN, Japan

Objective: FFQ has been broadly used as the dietary survey method. Though soft drinks and alcohol are generally listed in FFQ, tea beverages such as green tea, oolong tea, barley tea (in PET bottles or cans) are removed from items in FFQ. In Japan, the consumption of tea beverages is increasing in recent years. We surveyed to consider in validity of FFQ added several kinds of tea by index of intake amount of folic acid. Subjects/setting: 21 female university students who are long-distance runners. The surveys were performed 3 times in September, 2004; March, 2005; and September, 2005.
Results: The fluid intake amount using new FFQ added several kinds of tea increased significantly (p<0.01) against original FFQ. Moreover, there was significant difference between the intake amounts of folic acid by changing barley tea into green tea as intake drinks (p< 0.05). And then, a folic acid intake was filled 400µg currently recommended amount globally. Consequently, FFQ including several kinds of tea is necessary for dietary surveys of renal disease patients or pregnant women who need liquid management, and of the sport players who are apprehensive about anemia.

P04-08

Dietary intake assessment of the Korean Population - 2005 national health and nutrition survey

Cho-il Kim, Haeng Shin Lee, Young Ai Jang, Yoonna Lee, Hae Jeung Lee
Korea Health Industry Development Institute, SEOUL, South-Korea

The National Health and Nutrition Survey (NHNS) is a cross-sectional survey employing a nationwide sample by a stratified multistage probability sampling design. In 2005 NHNS, 12,000 households from 600 primary sampling units were selected and subjected to the Health Interview Survey. And 1/3 of the sample households (and PSUs) were subjected to the Nutrition Survey that dietary intake of every one 1 year and older in those households was monitored by 1-day 24-hour recall method along with a qualitative food frequency questionnaire. Trained dieticians visited each sample household and performed individual face-to-face interviews using measuring guides including the 2-dimensional model of actual size traditional bowels/pots and food shapes to help the respondent report the volume and dimensions of the food items consumed. Based on the recipes collected from each interviewed households, catering services for schools, work sites and community elderly centers, restaurant association, etc., the weight of each ingredient was estimated from the volume of food ingested. Then nutrient intake was calculated using Korean Food Composition Table and our own databases on nutrient composition of processed foods, imported foods and fast foods. The food and nutrient intake have been compared to the DRIs set for Koreans to evaluate the adequacy.

P04-09

Availability and cost of healthy foods in a rural environment

Angela Liese, Kristina Weis, Emily Smith, Delores Pluto
Arnold School of Public Health, COLUMBIA, SC, United States of America

The influence of the built environment on nutrition is increasingly recognized. Access to healthy foods is limited in disadvantaged urban areas in the United States, but little is known about rural communities. We characterized the nutritional environment in a rural county (population 91,582, 1,106 miles2). Food stores identified from a database were mapped with GIS technology and presence and location verified by ground-truthing. Stores were surveyed for availability and cost of select food items. In the rural county, 12 supermarkets were identified, 8 grocery stores and 57 convenience stores with gas stations. Supermarkets were located in more populated areas. Availability of a 'healthy food basket' (low-fat milk, apples, high fiber bread, eggs, canned tuna in water, smoked turkey) was greater at supermarkets/groceries (88-100%) than at convenience stores (4-29%, 54% for tuna) (all p-values = 0.007). Variety of produce was highest at supermarkets (P-value < 0.0001). Cost of the 'healthy food basket' varied by store type (supermarkets $9.62; groceries $9.87; convenience $13.01). In conclusion, supermarkets and grocery stores provided greater availability and variety of healthy foods at markedly lower cost. Large distances and transportation challenges in rural communities may dissuade from shopping in healthier, and lower cost food environments.

P04-10

Using a modified version of the USDA's ampm software: the Canadian experience

Isabelle Massarelli, Maya Villeneuve, Paula Roach, Isabelle Rondeau
Government of Canada, OTTAWA, Canada

Objective: To customize the USDA Automated Multiple-Pass Method (AMPM) for 24-hr recall data collection in the Canadian Community Health Survey – Nutrition (CCHS 2.2). Methods and Materials: This software was chosen for many reasons: the manual data collection was not a viable option due to the magnitude of the survey sample; the high cost of developing a data collection tool for similar populations; the type of interviewers utilized; and, the high level of compatibility between the US and Canadian food composition databases. The modifications included: the addition of Canadian brands and foods; the addition of metric measures; and, French translation. Results: Too many choices in the look-up tables (LUT) led to wrong food selections. The Tri-gram search mechanism resulted in both languages appearing jointly in the main food list (MFL) and LUT. Interviewers were not sufficiently trained to navigate through difficult situations and some used the tool, for the first time, weeks after training. Conclusion: Despite the proximity of the two countries many differences remain. Separating the French from English in the MFL and LUT, restoring the Tri-gram search, adapting questions in problematic categories and narrowing possibilities of answers in LUT would reduce errors and improve adaptability of this valuable tool.

P04-11

A systematic approach to adapting food probes from a national survey for a web-based, self-administered, 24-hour dietary recall

Anna McIntosh[1], Stephen Hull[1], Suzanne McNutt[1], Thea Zimmerman[1], Amy Subar[2], Frances Thompson[2], Nancy Potishman[2], Patricia Guenther[3]
[1]Westat, ROCKVILLE, MD, United States of America
[2]U. S. National Cancer Institute, ROCKVILLE, MD, United States of America
[3]USDA Center for Nutrition Policy and Pro, ALEXANDRIA, VIRGINIA, United States of America

A systematic approach was used to adapt food probes from the U.S. Department of Agriculture's Automated Multiple-Pass Method (AMPM) for a web-based, self-administered 24-hour dietary recall being developed by the U.S. National Cancer Institute. The approach aimed for three goals: 1) simplify probes for a web-based environment, 2) use simple language for food terms and link them to food codes in USDA's Food and Nutrient Database for Dietary Studies (FNDDS), and 3) produce accurate nutrient and whole food analyses. Thirty of the AMPM food group categories representing about 75 percent of all foods reported in the National Health and Nutrition Examination Survey (NHANES) 2002 were identified for initial review. Food codes in FNDDS associated with each of the 30 food categories were entered into a matrix along with their food description, number of mentions from NHANES 99-02, and associated food probes/answers. Rules were established to guide development of the matrix for each category, guidelines were set for determining food terms that best described the food codes, and processes were monitored for quality. This review resulted in 62% fewer probes and identified 3,751 food terms for the 30 food categories. All findings will be applied to the remaining 96 food categories.

P04-12

Evaluation of a short food screener for administration on aging (AoA) congregate meal clients

Suzanne McNutt, Beth Rabinovich
Westat, SALT LAKE CITY, UT, United States of America

A short food screener was developed to measure impact of the nutrition services provided by the Administration on Aging (AoA), which supports almost 3 million clients in congregate (CM) and home delivered (HDM) meals programs. Each meal provided by AoA provides a minimum of one-third of the U.S. RDA, and for many nutrients it provides 40-50 percent of the RDA. The food screener originated from the Nutrition Screening Initiative (NSI) Nutritional Health Checklist. The food statements were changed to questions, questions were split into discrete food groups, and additional questions were added to represent the complete food guide pyramid groupings. The screener was evaluated against the National Cancer Institute food frequency questionnaire (FFQ). A total of 165 CM participants in Indiana and Maryland completed the self-administered short screener and were administered the FFQ by telephone. The sample, which reflected the CM program demographics, was primarily female, Caucasian, over 75 years old, and had completed high school. The results indicated that compared to the FFQ, the screener underreports Grains and over reports Meat servings. This presentation will describe development and results, and provide recommendations for revising and testing the short screener.

P04-13

Cognitive testing of the Dutch BASIS food frequency questionnaire

Saskia Meijboom, Marieke van Bakel, Jeanne de Vries
Wageningen University, WAGENINGEN, The Netherlands

The Dutch BASIS food frequency questionnaire (FFQBASIS) is based upon the validated food frequency questionnaire by Feunekes et al. (1993), and has been developed to estimate the intake of energy and macronutrients. This FFQ consists of 195 questions that have been adapted according to a cognitive-based approach, and provides information on the intake of 121 food items. To investigate whether the respondents encounter problems in understanding and answering the questions of the FFQBASIS, we conducted a pilot study in five participants, aged 51 to 74 years. Think-aloud interviews in which the participants verbalized their thoughts while filling out the questionnaire were recorded on tape and transcribed afterwards. Problems were categorized into four fields: question wording, recalling relevant behaviour, food listing & order of questions, and frequency & portion size. In 33% of the questions, one or more respondents encountered a problem. Most problems (90%) were equally distributed to the fields of question wording and frequency & portion size. No problems could be related to the field of recalling relevant behaviour. Further investigation on the encountered problems in a larger population is needed in order to improve the questionnaire.

P04-14

Combination of FFQ and non repeated 24h dietary recalls (24DR) methods as a tool for diet measuring

Dana Mullerova*[1], Ludek Muller*[2]
[1]Charles University in Prague, PILSEN, Czech Republic
[2]University of West Bohemia, PILSEN, Czech Republic

Validity of results of the FFQ and 24 h DR is increased with repeated examination of particular person. This approach needs to identify investigated person for repeated examination, which is cost- and time consuming with the necessity to save personal data. Although the both methods describe different sides of dietary assessment, the aim of our work was to evaluate internal consistency and relationships of results obtained as using FFQ, as 24 h DR obtained simultaneously during one session only from particular person. In this way we examined uniformly through the whole year 1348 randomly selected person older than 12 years (respondency together with 5% of excluded examinations for incompleteness = 71%). As FFQ was used self constructed questionnaire evaluating 54 food items in 9 values of frequency scale. 24 h DRs were calculated using NutriDan software, obtaining Czech and international food composition table data.
Results: Internal consistency of results of two used methods was confirmed by Spearman`s test of rank correlation where results of energy content obtained using 24 h DR were depended inversely on relative representation frequency consumption of fruit and vegetable (P <0,001); and calcium content was positively correlated with relative representation of dairy products consumption frequency (P <0,001).

P04-15

Development of the taste mapping method using the seals

Shimako Muto[1], Yuko Yoshimoto[2], Jyunko Fujikura[1], Hiromi Ideda[1], Surasak BOONYARITICHAIKIJ[3], Tavipa BOONYARITICHAIKIJ[4], Jirakorn Thasakhet[5]
[1]Kagawa Nutrition University, SAKADO, Japan
[2]Senri Kinran University, OSAKA, Japan
[3]Faculty of Medicine,Chiangmai University, CHIANGMAI, Thailand
[4]Surasak Clinic, CHIANGMAI, Thailand
[5]Jittra Witthaya School, CHIANGMAI, Thailand

[Purpose] The taste mapping method using the seals was developed as the assessment tool to measure children's preferences for the taste in food. [Method] 40 sort of foods were selected by combination with seven tastes such as sweet, sour, salty, bitter ,oily, spicy and others, and the food groups of staple food, main dishes, side dishes ,dairy products, fruit, beverage and confectionery, and the traditional taste, a child's favourite or dislike foods. Children stick illustrated seal (2cmx1.5cm) of the foods on the 2-dimensional plane.
The survey using this method was performed on all the children of the fourth and fifth grades of a private elementary school in Chiang-May city in July, 2005. [Result] The most inexperienced food was fermented fish. Milk was shown the highest preferable taste score. Sweet and oily taste were liked and bitter taste foods were disliked. Although there was not significant sex difference in taste, but girls had higher scores of sour, salty, bitter taste than boys. Obesity group (Rohrer-index >=160) showed the low taste score especially a salty, bitter and sour taste. [Discussion] The preference for the taste is westernizing in Thai children. The relation of the taste and overweight will be a subject hereafter.

P04-17

Let your data collection instrument 'speak' to you

Betty Perloff, Jaswinder Anand, Lois Steinfeldt
USDA, BELTSVILLE, MD, United States of America

A well-designed instrument for collecting 24-hour food recalls does more than provide data on the consumption habits of your subjects. It tells you how well your interviewers perform and identifies where you need to provide additional training. It tells you which questions work well and which questions need revision. It tells you about new foods in the market place, new package sizes, and new restaurant foods. It lets you know when new food and restaurant trends are emerging. Furthermore, it guides you to the exact location in the instrument to accommodate changes for keeping the instrument up-to-date. The Automated Multiple Pass Method (AMPM) communicates all of these messages to the Food Surveys Research Group at the U.S. Department of Agriculture, where it was developed and is maintained for collecting national dietary data in the U.S. Examples will be shown of how management information from the AMPM is used to monitor data collection, to evaluate instrument effectiveness, and to make revisions that accommodate the latest trends in food consumption.

P04-18

Approaches for collecting quality dietary data from community-dwelling seniors with early-stage Alzheimer Disease.

Bryna Shatenstein[1], M-J dr. Kergoat[2], I Reid[2], K Turcotte[2]
[1]Université de Montréal, MONTRÉAL, Canada
[2]Inst. univ de gériatrie de Montréal, MONTRÉAL, Canada

Background: Collecting dietary data from people with Alzheimer's dementia (AD) represents a great challenge. Over a two-year period, we followed the natural progression of undernutrition in community-dwelling seniors in early stages of AD. Methods: Thirty-two patients aged 65+y were recruited from memory clinics with their caregivers. Data were collected at five timepoints at four-month intervals to document weight stability, diet, appetite, nutrition risk, anthropometric, clinical, biochemical and other relevant parameters. Usual diet was assessed at baseline by semi-quantitative food frequency questionnaire (FFQ) and current diet was followed monthly by two non-consecutive food records (FR). Research dietitians used a flexible approach and complementary dietary data collection methods considering the patient's ability and caregiver input. Results: Data were provided independently by 11% of patients, obtained in assisted interviews from 25%, and the caregiver served as proxy for 50%. Home visits were conducted in 8% of cases with the dietitian observing the patient's food preparation, eating capacities, and intakes. For those placed in institutions (6%), dietary intakes were obtained by institution staff. No method worked for one patient who lived alone without an active caregiver. Conclusions: Response quality assessed using clinical judgement indicated that our flexible approach led to plausible and coherent results.

P04-19

Automated food coding in a national dietary intake survey

Lois Steinfeldt
USDA, BELTSVILLE, United States of America

Improving the quality of dietary intake data in large scale surveys is a continuing goal for the Food Surveys Research Group in the U. S. Department of Agriculture. In support of this goal, software was developed to automatically code foods and amounts of foods eaten. Based on the Automated Multiple Pass Method (AMPM) instrument used to conduct dietary intake interviews, details about each food are matched against pre-determined sets of questions and responses that have been linked to food codes. For the amount eaten, different procedures are used based on how the amount was reported, i.e., food models, food specific portion size descriptions such as a 12 fluid ounce can, and generic descriptions such as one medium. The software determines which procedure to follow by matching the quantity responses against a portion size translation table. For both food and amount coding, the software does simple text matching and data table lookups. Previously coded foods and amounts were used to develop the data tables. Automated coding is being implemented in phases in What We Eat in America, the dietary intake component of the National Health and Nutrition Examination Survey (NHANES), as well as other studies.

P04-20

A checklist-adjusted food frequency method for assessing dietary intake

Frances Thompson, Amy Subar, Nancy Potischman, Douglas Midthune, Victor Kipnis, Richard Troiano, Arthur Schatzkin
U.S. National Cancer Institute, ROCKVILLE, MD, United States of America

The 1999-2000 Observing Protein and Energy Nutrition (OPEN) Biomarker Study evaluated measurement error in a food frequency questionnaire (FFQ) using urinary nitrogen and doubly-labeled water as reference instruments for protein and energy intake. Three years later, participants in the OPEN study were re-contacted (the Re-OPEN Study) and asked to complete another FFQ and 7 consecutive daily checklists. The checklist, completed by 287 adult men and women in Re-OPEN (response rate = 59%), is a self-administered, scannable instrument that asks respondents to check each time they consume 35 foods on a given day. Checklist frequency data were used to adjust frequency values for similar food groups in the FFQ. Protein and energy intake from both the FFQ alone and the checklist-adjusted FFQ were compared to true intake as reflected by the biomarkers. Compared to true intakes, mean absolute energy and protein intakes were closer and correlation and attenuation coefficients were higher from the checklist-adjusted FFQ than from the FFQ alone. The opposite was true for protein density. The potential uses of this method will be discussed.

P04-21

A computer-based system to generate and process food frequency questionnaires for valid assessment of dietary intake in the Netherlands

Jeanne Vries[1], Pieter Dagnelie[2], Margje Jansen[3], Marga Ocke[4], Piet van den Brandt[2], Wija van Staveren[1]
[1]Wageningen University, WAGENINGEN, The Netherlands
[2]Maastricht University, MAASTRICHT, The Netherlands
[3]TNO Quality of Life, ZEIST, The Netherlands
[4]National Institute for Public Health, BILTHOVEN, The Netherlands

In epidemiological and clinical studies, a food frequency questionnaire (FFQ) is an appropriate instrument for assessing habitual dietary intake of nutrients with a high day to day variation. However, to capitalise on new research questions, changing food patterns, and a rapidly changing food market, FFQs must regularly be updated. The aim of the present study is to develop a computer-based system for generating and processing tailor-made FFQs for studies in the Netherlands.
The computer-based system will consist of 1. a database with questions on the consumption of foods important in the Dutch food pattern. 2. computer software to select questions for generating FFQs for specific study aims based on predefined criteria and Dutch food consumption survey data, and 3. a nutrient computation system. Based on literature and existing FFQs, we have defined the criteria for this system, and developed the first step i.e. the database with questions and answers. Also, we made an inventory of the major aims of nutrition research using FFQs, anticipating on future developments. During the conference our criteria for developing the system and the results of the first step will be discussed.

P04-22

A new Japanese vegetarian food guide pyramid part II

Keiko Nakamoto
SODEGAURA CITY, Japan

The new Japanese vegetairan food guide pyramid (JVFGP) was developed last year based on the North-American version since the American Dietetic Association supports vegetarian diets. Because the new Japanese DRIs and food guide were released, this new JVFGP was revised. Major changes were made in serving size and the number of servings. Thus, this JVFGP was revised so that it would not only provide all the adequate nutrients but also could be useful among both the health professionals and the general public, based on the newest Japanese nutritional guidelines. In the future, the effectiveness of this JVFGP will be studied and revised accordingly.

P05-01

An evaluation of different methods to assess physical activity in a sub-sample of the Malmö Diet and Cancer (MDCS) cohort.

Carin Andrén Aronsson, Elisabet Wirfält, Bo Gullberg, Bo Hedblad
MALMÖ, Sweden

Different types of physical activity assessment methods used in epidemiological studies may capture different aspects of activity patterns. Also, miss-reporting may be a concern in self-reported physical activity. This study compares the ability of three different physical activity assessment methods to rank individuals on physical activity: an objective method (CSA/MTI accelerometer), the MDCS leisure time physical activity score, and the total physical activity level (PAL), estimated from the MDCS lifestyle questionnaire. The relations between the three activity measures and with obesity indicators and metabolic variables were examined.
Middle-aged men and women, who are physically active when assessed by the objective method, are leaner, have better metabolic profiles than subjects with low physical activity.
A similar health pattern, but not as evident, is seen with the MDCS-score as a grouping variable.
Correlation analysis indicates modest and significant relations between the subjective and the objective methods, but different patterns are seen for men and women. Correlations were strongest between the accelerometer and MDCS-score in men ($r=0.37$, $p=<0.01$) and between the accelerometer and PAL in women ($r=0.21$, $p=<0.01$). Therefore, in order to ensure sufficient accuracy of physical activity, instrument need to incorporate the common activity patterns of both gender groups.

Genetic and environmental contributions to physical activity in 15-17-year-old Swedish twins

Gabriele Eiben[1], Lauren Lissner[2], Paul Lichtenstein[3]
[1]Göteborg University, GÖTEBORG, Sweden
[2]Dep of Primary Health Care, GÖTEBORG, Sweden
[3]Dep of Med Epidemiology and Biostatistic, STOCKHOLM, Sweden

Objective: The aim of this study is to investigate if a simple questionnaire can give reasonable estimates for the genetic and environmental contributions to physical activity in 15-17-year-old twins.
Method: The twins are part of a longitudinal Swedish Twin study. A total of 2367 males and females aged between 15 and 17 years responded (82%) in 2002 when three questions about physical activity (frequency, duration, intensity) were included. Additive genetic, shared and nonshared environmental effects have been estimated by model fitting. The differences in intraclass correlations between monozygotic and dizygotic twin pairs provide estimates of these effects.
Results: Overall, the prevalence of regular physical activity in leisure time was 86%. However, boys spent about 30 minutes more per week on physical activity and the intensity was higher compared to girls. Heritability explained 70% and 65%, shared environment 6% and 11% and nonshared environment 24% and 23% of the variation in time spent on physical activity in boys and girls respectively.
Conclusion: Physical activity (frequency x duration) is mainly genetically influenced while environmental factors only play a secondary role as shown in earlier studies using more detailed questionnaires.

Reproducibility of clinical tests of physical function in obese subjects

Ulla Evers Larsson[1], Anne Christenson[2], Maren Schuldt[2], Signy Reynisdottir[2]
[1]Karolinska, HUDDINGE, Sweden
[2]Centre for Obesity Treatment, Norrtull, STOCKHOLM, Sweden

BACKGROUND: Simple and reliable tests of physical function are necessary for designing and evaluating treatment programs. The aim of this study was to describe the reliability of a clinical test battery for obese outpatients.
METHOD: Thirty-four (22 female) obese outpatients 20-62 yrs, mean BMI 38.7 kg·m-2, were within a week tested twice on separate days with the six-minute-walk test (6MWT), the Timed Up & Go (TUG), a revised 4-item Functional test and a short Disability questionnaire. Inter-rater reliability was tested in 17 patients.
PRELIMINARY RESULTS: The patients walked 539 (83.7)m the first walk and 553 (94.7)m the second (n.s., ICC1.1=0.94). Coefficient of Variation (CV) was 4.15%. The repeatability (clinical significant difference) of the 6MWT was 62.8m.
The first TUG took 6.73s, the second 6.64s (n.s., ICC1.1=0.84). CV was 8.1% and the repeatability 1.5s.
ICC1.1 varied 0.47-0.98 in the Functional test items.
No systematic test-retest differences were detected in the Disability questionnaire.
No inter-rater differences were detected.
CONCLUSIONS: The tests 6MWT, TUG, and most Functional test items and Disability questions held high reliability. Whether the tests are used combined in a battery or single they can be recommended for evaluation of physical function in obese subjects before and after intervention.

P05-04

Clinimetric review of motion sensors to assess physical activity in children and adolescents.
Sanne De Vries[1], Ingrid Bakker[1], Marijke Hopman-Rock[1], Remy Hirasing[2], Willem Van Mechelen[2]
[1]TNO Quality of Life, LEIDEN, The Netherlands
[2]Institute for Research in Extramural Med, AMSTERDAM, The Netherlands

Objective: To review the clinimetric quality of motion sensors used to assess physical activity in healthy children and adolescents (2-18 yr). Study Design: A systematic literature search was performed in PubMed, Embase, and SpycINFO. The clinimetric quality of two pedometers (Digi-Walker, Pedoboy), four one-dimensional accelerometers (LSI, Caltrac, Actiwatch, CSA/ ActiGraph), and three three-dimensional accelerometers (Tritrac-R3D, RT3, Tracmor2) was evaluated and compared using a 20-item checklist. Results: Overall, the quality of the studies (n=35) and therefore the level of evidence for the reproducibility, validity, and feasibility of the motion sensors was modest (M=6.4±1.6 out of 14 points). There was strong evidence for a good reproducibility of the Caltrac in adolescents (12-18 yr), a poor reproducibility of the Digi-Walker in children (8-12 yr), a good validity of the CSA/ ActiGraph in children and adolescents (8-18 yr), and a good validity of the Tritrac-R3D in children (8-12 yr). Conclusion: The CSA/ ActiGraph and the Caltrac are the only motion sensors in which the reproducibility, validity, and feasibility have been examined in different age groups. Further studies of the reproducibility of motion sensors in preschool children, improvement of the quality of clinimetric studies, and evaluation of the acceptability of motion sensors are warranted.

P05-05

The role of measurement error in estimating level of physical activity
Pietro Ferrari[1], Christine Friedenreich[2], Charles Matthews[3]
[1]IARC, LYON, France
[2]Alberta Cancer Board, CALGARY, Canada
[3]Vanderbilt University School of Medicine, NASHVILLE, United States of America

Recent epidemiological investigations have indicated lack of physical activity as an important risk factor for many chronic diseases, although the quantification of these associations is problematic because of random and systematic measurement error in self-reported estimates of physical activity, which cause attenuation of relative risk estimates. Within a validation study conducted at the Alberta Cancer Board, four physical activity questionnaire measurements, four 7-day physical activity logs (PA-LOGs) and four sets of accelerometer data were collected on 154 men and women aged 35-65 years. A measurement error model was used to estimate the validity coefficient and the attenuation factors of different assessments, after taking into account error correlations between self-reported measurements. The validity coefficients were overall higher for accelerometers, ranging form 0.739 to 0.845, compared to PA-LOG, from 0.517 to 0.593, and questionnaire measurements, 0.250 to 0.408. Estimates of attenuation factors for questionnaires ranged from 0.133 to 0.195, with values more than two-fold lower than estimates obtained in a model that does not account for error correlation in questionnaire and PA-LOG measurements.
This study confirms that, after the role of error correlations has been taken into account, the degree of attenuation for the evaluation of exposure/disease associations can be substantial.

P05-06

Validity of self-administered physical activity questionnaires in the Japan Public Health Center-based prospective Study (JPHC Study).

Hitomi Fujii[1], Mitsuhiko Noda[2], Seiichiro Yamamoto[3], Manami Inoue[3], Takashi Kadowaki[4], Shoichiro Tsugane[3]
[1]Graduate School of Med. Tokyo University, TOKYO, Japan
[2]International Medical Center of Japan, TOKYO, Japan
[3]National Cancer Center, TOKYO, Japan
[4]Graduate School of Med.Tokyo University, TOKYO, Japan

The validity and reproducibility of energy expenditure (EE) estimates based on five different self-administered Physical Activity Questionnaires (PAQs) was evaluated.

'Short Category', 'Middle Version', 'Exercise Part', and 'Long Version with seasonal variation' and 'Long Version without seasonal variation' were developed to assess daily EE and seasonal variation in EE in the JPHC Study.
Methods: The EE estimates on the basis of the PAQs and use of a 7-day accelerometer were evaluated by using a 4-day 24-hr Physical Activity Record (24h-PAR) as the gold standard for the 110 volunteers.
Results: The correlations between the EE estimates based on the four PAQs and the estimate based on the 24h-PAR were moderately strong (Correlation Coefficient =0.48~0.62).
The correlation between EE values by the accelerometer and EE estimates by the 24h-PAR was poor (CC=0.13).
EEs were especially lower in cold winters in rural areas.
Conclusion: The reproducibility and validity of the EE values based on the PAQs was good enough. The 'Short Category' was good enough (CC=0.48) to classify the quantity of EE into four groups. Although including seasonal variation into the estimates did not contribute to increasing the correlation coefficient, it was useful for estimating average EE more accurately and with less fluctuation.

P05-07

Validity of DR`s EXTRA physical activity interview

Reija Kouki[1], Leena Kiviaho[1], Harri Heikkilä[1], Timo Lakka[2], Rainer Rauramaa[1]
[1]Kuopio Research Institute of Exerc Med, KUOPIO, Finland
[2]Dep of Physiology, University of Kuopio, KUOPIO, Finland

Measuring physical activity (PA) is challenging and better methods are needed. Dose-Responses to Exercise Training (DR`s EXTRA) Study group has developed a new interview of leisure time PA at different intensities, sedentary time and sleeping time during preceding month in middle-aged and elderly men and women.
The validity of the DR`s EXTRA PA Interview (DEPAI) was investigated in 89 men and 79 women in a subgroup of a population-based DR`s EXTRA -study. Energy expenditures of total (EEtot) and moderate + vigorous intensity (EEmod+vig) PA were expressed in MET-hours. DEPAI was validated against maximal oxygen uptake (VO2max in ml x kg-1 x min-1) measured directly during bicycle exercise test and the KIHD 12-month Leisure-Time PA History.
The Spearman correlation between VO2max and DEPAI EEtot was 0.242 (p=0.002) in men and 0.394 (p<0.001) in women. The correlation between VO2max and DEPAI EEmod+vig was 0.326 (p=0.002) and 0.340 (p=0.002), and between VO2max and DEPAI EElight -0.040 (p=0.708) and 0.252 (p=0.025) for men and women, respectively. DEPAI EEtot also correlated with KIHD EEtot in men (0.529, p<0.001) and in women (0.435, p<0.001).
DEPAI is a suitable method for assessing PA in Finnish middle-aged and elderly men and women.
Physical activity, energy expenditure, VO2max, validity

P05-08

Physical activity and energy expenditure by an activity diary in adolescents and young adults.

Bo Sandhagen[1], Lars-Eric Bratteby[2], Gösta Samuelson[3]
[1]Medical Sciences, UPPSALA, Sweden
[2]Medical Sciences, Clinical Physiology, SE-75185 UPPSALA, Sweden
[3]University West, TROLLHÄTTAN, Sweden

Total energy expenditure (TEE), activity energy expenditure (AEE) and physical activity level (PAL) were assessed on the basis of an activity diary, validated by the Double Labelled Water technique, in 160 selected healthy subjects at ages 15 and 21 y. At both ages, TEE and PAL were high with gender, sitting time and physical activity habits as main correlates. At age 21 y, employment and the mother's educational level also appeared as significant correlates. A reduction of daily sitting appears to be a major reason why high levels of physical activity and energy expenditure were maintained from 15 to 21 y of age in spite of changed and less frequent activity habits during this interval.

P05-09

How well does the ActiReg® method measure total energy expenditure (EE) in obese subjects? A doubly labelled water study.

Mette Svendsen[1], Bo Hustvedt[2], Lasse Ellegaard[3], Jostein Hallén[4], Serena Tonstad[5]
OSLO, Norway
[2]Department of Nutrition, University of O, OSLO, Norway
[3]Dept Clinical Nutrition, Sahlgrens Hospi, GOTHENBURG, Sweden
[4]Norwegian University of Sport and Physic, OSLO, Norway
[5]Department of Preventive Cardiology, Cen, OSLO, Norway

Introduction: The ActiReg® method is using combined recordings of body position and motion to calculate total energy expenditure (TEE).
Aims: Compare calculated TEE from the ActiReg® against TEE estimated by the doubly labelled water (DLW) method. This is accomplished by using measured resting metabolic rate (RMR) and 2 different predictive equations.
Subjects and methods: Twenty-three men and 27 women aged 43 years (range 24-65) with BMI 35.7 kg/m2 (range 30.5-43.8). TEE by the DLW was measured during 14 days. During 7 of these days they wore ActiReg. RMR was measured with Deltatrac?, and estimated. Due to increased EE during weight bearing activities for obese, a special calculation model was established.
Results: The TEE±SD MJ/d for the group measured by DLW was 13.94±2.47, while the TEE calculated from the ActiReg data were 13.39±2.26, 14.18±2.59, 13.73±2.32 based on measured RMR or calculated by the FAO/WHO/UNU 1985, and Mifflin et al 1990 equations respectively.
The mean TEE from ActiReg based on measured RMR was slightly underestimated compared to the DLW measurement (p=0.01), while the TEE based on the equations was not significantly different, p=0.34 and p=0.38.
Conclusion: The results show that ActiReg may be used to measure TEE in groups of obese subjects.

P05-10

Objective measurement of free-living physical activity using the activPAL

William Tigbe, Margaret Grant, Cormac Ryan, William Tigbe, Malcolm Granat
Glasgow Caledonian University, GLASGOW, United Kingdom

PURPOSE: To evaluate the validity and reliability of the activPAL monitor as a measure of free-living activity.
Study 1
METHOD: Ten adults wore three activPAL monitors to carried out everyday activities Activities were videoed and classified by three observers into sitting, standing and walking. Data from the activPAL similarly classified.
RESULTS: Inter-observer reliability was excellent (>0.97) and inter-device reliability good-excellent (0.78-0.99). Agreement between activPAL and observation by Bland-Altman method was good-excellent, mean difference of -2.0% to 0.2% (limits of -16.1% to 12.1%). Second-by-second analysis yielded a percentage agreement of 95.9% with sensitivity and predictive values 88.1% to 99.6% for different activities.
Study 2
Step-count and cadence in 20 adults (12F, 8M) were evaluated during treadmill walking for five different speeds and outdoor walking at three self selected speeds. Trials were videoed and observation used as the criterion measure. Each participant wore four activPAL monitors.
RESULTS: Inter-device reliability was =0.99 for step-count and cadence. Agreement by Bland-Altman method, between the activPAL and observation, was excellent for both step-count and cadence at all speeds, mean difference of 0% - 1.0% (limits of -2.6% to +3.2%)
CONCLUSION: The activPAL activity monitor is a valid and reliable objective measure of free-living physical activity.

P06-01

Comparison of food supply data with household consumption survey data: the case of Morocco

Sabah Benjelloun
Institut Agronomique et Vétérinaire Hass, RABAT, Morocco

Objective: To compare dietary indicators obtained by two methods: Food balance sheet and household budget and consumption survey in Morocco.
Design: Examination of data from national household surveys (HS) and corresponding data from FAO food balance sheets (FBS) for the years: 1970/71, 1984/85 and 2000/01.
Results: Researchers and planners acknowledge the discrepancies between the two methods (different objectives, methodologies and uses) and recognise that they ought to be used in a complementary manner. However, often, they use FBS data as a substitution for HS data.
Examination of data from both sources for Morocco shows that the FBS method overestimates food availability for all major food groups, except vegetables and oils.The magnitude of overestimation varies from 1% for dairy products in 1970/71 to 148% for fish in 2000/01. Yet, the magnitude of the difference is quite minor for total calories (+0.2% in 1970, 10% in 1984 and -3.8% in 2001). But importantly, the two methods differ widely for calories origin: while the 2001 HS allocates 28% of total calories to fats, the corresponding figure for the FBS is a mere 18%.
Conclusion: Caution should be made in the interpretation of nutrition indicators obtained from the more readily available FBS data sets.

P06-02

Dietary and physical activity assessments in a prospective cohort study in Brazil: the ELSA study
Marly Cardoso[1], Alessandra Goulart[1], Fernanda Scagliusi[1], Isabela Benseñor[1], Frank Hu[2], Paulo Lotufo[1]
[1]University of Sao Paulo, SAO PAULO, Brazil
[2]Harvard School of Public Health, BOSTON, United States of America

Limitations in the validity of dietary intakes and physical activity measurements have been considered the main reasons for inaccuracies in epidemiological studies. The present report describes the study design of the dietary and physical activity assessments for a prospective cohort in Brazil. The ELSA study (Estudo Longitudinal de Saude do Adulto, in Portuguese) is a multi-centre prospective cohort study designed to investigate the relation between various lifestyle factors and the risk of diabetes and cardiovascular diseases. The study is based in 6 collaborating centres (Sao Paulo, Rio de Janeiro, Porto Alegre, Belo Horizonte, Vitoria, Salvador) and includes public universities employees. It is planned to comprise around 15,000 middle-aged men and women to be followed-up for at least 7 years. During the baseline, blood samples will be collected in all centres together with two 24-hour diet recalls (24hDR) following a common protocol. A modified version of validated Brazilian Food Frequency Questionnaires (FFQ) will be used. In the Sao Paulo collaborating centre, the accuracy of the FFQ and the International Physical Activity Questionnaire (IPAQ) will be assessed in a 1-year interval among 200 randomly selected subjects using multiple 24hDR, blood samples, and doubly labelled water assessment.

P06-03

Comparison of food frequency questionnaire and 24-hour dietary recall data: A calibration study to Brazilian population
Nagila Damasceno, Nagila Damasceno, Ana Paula Mello, Patricia Lima, Camila Damaris
Universidade de São Paulo, SÃO PAULO, Brazil

Dietary approaches and lifestyle have been associated to chronic disease. In Brazil, cerebrovascular diseases are related to 56% of the mortality and dietary patterns show a great association with these pathologies. In this study, our objective was to calibrate a food frequency questionnaire (FFQ) to Brazilian population applied to studies on dislipidemia and atherosclerosis. This study was based in FFQ previously validated to Japanese ancestry living in Sao Paulo, Brazil. Initially, all food traditional of Japanese culture was excluded. The new FFQ (FFQn) was applied to twenty nine healthy persons, female and male living in Sao Paulo, Brazil. The FFQn and one 24-hour dietary recall (24h-r) was applied by health professionals by direct interview. Twenty four dietary recall data was considering as a gold standard to comparison results about FFQn. After all values were corrected by residual nutrient method, results were log transformed and statistically analyzed. Results indicated a good correlation between FFQn and 24h-r to macronutrients, calcium, iron, sodium, cholesterol, fiber, alfa-tocopherol and all fat acids. Therefore, FFQn was able to evaluate the habitual diets of Brazilian population and this FFQn will be an important tool in future studies about nutritional epidemiology associated to atherosclerosis in Brazil. SUPPORTED: FAPESP

P06-04

Quantitative food frequency questionnaire (QFFQ) to Brazilian women with breast cancer: A calibration study

Nagila Damasceno, Nagila Damasceno, Sara Verde, Camila Barros, Natalia Misumi
Universidade de São Paulo, SÃO PAULO, Brazil

Cancer is the second cause of death on the world, and the food intake has an important role on the development of this disease. The food frequency questionnaire (FFQ) is an important tool to assessment the habitual food intake of calories and nutrients in person or population and calibration represent a necessary stage where FFQ is adjusted to a new population. The aim of this study was to calibrate the quantitative food frequency questionnaire (QFFQ) previously validated to woman with breast cancer. Twenty nine women, with breast cancer, from Cancer Hospital in São Paulo, Brazil were included. QFFQ was compared to one 24-hour dietary recall data (R24h, used as good standard). The variables were calculated by NutWin® e Dietsys® programs. After correction by residual method, variables were log transformed and analyzed by software SPSS®. Results showed good correlations between QFFQ e R24h to folate (r=0.535, p=0.003) alfa-tocopherol (r=0.405, p=0.029) and iron (r=0.371, p=0.047). Therefore, QFFQ was calibrated to be used in assessment of the habitual intake of these nutrients.
SUPPORTED:FAPESP

P06-05

Fruit and vegetable intake in the context of public health surveys: are a couple of frequency questions sufficient?

Lene Frost Andersen[1], Inga Thórsdóttir[2], Maria De Almeida[3], Johanna Haraldsdóttir[4]
[1]University of Oslo, OSLO, Norway
[2]University of Iceland, REYKJAVIK, Iceland
[3]University of Porto, PORTO, Portugal
[4]Royal Veterinary and Agricultural Uni., COPENHAGEN, Denmark

Public health surveys often include a couple of frequency questions on intake of fruit and vegetables (F&V). This paper aims at clarifying the potential and the limitations of this type of information in the public health context.
The analyses are based on two validation studies; one in 11 year old schoolchildren from 4 European countries (n=43-60 per country), and one in adult Norwegian men (20-55 yrs., n=108). Both studies included 6 F&V questions but these were not identical. Food records were used as reference.
Results: Overall 25-50 % were classified into identical quartiles, and 70-88% were in the correct or the adjacent quartile. Pearson correlations ranged between 0.46-0.66.
Predictive value of the FFQ was high with respect to identifying subjects not meeting recommendations on F&V intake (0.97 for the adults). Further analyses elaborated these results.
Conclusions: A couple of frequency questions on F&V intake are very useful for distinguishing between high- and low-consumers. However, for identifying subjects belonging to the top quartile of intake, or subjects consuming more than a specific amount of F&V, the predictive value of the FFQ is moderate or low. This needs to be taken into account when results are applied in a public health context.

P06-06

Validity of a precoded questionnaire to assess fruit and vegetable intake among portuguese adults

Bela Franchini[1], Rui Poínhos[2], Asa Kristjansdottir[3], Lene Andersen[4], Jóhanna Haraldsdóttir[5], Inga Thorsdottir[3], Knut-Inge Klepp[4], M Daniel Vaz De Almeida[2]
[1]Faculdade de Ciências da Nutrição e Alim, PORTO, Portugal
[2]Faculty of Nutrition and Food Sciences, PORTO, Portugal
[3]Unit for Nutrition Research, Landspitali, REYKJAVIK, Iceland
[4]Department of Nutrition, Faculty of Medi, OSLO, Norway
[5]Department of Human Nutrition, Royal Vet, COPENHAGEN, Denmark

Objective: To test the validity of a newly developed questionnaire to assess fruit and vegetable intake within the ProChildren Project (http://www.univie.ac.at/prochildren/). Methods and Subjects: The self-administered questionnaire included a 24-hour recall part (24hR) which measured group mean intake and a food frequency part (FFQ) that ranked intakes. Validity was tested using a 7-day food record (7dFR) as reference method. The one-day weighed record was used for validation of the 24hR, and the whole 7dFR for validation of the FFQ. Participants were 40 adults (mean age = 40+/- 5 years; 30 women and 10 men), parents of 11-12 year-old children, who were recruited through two schools in the Greater Porto area.
Results: No significant differences were found between intakes yielded by the 24hR and the one-day weighed record. The FFQ correlated significantly with the 7dFR for Fruit (F; r=0.452), Vegetables (V; r=0.417), F+V combined (FV; r=0.599) and FV+Juice combined (r=0.464). As Iceland and Portugal represent the lowest and highest F+V consumption, respectively, these results will be compared with those obtained from Iceland.
Conclusion: This method is valid to measure fruit and vegetable intake of adults in a European country of high intake, in agreement with the other Prochildren validation studies.

P06-07

Relative validity of a semi-quantitative food-frequency questionnaire on-line (QSFA) to evaluate the intake of Calcium and Iron

Andrea Galante Polo[1], Celia Colli[2]
[1]University of Sao Paulo, SÃO PAULO, Brazil
[2]Universidade de São Paulo, SÃO PAULO, Brazil

The development of computers in the 90's,brought different alternatives of communication which are now available through the Internet. This study was to develop and validate a semi-quantitative food-frequency questionnaire on-line (QSFA) to evaluate the intake of Calcium and Iron.The site of access to the research and the interaction were obtained through a newspaper entitled Folha Online (Brazil). Thirty internet users were selected, of both sexes, living in the state of São Paulo, ages 21 to 45. To validate the QSFA on-line, the information obtained from a 4 recall during two consecutive months, was compared to the information obtained from the QSFA on-line applied during the third month thereafter. Two relative validity tests were used: correlations and sign test and both tests showed that the QSFA on-line can be used to evaluate the average intake of Ca, as well as the 4 recall. With regards to the Iron nutrients, the QSFA on-line should be reevaluated on a larger sampling. The Pearson´s correlation coefficients, after adjustment and correction for variance was 0,57 and -0,13 for calcium and iron respectively. The results indicated that the QSFA on-line, presented relative validity to evaluate the average calcium intake.

Validity of a self-administered food frequency questionnaire for estimation of dietary amino acids

Junko Ishihara[1], Shoichiro Tsugane[1], Manami Inoue[1], Hidemi Todoriki[2]
[1]National Cancer Center, RCCPS, TOKYO, Japan
[2]University of Ryukyus, OKINAWA, Japan

Objective: To assess validity of a food frequency questionnaire (FFQ) for estimation of dietary amino acids. Methods: Amino acid intake was calculated by using a composition database developed based on the Standard Tables of Food Composition for amino acid in Japan. Subjects were subsampled from 2 populations of the Japan Public Health Centre-based prospective Study who volunteered to participate in the validation study of the FFQ. First group was from the population that the FFQ was developed for (internal population, n=215), and the second was a separate population to confirm external validity (external population, n=350). Validity of a FFQ was evaluated using 28-day weighed dietary records (DRs) as a goldstandard. The Spearman's rank correlation coefficients (CC) between amino acid intake from FFQ and DR were calculated. Results: Dietary intake of amino acids was slightly underestimated by FFQ. CCs of energy-adjusted amino acid intake according to FFQ and corresponding amino acid intake according to DR ranged from 0.14 to 0.50. Median CCs for 20 amino acids were 0.32 for male and 0.24 for female in internal population, and were 0.38 for male and 0.28 for female in external population. Conclusion: Validity of the FFQ to estimate amino acid intake was moderate.

Relative validity of a food frequency questionnaire (FFQ) for B vitamins intake in old people in relation to cognitive function

Xueli (Shirley) Jia, Geraldine Dr. McNeill
University of Aberdeen, ABERDEEN, United Kingdom

87 (44M, 43F) community-living healthy people aged 67-80 years old completed a 4-day weighed diet record (WR) and a 190-item semi-quantative self-administrated FFQ. After exclusion of subjects with low energy intakes by FFQ or WR, the Spearman correlation coefficient for nutrient intakes by FFQ and WR were above 0.36 (p<0.05) for thiamine, vitamin B6 and folate in men, and were above 0.44 (p<0.05) for vitamin B6 and folate in women. There was no significant correlation between vitamin B12 intake in either men or women. In both men and women those with lower cognitive function, assessed by digit span forward and verbal fluency tests, had similar or higher correlation coefficients for these nutrients. These results provide no evidence that cognitive function adversely affects the accuracy of completion of an FFQ in healthy older subjects.

The development of a short food frequency questionnaire to assess iron intake.

Ernesta Kunneke[1], Petro Wolmarans[2], Ria Laubscher[3], Este Voster[4]
[1]University of the Western Cape, BELVILLE, South Africa
[2]Nutrition Intervention Research Unit,MRC, BELVILLE, South Africa
[3]Biostatistics Unit, MRC, BELVILLE, South Africa
[4]Faculty of Health Sciences, North –West, POTCHEFSTROOM, South Africa

Iron deficiency is the most frequently encountered nutritional deficiency in humans and rapid dietary assessment methodology is needed in epidemiological studies on iron status. The aim of this study was to develop a short quantified food frequency questionnaire (SFQ) to assess iron intake and to determine the validity of this SFQ. This was a descriptive study, done in 2 phases. In phase I, a 3-day estimated dietary record (DR) was completed by a convenient sample of 30 females, aged 18-26 years. A quantified food frequency questionnaire (FFQ) was completed by interview. Bland-Altmann plots showed a good level of agreement between the 2 methods for iron and the SFQ was developed, based on the FFQ. In phase II, the SFQ and a questionnaire on non-dietary factors that can influence iron status were completed and a blood sample, for Hb and ferritin analysis, were obtained on a convenient sample of 100 females, aged 18-26 years. No significant correlations were found between Ferritin or Hb and dietary iron, as assessed with the SFQ. It is concluded that a SFQ to assess iron intake can be developed, because of the high iron content of certain foods, but validity testing needs further investigation.

Reproducibility of a food frequency questionnaire for adolescents

Betzabeth Slater, Dirce Marchioni, Silvia Voci, Flávia Lima, Regina Fisberg
Public Health School/ USP, SAO PAULO, Brazil

The objective of this study was to assess the reproducibility of a validated 76 items food frequency questionnaire for assessment of the habitual diet among adolescents (AFFQ) living in Sao Paulo City. The reproducibility was evaluated using a test-retest study design, by administering the questionnaire twice to 50 high school students (aged 14-19 years). Intraclass correlation coefficient (ICC), weighted Kappa and percentage of agreement were used between the two AFFQ, in both crude and energy adjusted nutrient indexes. The differences between the individual intakes reported by students on the first and second AFFQ were compared using Wilcoxon signed-rank test. Bland Altman plots were used to examine the limits of agreement for energy and macronutrients between AFFQ1 e AFFQ2. The ICC between the two AFFQs ranged from 0, 48 to 0,65 in crude values and from 0,25 to 0,58 in adjusted values. The values for kappa weighted ranged from 0,28 to 0,56. Bland Altman shows a larger trend of difference in energy and fat according to values increase. Observed values indicated reasonable reliability and acceptable precision for classifying individuals according to their energy and most nutrients intake, but this precision differed according to sex.

P06-12

Development of an Interviewer administered meal based semi quantitative food frequency questionnaire (FFQ) in India

V Sudha[1], V Mohan[2], G Radhika[2], RM Sathya[2], A Ganesan[2]
[1]Dr. Mohan's Diabetes Research, , India
[2]Diabetes Specialities Centre, CHENNAI, India

Food Frequency Questionnaire (FFQ) needs to be developed and validated for each region to be culturally sensitive. As India has the largest number of people with diabetes, there is an urgent need for developing such a FFQ to understand the role of diet in disease. We report on the development of a FFQ for south Indians. 102 adult subjects aged = 20yrs (n=102) were randomly selected from the Chennai Urban Rural Epidemiology Study (CURES). A 222-item meal based semi quantitative FFQ was developed based on the usual dietary habits of the population. This was administered thrice (0, 6 &12 months) to assess the reproducibility. Multiple 24hr recalls administered at 2 month intervals for a period of one year were obtained to test the validity. Intraclass correlation for the 3 FFQs ranged from 0.72 for carbohydrates to 0.45 for folate. The session-wise average correlation of the FFQ (FFQ1 vs.. FFQ3) for macronutrients ranged from 0.42 for both breakfast and lunch to 0.68 for snacks. De-attenuated Pearson correlation for the energy adjusted nutrients between FFQ3 and 24hr recalls ranged from 0.73 for carbohydrates to 0.35 for calcium. This FFQ appears to be a robust tool to assess the dietary intake of south Indians

P06-13

Development and validation of a Food Frequency Questionnaire (FFQ) to measure histamine and thyramine intake in a Spanish population

Bahi Takkouche[1], Eugenia Lado-Lema[2], Carlos Regueira-Méndez[1], Nieves Aja[3], Rosa Meijide-Failde[4], Carmen Vidal-Carou[5], Cristobalina Rodríguez[6]
[1]University of Santiago de Compostela, SANTIAGO DE COMPOSTELA, Spain
[2]Consellería de Sanidade-Xunta de Galicia, SANTIAGO DE COMPOSTELA, Spain
[3]University of the Basque Country, SAN SEBASTIÁN, Spain
[4]University of A Coruña, A CORUÑA, Spain
[5]University of Barcelona, BARCELONA, Spain
[6]University of La Laguna, LA LAGUNA, Spain

To determine whether a diet rich in histamine and thyramine is a risk factor for frequent headaches in a large cohort study, we developed an FFQ with 26 different food items. These were selected based on the following criteria: 1) frequent consumption in the population, 3) variation of consumption between subjects, and 3) high content in either nutrient.
Fifty subjects were randomly selected from the study population to document the validity and reproducibility of the Questionnaire. We compared our questionnaire with a 12 –day diet record (2 nonconsecutive weekdays and one weekend day per season). For reproducibility, we administered the same FFQ one year later.
The Spearman coefficient of correlation between FFQ and record was 0.63 for histamine and 0.50 for thyramine. The intraclass correlation for reproducibility was 0.92 for histamine and 0.84 for thyramine.

These results show that our FFQ is a reasonably adequate tool for measuring long term amine intake. The correlation figures for validity would have probably been enhanced had we adjusted for total energy intake. This adjustment was not feasible because the FFQ did not cover complete diet of individuals but, for practical reasons, focused only on items that were relevant for the determination of amines.

P06-14

Minimizing the impact of systematic error through calibration of food frequency questionnaire for adolescents – AFFQ

Silvia Voci, Betzabeth Slater, Dirce Maria Marchioni
School of Public Health - USP, SÃO PAULO, Brazil

For proper interpretation of results from epidemiological studies that use food-frequency questionnaires (FFQs), it is necessary to know the relationship between these reported intakes and true usual intake. This study was developed to calibrate diet measures estimated by a developed and validated 76-item FFQ for assessment of adolescents' habitual diet (AFFQ). Methodology: Between May and August 2001, 79 adolescents, completed a FFQ and three 24-hour diet recalls (R24h). Calibration coefficients were estimated by linear regression of the 24-HDR on the FFQ1 measurements. Subsequently, the regress coefficient was used to calculate the calibrated nutrient intake. Results: Calibration coefficients estimated ranged from 0.10 for iron to 0.70 for unsaturated fat. The average values to protein were 68,92g for AFFQ (SD 11,53g) and 80,36g for R24h and calibrated value (SD 16,33g and 2,29g respectively). For carbohydrates, AFFQ median was 265,27g (SD 23,75g), 242,25g for R24h (SD 35,32g) and 242,15g for the calibrated value (SD 9,62g). Total lipids means were 76,56g for AFFQ (SD 9,08g), 79,54g for R24h (SD 12,43g) and 79,52g for calibrated value (SD 1,98g). Conclusion: Since the calibrated values very similar to the reference method, it's expected that the true relation between food intake and the disease studied will better estimated.

P06-15

Evaluation study of an electronic food frequency questionnaire for estimating calcium intake among multiethnic youth

Siew Sun Wong[1], Deborah Gustafson[2], Carol Boushey[3], Jeanne Gleason[4]
[1]Utah State University, LOGAN, United States of America
[2]Göteborgs Universitet, GÖTEBORG, Sweden
[3]Purdue University, WEST LAFAYETTE, United States of America
[4]New Mexico State University, LAS CRUCES, United States of America

OBJECTIVE. To evaluate a self-administered, electronic food frequency questionnaire (eFFQ) that estimates calcium intake among Asian, Hispanic, and White youth.
DESIGN. An eFFQ based on a list of 80 foods with corresponding food photos was evaluated for four consecutive weeks. Participants completed eFFQs during Weeks 1 and 4, and 24-hour dietary recalls (24hdrs) during each of Weeks 2 and 3.
SUBJECTS. A convenience sample of Asian (29%), Hispanic (36%), and White (35%) youth, aged 11 to 18 years old, living in Northern Utah (N=161).
RESULTS. The correlation of calcium intakes estimated by the first and second eFFQ, one month apart, was 0.72 (transformed Pearson's r) for the total sample (N=161). Correlations within subgroups were for males (r=0.59), females (r=0.81), 11-14 year olds (r=0.66), 15-18 year olds (r=0.82), Asians (r=0.73), Hispanics (r=0.76), and Whites (r=0.61). The correlation of calcium intakes estimated by the second eFFQ and the mean of two 24hdrs was 0.56 (deattenuated, transformed Pearson's r) for the total sample. Correlations were also significant for males (r=0.50), females (r=0.57), 11-14 year olds (r=0.56), 15-18 year olds (r=0.59), Asians (r=0.63), Hispanics (r=0.55) and Whites (r=0.57).
CONCLUSION. The eFFQ performs reasonably reliable in estimating calcium intake among multiethnic youth.

P07-01

Dietary diversity, nutritional status and time on daily activities of pregnant women in Caracas, Venezuela

Jennifer Bernal, Analy Pérez
Universidad Simón Bolívar, CARACAS, Venezuela

To determine dietary diversity (DD), nutritional status (NS) and time given to daily activities (TDA), a cross-sectional, descriptive and comparative research was performed with 89 voluntary healthy pregnant women, in a prenatal public consultation. To obtain DD, all the primary foodstuffs reported in a 24-hour consumption reminder were quantified. To estimate NS in pre-gestational and gestational, weight and size were measured. The Body Mass Index was determined for both periods. The TDA was obtained from 24-hour reminder for activities of previous day. SPSS 12 was used for statistical analysis. The DD of the sample was 15 + 4.4 foodstuffs/ day; pre-gestational NS deficient in 19,1% and excess in 16,9%; post-gestational NS, the deficit was 16,9% and the excess 38,2%. The average/day TDA was 10,7 hours for sleeping, 3,1 hours for watching TV and making visits and 2 hours for activities related with food, among others. During pregnancy, low DD, sedentary activities, could be one of the determiners of malnutrition from excess. Women be treated as healthy individuals performing a good level of activities, increase consumption of fruits and vegetables; to avoid overweight or obesity that may cause complications during childbirth in the short term and later, problems after childbirth.

P07-02

Seafood consumption in two large birth-cohorts in Denmark and Norway: large variations in intake levels and covariate structures across studies

Thorhallur Ingi Halldorsson[1], Margaretha Haugen[2], AL Brantsaeter[2], Helle Margrete Meltzer[2], Sjurdur Frodi Olsen[1]
[1]Statens Serum Institut, COPENHAGEN S, Denmark
[2]Norwegian Institute of Public Health, OSLO, Norway

Background: Fetal exposures to nutrients or pollutants from seafood have been linked to health phenomena throughout the offspring's life span, from cognitive development to male fecundity. We compared maternal seafood intake in the Danish National Birth Cohort and the Norwegian Mother and Child Cohort, to examine the potential for future coordinated analyses.
Methods: In both cohorts dietary intake was recorded by a similarly structured FFQ. In the Danish cohort (70189 observations), dietary intake was recorded in mid-pregnancy while in months four and five in the Norwegian cohort (19138 observations, recruitment ongoing).
Results: Median seafood consumption was 22g/day (25th centile=12g/day, 75th centile=36g/day) in the Danish cohort and 43g/day (25th centile=27g/day, 75th centile=61g/day) in the Norwegian cohort, and accounted for 1.6% and 3% of the total energy consumption, respectively. Consumption was strongly associated with higher education and less smoking in the Danish, but not in the Norwegian women.
Conclusion: The observed differences in covariate structures, enables rigorous testing of hypotheses relating seafood to health outcomes, by undertaking replication studies across the two cohorts. Moreover, pooled analyses will enable scrutiny of wider variation in seafood exposure, than in one cohort alone.
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Diet patterns of pregnant women attending antenatal clinic in Nakuru, Kenya

Elizabeth Mbuthia, I professor Elmadfa
Vienna university, VIENNA, Austria

Introduction: Nutritional needs are increased during pregnancy and therefore a variety of foods with enhanced nutrient density should be selected.
Objective:
Diet patterns of pregnant women attending the antenatal clinic and birth outcomes were investigated.
Methodology: An observational study was carried out in a hospital in Kenya from February 2004-July2005. Pregnant women were interviewed about their eating habits using a 24-hour recall. Birth weight was also taken.
Results: 239 women were interviewed. The intake of the following nutrients was found to be adequate: energy (94%), protein (101%), vitamin A (122%), and zinc (93.49). The intake of the following nutrients was found to be inadequate: fat (57.5%), total folic acid (53.1%), calcium (41.2), and iron (54.2%). Hemoglobin levels of a sub-group of the women were also analyzed (n=56, mean Hb=11.7g/dL). Total folic acid was the only nutrient that showed a correlation with birth weight (r=0.238, p=0.000).
Conclusion: Most of the foods were of plant origin and were also influenced by seasonal availability and this contributed to the low intake of some of the nutrients and the quality of the diet.

Maternal dietary intake in twin pregnancies: does it diminish towards term?

Ruth Morley[1], Mark Umstad[2], Jodie Bond[3], Vivienne Moore[4], Julie Owens[4], Terry Dwyer[5], John Carlin[1]
[1]University of Melbourne, MELBOURNE, Australia
[2]Royal Women's Hospital, MELBOURNE, Australia
[3]Royal Children's Hospital, MELBOURNE, Australia
[4]University of Adelaide, ADELAIDE, Australia
[5]Murdoch Childrens Research Institute, MELBOURNE, Australia

We tested the hypothesis that energy intake among women with twin pregnancies decreases in late gestation, as the uterus enlarges and they become increasingly uncomfortable.
We asked women to recall dietary intake for the previous 24 hours, every two weeks from around 29 weeks of gestation, using a photographic atlas and other strategies to estimate portion size. Eighty women provided data at around 29, 31, 33 and 35 weeks of gestation. We calculated total energy intake, and energy intake from carbohydrate, fat and protein.
Data were skewed so were log transformed. Using mixed effects regression models (with random slopes and intercepts), we found minimal evidence that total energy intake changed over this time period, either before or after adjustment for potential confounding factors. 95% CI for estimated change in energy intake per week was -1.4%, 0.6%; p=0.5. There was weak evidence of a decrease in carbohydrate intake over time, both before and after controlling for total energy intake, but no evidence of change in either fat or protein intake. 95% confidence intervals for estimated change per week, adjusting for total energy intake were: for carbohydrate -1.3 %, 0.1%, p=0.09; for fat -0.3%, 1.5%, p=0.2, and for protein -0.6%, 1.4%, p=0.4.

P07-05

24-hr energy intake of pregnant Nigerian women

Babatunde Oguntona
University of Agriculture, ABEOKUTA, OGUN STATE, Nigeria

A knowledge of the nutrient intake of pregnant women is central to the understanding of the issue of mother and child malnutrition. Despite the high prevalence of malnutrition among children and women in Nigeria, data on their nutrient, particularly energy intake (and therefore needs) are very few.

56 women in their 3rd trimester of their pregnancy were surveyed using an interactive 24-hr recall procedure over three days to estimate total food energy intake. Data were collected from three locations representing urban, rural and semi-urban settings. Overall, total food energy intake ranged from 3.89 MJ to 8.66 MJ per day. Mean intake was 4.72MJ, while the median was 4.81MJ (SE=1.5).

Only 17% of subjects met 100% RDA for energy. Another 12% met 75% of RDA while 60% of the subjects did not meet 50% of RDA. Mean intake for urban subjects was 5.51MJ; 4.90MJ for rural and 3.80MJ for semi-urban. While only 1 subject in the semi-urban setting met RDA, none in the rural area did.

Given that total energy expenditure for physical activities is generally considered to be high for rural populations, the result raises several questions about energy balance and possible adaptation in energy expenditure by pregnant Nigerian women.

P07-06

**Maternal dietary exposures assessed in the Danish National Birth Cohort:
prospective study of 70,000 pregnant women**

Sjurdur Olsen
University of Aarhus, COPENHAGEN S, Denmark

Numerous hypotheses link various aspects of the maternal diet to occurrences of adverse health outcomes such as malformations, impaired brain development, impaired male fecundity, and inceased risk of cardiovascular dieases or cancer in adult life. Follow up studies with sufficient size and data quality are needed to substantiate of refute these hypotheses. The Danish National Birth Cohort (DNBC) contains extensive information on maternal diet. By October 2002 100,000 women had been recruited while in their early pregnancies, for long term follow up of themselves and their offspring. The recruitment form, completed in gestation weeks 8-10, recorded periconceptional dietary supplements. A 19-pages dietary questionnaire, mailed to the women in gestation week 25, had three components: 1) food frequency questions regarding around 300 food items; 2) a component assessing quantified amounts of up to 8 different food supplements; and 3) a component asking about vegetarianism, organic foods, and pregnancy related changes in intake (aversions, cravings, pica). Some dietary information was also recorded in the four telephone interviews, undertaken in gestation weeks 12 and 30 and when the child was 6 and 18 months. I will present the basic structure, the current status of follow up, and show some selected dietary exposure characteristics.

P08-01

Using reported physical activity to identify invalid reporting of energy intake (EI) in The Alberta Cohort Study

Ilona Csizmadi, Christine Friedenreich, Paula Robson, Heather Bryant
Alberta Cancer Board, CALGARY, Canada

EI misreporting is a recognized problem in nutritional epidemiology. We explore the use of total energy expenditure (TEE), estimated from reported physical activity on a self-administered physical activity questionnaire (PAQ) and predicted resting energy expenditure (REE), to identify EI misreporting. Participants in the The Alberta Cohort Study with BMIs between 18.5 and 24.9 were used in this analysis (n=4415). EI was assessed using the NCI's Diet History Questionnaire (DHQ) modified for use in Canada. Metabolic equivalents (METs) derived from activity reported on the PAQ were converted to kilocalories (1 MET= 1kcal/kg/hr) for the estimation of the energy cost of physical activity. Physical activity level (PAL, TEE:REE) and individual level 95% CIs were calculated using a method described by Black (1). 95%CIs for PALs were compared with EI:REE to identify under-(<lower 95%CI), over- (>upper 95%CI) and acceptable reporters. Application of this criteria resulted in 41% of men and 41% of women identified as acceptable reporters, 55% of men and 58% of women as under-reporters and 4% of men and 1% of women as over-reporters of EI. The estimation of individual level PALs and 95%CIs for identifying EI misreporting in epidemiologic research requires further evaluation. (1) Int J Obesity (2000) 24: 1119-1130.

P08-02

Response bias in self-reported physical activity and dietary behaviours related to social desirability and weight status in African American girls

Lisa Klesges[1], Michelle Stockton[2], Jennifer Lanctot[2], Barbara McClanahan[2], Deborah Slawson[2], Lisa Klesges[1]
[1]Mayo Clinic, ROCHESTER, MN, United States of America
[2]University of Memphis, MEMPHIS, United States of America

Children's self-reported health behaviours may suffer response bias due to social desirability (SocD) and weight status. At baseline, 303 8-10 yr-old African-American girls were studied in a weight gain prevention intervention. Measures included: body mass index (BMI), 24-hr recall of water and sweetened beverage intake, accelerometer-measured all-day physical activity (PA), and psychosocial measures of PA and beverage preferences. After controlling for age, higher BMI correlated with lower daily PA (p <.01) and higher SocD correlated to lower PA preferences and self-concept (p < .05); neither BMI nor SocD was related to psychosocial measures or beverage intake (p's >.05). Linear regression models analyzed potential response bias due to SocD and BMI by including CSA-measured PA and beverage intake as 'criterion' dependent measures in respective equations with self-reported variables. After controlling for age, associations between PA level and PA self-concept, PA preferences, preference for sedentary behaviours, positive PA expectancies, and PA self-efficacy were lower at higher BMI (all p's < .001), but were not influenced by SocD. For beverage intake, neither BMI nor SocD were significantly influential. We conclude that BMI may bias girls' self-reported psychosocial PA measures by lowering estimates and associations with objectively measured PA.

P08-03

Impact of physical activity levels on under-reporters identification in a sample of children and adolescents living in Granada (Spain)

Miguel Mariscal Arcas[1], Cinzia Le Donne[2], Raffaela Piccinelli[2], Ana Maria Rivas Velasco[1], Davide Arcella[2], Maria Fatima Olea Serrano[1], Catherine Leclercq[2]
[1]University of Granada, GRANADA, Spain
[2]Nat. Research Institute Food Nutrition, ROME, Italy

Under-reporters are generally identified using cut-off values of Energy Intake (EI)/BMR ratio. The level of Physical Activity (PA) of the subjects is rarely taken into account. Data from children and adolescents (age 6-18 years) of Granada (Spain) were used to investigate the impact of the level of PA on the identification of under-reporters. 157 subjects were recruited at school (respectively 59% and 41% with moderate and light reported level of PA) and 67 among those attending organised sport activities (respectively 76% and 24% with moderate and high reported level of PA). EI was assessed through one 24h-recall and BMR was predicted on the basis of measured height and weight through Schofield's equations. EI/BMR ratio of each subject was calculated and compared with the standard cut-off value of 0.9. Subjects classified as under reporters resulted to be 20% of those recruited at school and 12% of those attending organised sport activities. The proportion decreased with the level of PA. It was respectively 23%, 16% and 12% of subjects with light, moderate and high PA. These results stress the importance of using specific cut-off points according to the level of PA in order to avoid misclassification.

P08-04

Accounting for underreporting using alternative methods improves the credibility of associations between dietary intakes and obesity: Results from EPIC-Spain

Michelle Mendez[1], CA Gonzalez[1], Collabora EPIC-Spain[2]
[1]Catalan Institute of Oncology, L'HOSPITALET-BARCELONA, Spain
[2]Spanish Public Health Services, ASTURIAS,GRANADA,MURCIA,NAVARRA,BASQUE C, Spain

Objective: Data from the European Prospective Investigation into Cancer and Nutrition-Spain were used to assess alternative methods of accounting for implausible energy reporters (IERs) on associations between body mass index (BMI) and dietary factors susceptible to underreporting.
Methods: 25,192 women and 15,167 men 29-65y with measured anthropometry and validated diet history data were included. IERs were identified using: the Goldberg method, comparing reported energy intakes to requirements estimated based on predicted BMR and reported activity; and a new method (Huang et el, 2005) based on energy expenditure predicted from doubly-labeled water equations. Multivariate linear regression was used to examine diet-BMI associations accounting for the presence of IERs. Effects of increasing the Goldberg cutpoint from 2 to 1.5 SDs, the value used with the newer method, were also examined.
Results: Excluding or adjusting for IERs reversed associations between BMI and energy, pastries, vegetables and fruit, yielding credible relationships, especially with more restrictive cutpoints. For example, in women, the multivariate association with the highest vegetable tertile was initially 0.37±0.07, but -0.19±09 and -0.23±0.07 after IER exclusion or adjustment, respectively (new method; p<0.05 for all).
Discussion: For dietary factors susceptible to bias, accounting for underreporting may be essential for valid associations with BMI.

Differences in dietary intake among Croatian adults with relationship to overweight status
Antonija Perl, Ljiljana Primorac, Milena Mandic, Daniela Kenjeric
Faculty of Food Technology, OSIJEK, Croatia

There are many factors which can cause overweight, yet the nutrition is one of the most important. Therefore, the aim of the present work was to compare dietary habits, regarding daily intake of nutrients which are sources of energy (proteins, fats, carbohydrates, alcohol), dietary fibre, minerals and vitamins, for normal weight as well as for overweight persons. The research was conducted on a sample of 45 subjects (18 overweight; BMI 27.0 kg/m2 and 27 normal weight subjects; BMI 21.8 kg/m2). Seven-day weighed dietary records were used to obtain data on the nutrient intakes. The mean daily intakes of all nutrients, except alcohol, were higher among overweight subjects, but the difference was statistically significant for the proteins (g/day, $p<0.05$ and % E, $p<0.01$), K, P, Fe, niacin, vitamin B6 and vitamin C ($p<0.05$) intake. The statistically significant difference only for certain nutrients can be justified with the fact that a number of overweight people underreported their intake.

Underreporting dietary energy intake in obese and normal weight adolescents.
Luana Santos[1], Isa Cintra[2], Mauro Fisberg[2], Lígia Martini[1]
[1]Sao Paulo University, SAO PAULO, Brazil
[2]Federal Sao Paulo University, SAO PAULO, Brazil

Introduction: Underreporting of dietary intake has been observed consistently in food consumption surveys, often associated with obesity.
Objective: To examine the prevalence of energy underreporting on obese and normal-weight adolescents and its associated factors.
Methods: Cross-sectional study with 96 post-pubertal adolescents (47 normal-weight and 49 obese), mean age of 16.6(1.3) years old. Weight and height were measured, and BMI was calculated. Body composition was assessed by DXA. Dietary intake was evaluated by a 3-day dietary record. Underreporters was considered as energy intake (EI)<1.35*BMR according to Goldberg et al. or 0.70*BMR with Black's calculation.
Results: Prevalence of underreporting was highest in obese subjects, independent of the cut-off values used: 14.3% vs. 0% in normal-weight adolescents with Black´s calculation and 83.6% vs. 46.8% with Goldberg´s cut-off. Male adolescents had higher underreporting than female, independent of nutritional status and method. Obese underreporters presented significantly lower macronutrients and saturated fat intakes. Furthermore, EI/BMR was inversely associated to body fat ($r=-0.304$, $p<0.001$).
Conclusions: These data demonstrated a high percentage of energy underreporting in obese adolescents, and suggests that the energy adjusted intake values according to the residual method should be employed in diet-disease risk analysis in order to contribute to decrease errors associated with underreporting.

Food habit change in the past and obesity status influences the association between dietary factors and postmenopausal breast cancer

Emily Sonestedt, Elisabet Wirfält, Bo Gullberg
Department of Clinical Sciences, Malmö, MALMÖ, Sweden

Background: Valid dietary data is essential when identifying the dietary exposure responsible for diseases. No study has shown the implication of self reported food habit change in the past when investigating diet-disease relations.
Objectives: We examined the dietary quality among women who report dietary change in the past, and how the association between dietary factors and postmenopausal breast cancer is influenced by dietary change and obesity status.
Design: In a sub sample of 12 781 women from Malmö Diet and Cancer cohort, 428 postmenopausal women were diagnosed with incident breast cancer.
Results: Past food habit changers reported healthier food habits and lower energy intake compared with non-changers. When excluding diet-changers, the trend of increased breast cancer risk across omega-6 quintiles was stronger, and a tendency emerged of decreased risk for 'fruit, berries and vegetables'. In women with BMI <27 trends of increased risks were seen for total fat and omega-6 fatty acids, and decreased risk for 'fruit, berries, and vegetables'.
Conclusions: This study indicates that both obesity and self-reported past food habit change are important confounders of the diet-breast cancer relations. The study demonstrates the importance of stratified analysis to avoid erroneous conclusions.

Using the NCI method for estimating an individual's usual intake when calculating probability of adequacy

V Kipnis[1], Patricia Guenther[2], Dennis Buckman[3], Kevin Dodd[1], Susan Krebs-Smith[1], D Midthune[1], Amy Subar[1], Janet Tooze[4], Laurence Freedman[5]
[1]National Cancer Institute, BETHESDA, MD, United States of America
[2]US Department of Agriculture, WASHINGTON, DC, United States of America
[3]Information Management Services, SIVER SPRING, MARYLAND, United States of America
[4]Wake Forest University, WINSTON-SALEM, NC, United States of America
[5]Gertner Institute for Epidemiology, TEL HASHOMER, Israel

Dietary assessment of nutrient intake by individuals in a clinical setting is being guided by the Institute of Medicine report that advocates the probability of adequacy approach. This method requires an estimate of the individual's usual nutrient intake as a starting point. Currently, the mean of two or three 24-hour recalls (24HR) is often used for this purpose. This may produce inadequate estimates of long-term usual intake. A new method has been developed at the US National Cancer Institute (NCI) for estimating usual intake, using a statistical model based on 24HR assessments from a representative national survey. Personal characteristics, such as gender, age, and race may be used as covariates to refine the estimates of an individual's usual nutrient intake. Applying the NCI method to 24HR data, we show that such estimates can also be enhanced considerably by including reported frequencies from a food frequency questionnaire as an additional covariate in the model. Finally, we present simulation results demonstrating that the NCI method provides unbiased estimates of an individual's usual intake, thereby improving the application of the probability of adequacy approach.

P09-02

French individual national food consumption survey 2 (2005-2006): results of a pilot study

Lionel LAFAY[1], Mathilde Touvier[1], Sandrine Lioret-Suteau[1], Valérie Blineau[2], Marc Christine[3], Ariane Dufour[1], Jean-Luc Volatier[1]
[1]French Food Safety Agency, MAISONS-ALFORT, France
[2]ISL, PARIS, France
[3]INSEE, PARIS, France

The French Food Safety Agency has planned a representative national study on food intake and behaviour using a 7-day food record. To evaluate the participation rate and the feasibility of the protocol, a pilot study was conducted in 2 urban and one rural/urban areas.
Two databases of household addresses were obtained from the last French census (1999): one to recruit children (households with at least one child aged 14 y or less in 1999) and one to recruit adults. One person per household was randomly selected. To present the study and to include subjects, 898 addresses were contacted, either by a phone call (52% of the sample) or by a face-to-face visit. The participation rate was higher for children (48 %) than for adults (43 %). Data concerning the participants were compared to those obtained from the census: households whom the householder was active or household from rural area were over-represented. Nevertheless, a first contact by a face-to-face visit enables to recruit more households with jobless or retired householders, single and couples with no child, and those living in blocks. A similar design, with both kinds of contacts, will be used for the national survey.

P09-03

The importance of error checking after data-entry of open-ended dietary methods: CHEDDAR

Marleen Lentjes, Ailsa Welch, Alison McTaggart, Angela Mulligan, Sheila A Bingham
University of Cambridge, CAMBRIDGE, United Kingdom

Introduction: In the Norfolk arm of the European Investigation into Cancer (EPIC-Norfolk) 7-day food diaries were completed by 92% of the participants (1). These diaries are analysed using the program Data Into Nutrients for Epidemiological Research (DINER) (2). Although data-entry is structured, it leaves room for interpretation and errors. To systematically reduce the number of errors in data-entry and databases, checks and programs were developed and documented in CHEDDAR (Correct Handling of EPIC-Norfolk Data to Diminish Awful Results).
Method: CHEDDAR describes how checking needs to be done for missing days, meals, foods, portion weights, conversion factors, duplicated foods, incorrect interpretation of diary items and extreme nutrient values.
Results: Sets of food diaries were analysed with and without CHEDDAR. Analyses were performed to investigate the effects.
Conclusion: The extent to which errors corrected during diary processing affect the overall average and distribution of dialy intake will be shown.
(1) Bingham SA et al. Nutritional methods in the European Prospective Investigation of Cancer in Norfolk. Public Health Nutrition 2000(4), 847-858.
(2) Welch AA et al. DINER (Data Into Nutrients for Epidemiological Research)-a new data-entry program for nutritional analysis in the EPIC-Norfolk cohort and the 7-day diary method. Public Health Nutrition 2001(4), 1253-1265.

P09-04

The effect of missing nutrient database values on average daily intakes of a-carotene and b-carotene equivalent in EPIC-Norfolk cohort.

Subodha Shakya Shrestha[1], Sheila A Bingham[2], Kay-Tee Khaw[1], Ailsa Welch[1]
[1]The University of Cambridge, CAMBRIDGE, United Kingdom
[2]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

The validity of food intake data in terms of nutrient intake is based on the availability and accuracy of food composition data. The current food composition tables only provide data on a limited number of food items. Where the nutrient content of a food is not known, 'zero' values are applied in dietary calculations. This underestimates the intake of these nutrients1,2 as in most cases the actual amount in food will not be zero. We have infilled missing food composition data for a-carotene and b-carotene equivalent in 1,266 commonly consumed foods by EPIC population. We propose to examine the impact of missing a-carotene and b-carotene equivalent data in McCance and Widdowson's food composition tables on the average intake and distribution of these nutrients in a study of 6,988 men and women aged 45-79 years derived from 7-day food diaries. Preliminary analysis suggests increases of about 23% in average daily intakes of both the nutrients after infilling.

1 Cowin I, Emmett P. EJCN (1999) 53:891-894.
2 Black AE, Paul AA, Hall C. Hum Nutr Appl Nutr (1985) 39(1):9-22.

P09-05

Performance of a food frequency questionnaire in the national institutes of health-aarp diet and health study

Frances Thompson[1], Douglas Midthune[1], Victor Kipnis[1], Laurence Freedman[2], Raymond Carroll[3], Amy Subar[1], Charles Brown[1], Michael Leitzmann[1], Traci Mouw[1], Arthur Schatzkin[1]
[1]U.S. National Cancer Institute, ROCKVILLE, MD, United States of America
[2]Gertner Institute for Epidemiology, TEL HASHOMER, Israel
[3]Texas A&M University, COLLEGE STATION, United States of America

The U.S. National Institute of Health-AARP Diet and Health Study is a cohort of 566,721 United States residents aged 50-69 years at baseline in 1995. We evaluated the performance of its baseline food frequency questionnaire (FFQ) by comparing it to 2 24-hour dietary recalls (24HR), collected from 2053 individuals. Mean reported intakes from the two methods were within 15% of each other for 42 of 52 nutrient-by-gender comparisons. When adjusted for reported energy intake, estimated correlation coefficients between the FFQ and ?true? intake ranged from 0.42 to 0.71; attenuation factors ranged from 0.26 to 0.66. Probable bias in the 24HR, however, implies that correlation coefficients and attenuation factors are actually lower than those observed. In this cohort, we estimate that true attenuation in FFQ macronutrient estimates is too severe to detect outcome relationships. However, true attenuation is less problematic with energy-adjusted macronutrients, allowing detection of small to moderate relative risks (< 2.0) in this large cohort study.

A statistical model for estimating the usual intake of foods: description and applications

Janet Tooze[1], Laurence Freedman[2], Douglas Midthune[3], Kevin Dodd[3], Amy Subar[3], Susan Krebs-Smith[3], Patricia Guenther[4], Victor Kipnis[3]
[1]Wake Forest University School of Medicin, WINSTON-SALEM, NC, United States of America
[2]Bar Ilan University, RAMAT GAN, Israel
[3]National Cancer Institute, BETHESDA, MD, United States of America
[4]Center for Nutrition Policy and Preventi, ALEXANDRIA, VA, United States of America

It is difficult to develop estimates of usual intake for most foods based on only a few (usually two) 24 hour recalls (24HRs), as are often used in dietary surveillance, using currently available methods. A two-part statistical model has been developed for this purpose, which can accommodate the large number of non-consumption days that arise for episodically consumed foods, and the correlation that usually exists between the probability of consuming a food and the amount consumed. This model may be used for a variety of situations requiring estimation of usual intake of foods including: (1) the distribution of usual food intake for a population or subpopulation, (2) individual food intake for use in a disease model, and (3) approximating the effects of individual covariates on food consumption. Covariates, including a food frequency questionnaire (FFQ), may be incorporated in the statistical model for all three applications, but the importance of including covariates in the model differs greatly by the application of interest. The three applications of the model will be illustrated using data from the Eating at America's Table Study and simulation studies.

Missing cases and their impact on results interpretation on the example of preferences and dairy products intake frequency

Lidia Wadolowska[1], Lidia Wadolowska[1], Karina Wadolowska[2]
[1]University of Warmia and Mazury, OLSZTYN, Poland
[2]Warsaw University, WARSAW, Poland

Objective: Impact of three missing cases levels on the quantitive features results interpretation was analyzed on the example of preferences and dairy products intake frequency.
Materials and methods: Analysis included data from 3401 youth aged 13-18. Data concerned preferences and dairy products intake frequency, described by 5-point hedonic scale. Complete data file was decreased by 10%, 25% and 50% of cases in random drawing. Poststratification of the incomplete data sets was conducted, with regards to age and sex. The obtained results were compared using the T and chi-square test.
Results: In complete and incomplete data sets, with or without stratification, no differences were revealed in: (i) single variables means, (ii) agregated variables means and (iii) agregated variables means distributions. Moreover, preferences showed no differences in single variables distributions. The intake frequency had differences in single variables distributions for 7 products (10% incomplete data set), 8 products (25%) and 6 products (50%) out of 13 products.
Conclusions: In the analyzed data set the missing data level did not have impact on results and interpretation of single or agregated means values. The revealed for single variables distributions differences depended not on the missing cases number but on variables characteristics.

P10-01

Variations in diet influence body composition, age at menarche and hormonal profiles among young women in Norway. The EBBA-I study

Sissi Espetvedt[1], Aina Emaus[2], A Hjartaaker[3], A Furberg[4], G Jasienska[5], P Ellison[6], N Potichman[7], Inger Thune[8]
OSLO, Norway
[2]Department of oncology, OSLO, Norway
[3]IMB, UNIVERSITY OF OSLO, Norway
[4]University Hospital of Northern-Norway, TROMSOE, Norway
[5]Jagiellonian University, KRAKOW, Poland
[6]Harvard University, BOSTON, United States of America
[7]National Cancer Institute, WASHINGTON, United States of America
[8]Department of Oncology, ULLEVAL UNIVERSITY HOSPITAL, OSLO, Norway

Aim: The aim of the present study was to elucidate how variation in diet using a pre-coded food diary may interact with biomarkers of breast cancer risk.
Material and Methods: Among 206 women in The EBBA-1 (Energy Balance and Breast cancer Aspects) in Norway, dietary data was collected during a menstrual cycle. The women recorded the type and the portion of every food item consumed during 24 hours in a pre-coded food diary. We used a photographic booklet to illustrate portion sizes. Average daily intake of energy and fat were computed. Height and weight were measured and age at menarche was assessed. Ovarian steroids concentrations were assessed by daily salivary samples .Results: Women with a mean age of 30.7, reported mean energy intake of 8088.3 kJ/day and mean fat intake was 77.2g/day. We observed a positive dose-relationship between energy and fat intake and height. No association was observed between energy and fat intake and ovarian steroid levels. In contrast, the tallest women reported the highest age at menarche, while high prepubertal body weight were associated with low age at menarche.
Discussion/Conclusion: A pre-coded food-diary may be a valid method when studying diet in relation to biomarkers of breast cancer risk.

P10-02

Dietary assessments of eating habits of children and mothers in Okinawa Prefecture, Japan

Noriko Iwama[1], shigeji Miyagi[2]
[1]Junior college of kagawa nutrition unive, TOKYO, Japan
[2]Kagawa nutrition university, SAKADO, Japan

Japan has the longest life expectancy at birth in the world. Okinawa previously had the highest longevity indices in the country. However, the latest life expectancy for men of middle aged in Okinawa is no higher than the national average. We conducted a questionnaire survey among children and their parents, with the aim of examine their dietary awareness and behavior in suburb of Okinawa prefecture of Japan. The subjects were 158 junior high school students, aged 13-14, and their mothers, aged 30-50. They answered to questionnaire at their class room, while their parents answered to questionnaire at own house. The results were shown that 65% of mothers ate breakfast everyday. Within children of mother which did not eating breakfast , the children of 32% did not also eat breakfast everyday in the same their mothers. The many mothers of 70% considered that the intake of well balanced nutrients was very important for usual diets, however, their cooking times of breakfast were slightly within 15-30 minutes for 87% within mother subjects. We indicated that Okinawa's mothers were necessary to the appropriate guidance for eating habits, and the improvements of mothers will invite to good eating habits of their children.

P10-03

Causes of growth faltering among children aged 6-36 months in rural areas in Amol, Iran

Naser Kalantari
Shaheead Beheshti Medical University, TEHRAN, Iran

Background: Growth faltering is the first sign of malnutrition indicated by the growth curve. Since there was no information among children in the rural areas in Amol, This study was designed to do so.
Methodology: Of the children aged 6-36 months refered to the health care centers, 92 were selected as the case group, 87 as the Control group. The children were matched for their gender and sex. Data collection were performed through questionnaire, interviews and scaling the height and weight of both the child and mother. The data were analyzed using SPSS, EP16 and HG softwares.
Results: Growth faltering was correlated with exclusive breast feeding (P=0.002), with the child dietary pattern (P<0.001), with the mean value of general dietary awareness of the mother (P<0.001), with maternal motivation for scaling of the child (P<0.002), and with the mean value of the mother's child- care behavior (P<0.006).
Conclusion: The findings of the study indicate that mother's general dietary awareness, her motivation to follow up the child growth, child- care behavior (background variables), and dietary pattern (direct and basic variables) are the most important variables to influence on growth faltering.

P10-04

Determinants of overweight in Dutch children – the KOALA Birth Cohort Study

Annette Stafleu[1], MCJF Jansen[2], I Bakker[2], C Thijs[3], PJF Vries de[4], C Veraart[5], J Messing-Verheesen[5], RA Goldbohm[2]
[1]TNO Quality of Life, ZEIST, The Netherlands
[2]TNO, ZEIST, The Netherlands
[3]University of Maastricht, MAASTRICHT, The Netherlands
[4]Friesland Foods, DEVENTER, The Netherlands
[5]Suikerstichting, BAARN, The Netherlands

Determinants of overweight in Dutch children will be studied in the KOALA Birth Cohort Study, the Netherlands. The original aim of the KOALA study in the Netherlands is to identify factors that influence the clinical expression of atopic disease with a main focus on lifestyle. The recruitment of the pregnant women started in 2000. In total, 2834 pregnant women and their newborn children participate in the cohort. All participants were enrolled between 14-18 weeks of gestation. Measurement of relevant variables took place at 14-18, 30 and 34 weeks of gestation and 3, 7, 12 and 24 months postpartum. End 2005 we extended the cohort with a new research area 'Determinants of overweight'. Aim of this new subproject is to investigate the (interactions) of determinants of the development of overweight in schoolchildren. Food consumption (energy intake), physical (in)activity, environmental factors, social psychological determinants of energy intake and activity, parental style and antropometric measures will be assessed at the age of 4 and 6 years. This new data will be combined with information gathered during pregnancy and early childhood (like birth weight and breast feeding) in data analysis. Design and methods of the extended study will be presented.

P10-05

Justifications, gaps and needs for new dietary and physical activity assessment methods for children under two years of age

Douglas Taren
University of Arizona, TUCSON, ARIZONA, United States of America

Collecting dietary and physical activity data for children less than 2 years of age need to account for all the issues associated with adults and numerous additional factors such as the use of proxy reporters. As can be seen by the submission of papers to this international conference, there is currently a limited amount of research being conducted on improving methods to measure dietary and physical activity patterns of children less than 2 years of age. Additional information for this young pediatric population is important in industrialized countries in order to understand any early programming that may occur that relates to obesity and other chronic diseases. In less industrialized countries, especially in Africa and Asia, better measures will support current studies on under-nutrition and on how infant feeding behaviors are related to mother-to-child HIV transmission.

Historically, studies have been limited to clinical situations using a small number of subjects and were not applicable for large epidemiological studies such as those that measured the amount of breastmilk a child received using weighing before and after feedings. We now need methods that are applicable to large cohort studies. Similarly, there are few studies on factors related to energy expenditure of toddlers once they start crawling and walking. Developing new state-of-the-art methods to measure dietary and physical activity in this population will help determine how the nutrition transition in many countries is affecting the youngest children. In developing countries, better quantification of viral exposure will be obtained with validated methods on infant feeding.

Finally, these methods are needed for longitudinal studies that will account for the dynamic physiological changes that occur over a few months within this age group. The methods from these studies should also be applicable for creating outcome measures for large intervention studies.

P10-06

Anaemia and micronutrient deficiencies (MND) and reported feeding patterns among Jewish and Bedouin infants in southern Israel.

Natalya Bilenko[1], Natalya Bilenko[2], Ilana Belmaker[3], Drora Fraser[4]
[1]Ben-Gurion University of the Negev, BEER-SHEBA, Israel
[2]SD Abraham Int Centr for Health&Nutr, , Israel
[3]Ministry of Health, BEER-SHEBA, Israel
[4]BGU, Epidemiology dept., BEER-SHEBA, Israel

Background. Early detection of anaemia and MND are important for treating and preventing their consequences.

The objective of this analysis was to assess rates of anaemia and other MND in Jewish and Bedouin Israeli infants at age 6 months, and to examine their associations with prior feeding patterns.

Methods. The study includes 224 Jewish and Bedouin infants. Children who were exclusively breastfed were not included. Laboratory tests were performed on venous blood and the FFQ was completed by interviewing the mother regarding the past month's feeding practices.

Results. 60% of infants were anaemic (hemoglobin <11 g/dl) and 15% had severe anaemia (Hb<10g/dl), 70% had low hematocrit concentration (<33%), 36% had high red blood cell distribution width (RDW >14%), 80% had low MCV (<77fL), 5% had marginal vitamin B12 deficiency (between 162 and 221pmol/L) and 7.5% were zinc deficient (<60µg/dl). Frequency of formula intake per day was protective for anemia (multivariable logistic regression model), after adjustment for ethnicity, breastfeeding and other reported foods (OR=0.8, 95% CI, 0.71-0.98, p=0.02). Bedouin origin was an independent risk factor for anaemia (OR=2.1, 95% CI, 1.17-3.96, p=0.01). Conclusions: A short FFQ including breastfeeding might serve as a screening tool for anaemia at 6 months of age.

P10-08

Prediction of fat-free body mass from bioelectrical impedance among 9-11 year-old Swedish children

Birgit Marie Nielsen[1], Magnus Dencker[2], Leigh C. Ward[3], Christian Lindén[2], Ola Thorsson[2], Magnus Karlsson[2], Berit Heitmann[1]
[1]Institute of Preventive Medicine, COPENHAGEN, Denmark
[2]Malmö University Hospital, MALMÖ, Sweden
[3]University of Queensland, BRISBANE, Australia

Aim: Predictive equations for estimating body composition from bioelectrical impedance analysis (BIA) among Scandinavian children are lacking. In the present study, equations for estimation of fat free body mass (FFM) and lean tissue mass (LTM) were developed and cross-validated from BIA using dual energy X-ray absorptiometry (DXA) as the reference measurement of body composition.
Methods: The study population consisted of 49 girls and 52 boys aged 9-11 years from Malmö, Sweden. BIA was measured between hand and foot at 50 kHz. Predictive equations were developed by multiple linear regression, and cross-validated against DXA-measurements of body composition.
Results: FFM was predicted from BIA and anthropometric variables with an adjusted $R2=0.95$ and RMSE =0.84kg, and LTM was predicted with an adjusted $R2=0.95$ and RMSE=0.87kg. Cross validation revealed a mean RMSE=0.95kg FFM, and a mean RMSE=0.96kg LTM.
Conclusion: FFM and LTM are predicted with sufficient accuracy at the population level. We recommend that the predictive equations developed in the present study are used in pre-pubescent Europeans aged 9-11y only, in order to minimize confounding of results because of possible differences in population samples.

P10-09

Relation between hydration status in children and their dietary profile – Results from the DONALD Study

Anna Stahl, Anja Kroke, Friedrich Manz
Research Institute for Child Nutrition, DORTMUND, Germany

Current research indicates that hydration status (HS) is both influenced by the diet and an influencing factor for dietary behaviour itself. To describe associations between HS and dietary behaviour, data from the DOrtmund Nutritional and Anthropometric Longitudinally Designed (DONALD) Study were examined. Using previous analyses of 24-h urine samples, HS was determined by calculating the 'free water reserve'. Children (age 4-11 years; N=717) were categorised into groups of HS and assessed for significant differences in their dietary profile. 3-day weighed food records described the dietary profile of the children (e.g. total energy and fluid intake intake, energy density, macronutrient composition, proportion of fluids from beverages, food and metabolism). Children in the highest group of the HS had a significantly lower energy density of the diet, higher total water intake, higher proportion of water from beverages and a lower proportion of metabolic water compared to children in the lowest group of the hydration status. Accordingly, euhydrated children, that are children with positive 'free water reserve' values, had a more preferable dietary profile than children at risk of insufficient hydration.
In summary, the biomarker for HS 'free water reserve' provides a useful non-invasive tool to describe an important aspect of dietary status.

P11-01

Validation of energy intake using an objective method
Lene Frost Andersen, Inger Therese Lillegaard, Anne Marte Johansen, Bo-Egil Hustvedt
University of Oslo, OSLO, Norway

In the present study ActiReg® was used to measure energy expenditure (EE) and validate energy intake (EI) estimated from food diaries in Norwegian schoolchildren and adults. ActiReg® is a validated position and movement monitor developed at the Department of Nutrition.

Studies were conducted in three age groups; 51 4th graders, 31 8th graders and 120 adults. Food intake was recorded for four or seven consecutive days using food diaries and participants wore ActiReg® during the same period.

On average EI was underestimated with 18%, 24% and 17% among 4th graders, 8th graders and adults, respectively. The width of the 95% confidence limits of agreement in Bland and Altman plots for EI and EE were large in all age groups. The Pearson correlation coefficients between reported EI and EE were 0.28 (p=0.05), 0.74 (p<0.001) and 0.49 (p<0.001) for the three age groups.

In summary, the data showed that there was substantial variability in the accuracy of the food diary at the individual level in all age groups. Furthermore, the diary underestimated the average energy intake. The ability of the food diary to rank individuals according to energy intake was found to be good among the 8th graders and moderate among adults.

P11-02

Validity of the reported energy expenditure and the reported dietary intake of rheumatoid arthritis patients in a dietary intervention study
Linda Hagfors[1], Klaas Westerterp[2], Lars Sköldstam[3], Gunnar Johansson[4]
UMEÅ, Sweden
[2]Department of Human Biology, MAASTRICHT, The Netherlands
[3]Department of Medicine, Visby Hospital, VISBY, Sweden
[4]Department of Food and Nutrition, UMEÅ, Sweden

Objectives: The aim of the study was to validate a three-day activity registration (AR) and a diet history interview (DHI) method with biological markers.
Methods: The reported dietary intake of 33 rheumatoid arthritis patients (17 patients on a Mediterranean-type diet and 16 patients on a control diet) participating in a dietary intervention study was assessed using the DHI method. The total energy expenditure (TEE), estimated by a three-day AR, was used to validate the energy intake (EI). For nine subjects the activity registration was also validated by means of the doubly labelled water (DLW) method. The excretion of nitrogen, sodium and potassium in 24-h urine samples was used to validate the intake of protein, sodium and potassium.
Results: There was no significant difference between the EI and the TEE estimated by the AR or between the intake of protein, sodium and potassium and their respective biological markers. However, in general the AR underestimated the TEE compared to the DLW method.
Conclusion: These results indicate that the DHI could capture the dietary intake fairly well. However, the AR showed a bias towards underestimation when compared to the DLW method, which illustrates the importance of valid biological markers.

P12-01

Seasonal variation of nutritional intake and quality in adults aged over 50 in Korean rural areas

Jeongsook CHOE[1], Sung Ok Kwon[1], Hee-Young Paik[2]
[1]Rural Resources Development Institute, R, SUWON, South-Korea
[2]Seoul National University, SEOUL, South-Korea

The purpose of this study was to estimate seasonal variation of nutritional intake and quality in adults. Mean daily intakes of most of the vitamins and minerals were lower than RDA except vitamin C and folate, especially %RDAs of Ca, vitamin D, vitamin B2, vitamin E were less than 60% of RDA. In general, nutrient intakes were high in spring compared to other seasons except vitamin C which was high in fall and winter. Energy intake ratios from protein was significantly high in spring. Both MAR and INQ were significantly different among sex and seasons, values were higher in males than in females and were higher in spring with the exception of vitamin C. In conclusion, subjects in Korean rural areas did not consume enough nutrients quantitatively as well as qualitatively, especially Ca, vitamin A, and vitamin B2. Also mean daily intakes of most of vitamins and minerals were insufficient in females, and were significantly different among season. Therefore we must consider a counterplan to augment nutrition intake for them. In addition, it seems to be essential to add micro nutrients to the food composition database to estimate dietary intakes more accurately.

P12-02

Whole Grain Intake in the USA: Assessment using dietary guidance-based servings versus gram amounts

Linda Cleveland
U.S. Department of Agriculture, BELTSVILLE, MD, United States of America

In the USA, whole grain intake is typically assessed in servings rather than gram amounts. This permits comparison to national dietary guidance to eat at least 3 servings of whole grains daily. Servings are defined in household units consumers understand (e.g., slices of bread; cups of cereal, rice, or pasta). But servings, as defined by the guidance, do not contain equal gram amounts of whole grain. A bread serving contains about 16 grams while a cereal, rice, or pasta serving contains about 28 grams. To examine associations between whole grain intake and health outcomes, researchers need to know the grams of whole grain consumed rather than the servings. This study uses 24-hour recall data from the 2001-2004 National Health and Nutrition Examination Survey to estimate mean intake of whole grain and non-whole-grain in terms of both servings and grams per day, and to determine the grams of whole grain consumed by individuals who eat 1, 2, and 3 whole-grain servings per day. The percent contribution of food groups to whole grain intake is estimated and contrasted when intake is defined in servings and in grams.

P12-03

European food consumption validation (EFCOVAL)

Evelien De Boer[1], Pieter Van 't Veer[2], Ellen Trolle[3], Kurt Hoffman[4], Catherine Leclerq[5], Max Feinberg[6], Nadia Slimani[7], Marga Ocke[8]
[1]TNO Quality of Life, ZEIST, The Netherlands
[2]Wageningen University, WAGENINGEN, The Netherlands
[3]DFVF, SOBORG, Denmark
[4]DIfE, POSTDAM, Germany
[5]INRAN, ROME, Italy
[6]INRA, VERSAILLES, France
[7]IARC, LYON, France
[8]RIVM, BILTHOVEN, The Netherlands

In 2000-2002 the project European Food Consumption Survey Method (EFCOSUM) was undertaken within the framework of the EU programme on Health Monitoring. The aim of EFCOSUM was to advise a method for monitoring food consumption in nationally representative samples in Europe in a comparable way. For a new pan-European food consumption surveillance to provide comparable dietary intake data, EFCOSUM advised a surveillance on individual level using a repeated 24-hour recall to increase reliability. EPIC-SOFT was advised as the software of choice to collect 24-hour recalls in all EU countries. In 2005 the EU-KP6 proposal for EFCOVAL was submitted aiming at validating the food consumption instrument proposed by EFCOSUM to assess intake of foods, nutrients and potentially hazardous chemicals within the European population including children. EFCOVAL will operate along three main objectives: trans European implementation, upgrade, extension and validation of the technical instrument EPIC-SOFT and methodologies to translate food consumption data to key information for food policymakers, each with several activities grouped under work packages. The Commission favorably reviewed the proposal and the proposed starting date is determined at March 2006. In the meeting more detailed information on the objectives will be presented.

P12-04

Design and development of a self-administered food frequency questionnaire (FFQ) for National Iranian Teachers Cohort Study

Anahita HoushiarRad, Morteza Abdollahi
National Nutrition and Food Technology R, TEHRAN, Iran

Food frequency questionnaires (FFQ) are the most preferred tools to assess habitual dietary intake in epidemiological studies. The purpose of this study was to develop a self-administered FFQ to measure an individual's habitual food and nutrient intake during the preceding year.
The recent national household food consumption survey data were used to select foods commonly consumed in Iran. From among 7000 different foods reported during 24000 interviews (24 hour recalls), foods having similar nutrients were combined into 400 foods/ food groups by a research nutritionist. Foods consumed by less than 10% of households were excluded from further analysis. Using stepwise regression method 100 food items were included in the final FFQ which could explain at least 90% of the variance in the consumption of energy and 10 key nutrients. To measure usual consumption 9 frequency categories, ranging from never to = 3 times per day were included. The medium serving size was defined by natural or household units. Small and large portion sizes were defined as a proportion of the medium serving.
For seasonal food items, average intakes in the season were asked. This FFQ can be used in epidemiological studies diet and NCD in adult population.

Development of a nutritional knowledge and attitude-questionnaire
Mats Persson
Lund University, MALMO, Sweden

Background: Inadequate knowledge of patients' nutritional needs, by personnel in institutional care, may lead to malnutrition in patients. The aim of the survey was to assess attitudes and knowledge concerning elderly patients' nutritional care.
Method: The surveys where collected at 14 one-day-courses concerning nutrition for registered nurses (RN's), nurse assistants (NA's), diet/kitchen staff (DKS's) and nursing students (NS's). The response frequency was 86% (N=631) and 94% were females.
Results: Fifty-six percent could not assess energy requirements correctly. Newly admitted patients should be assessed according to 95% of all answers, by the RN´s according to 70% of the answers. Of the RN's 53% considered themselves to have inadequate knowledge for assessment. Patients in institutional care should be weighed at least once a month according to 57% of the questioned. Knowledge of BMI was best known by the NS's (94%). Of DKS's 87% considered 3 - 4 between meal snacks/day adequate, corresponding to 48% of the NA's. Eight percent of the respondents thought the questionnaire was difficult to complete and 4% that the questions where difficult to understand.
Summary: The results indicate areas were education is needed. Continuous data collection takes place for a validating-and-reproducibility-testing of the knowledge and attitude-questionnaire.

Beyond nutrient assessment: psychosocial influences on dietary intake
Beverly McCabe-Sellers, Cathleen McFarlin, Terrance Norris, Earline Strickland, Margaret Bogle
USDA, Agricultural Research Service, LITTLE ROCK, ARKANSAS, United States of America

Design and funding of nutrition interventions are increasingly requiring assessment not only of current dietary intake but also assessment of nutrition behavioral factors such as intent to act, self-efficacy, and other psychosocial influences. This study presents WillTry, a new instrument to assess factors affecting willingness to try new foods in rural populations. Parents describe their perceptions of their children's, their own willingness to try new foods or new dishes, and in what settings. Older children were also asked to answer the 18-item questionnaire with the assistance of visual and descriptions of new foods. Respondents are asked to rate their levels of eating 'pickiness' and overall diet quality. This instrument was developed following community assessment workshops using the Comprehensive Participatory Planning and Evaluation (CPPE) model for community based participatory research. Rural community members gave unwillingness to try new foods as an underlying root problem in improving nutrition in the Lower Mississippi Delta region, a medically underserved and minority population with high rates of nutritionally responsive diseases. This and other instruments promise a better understanding of dietary behaviors through greater community participation in the planning of nutrition interventions and social marketing to promote better health through nutrition in high risk populations.

P12-07

Benefits of the use of a multi-operator data management system for the collection of consumption data through food diaries

Cinzia Le Donne[1], Davide Arcella[2], Raffaela Piccinelli[1], Stefania Sette[1], Dario Berardi[3], Catherine Leclercq[1]
[1]Nat. Research Institute Food Nutrition, ROME, Italy
[2]Nat. Res. Inst. for Food and Nutrution, ROME, Italy
[3]DASC s.a.s., ROME, Italy

A critical issue of food surveys performed through diaries is the standardization of operators' behaviour in codifying foods. In order to tackle with this problem and to speed up the process of quality control, INRAN has developed a data management system (INRAN-DIARIO3.1) for the simultaneous data entry by all the surveyors involved in a study. This software allows each single operator to create new temporary food codes or to decompose into ingredients unusual recipes when food items or recipes are not present in the relevant databanks. A central system (MASTER) applies quality control routines, including checks for under-reporting, and manages temporary food codes. When handling temporary food codes, the MASTER can 1) insert new foods in the composition database, 2) assign new names to existing food codes or 3) decompose temporary codes into ingredients present in the database. Final codes are available to all the operators through regular update of the databases. This management system allowed simultaneous and homogeneous data entry by 30 surveyors and the release of clean nutrient intake data based on 4.000 food diaries within 3 months of the end of a food survey. It is currently being used for the national Italian food survey.

P12-08

Usage of food photographs in EPIC UK 7 day food diary

Alison McTaggart[1], Ailsa Welch[1], Sheila A Bingham[2]
[1]EPIC Study, University of Cambridge, CAMBRIDGE, United Kingdom
[2]Dunn MRC Human Nutrition Unit, CAMBRIDGE, United Kingdom
McTaggart A, Welch AA, Bingham SA University of Cambridge, Cambridge

50465 7day food diaries which include a set of 17 coloured photographs of small medium and large portion weights to assist participants in indicating portion size, have been completed by participants in the EPIC-Norfolk study between 1993-2000. (1). By October 2005, 14534 7day food diaries had been entered into the DINER system for analysis. Entry involved matching each food item and the quantity consumed to a foodlist item with an associated portion size.(2).The DINER portion database currently contains 29755 portions. Photographs had been used for 7.4% food items. These were most important for vegetables and vegetable dishes (3.4%) and cereal based foods including breakfast cereals (2.5%). For meats and meat dishes and dairy based foods, photographs were little used (<0.8%). Since the photographs were used less than expected, this brings to question whether the photographs available cover an adequate range of foods and emphasises the importance of the accuracy for all other portions in dietary diary databases. Usage of other portions and their importance will be reported.

(1) Bingham, S., et al (2001). Public Health Nutrition 4, 847-858.
(2) Welch, A.A., et al (2001).. Public Health Nutrition 4, 1253-1265.

P12-09

Comparison of food servings with portions in food photographs
Marja-Leena Ovaskainen
National Public Health Institute (KTL), HELSINKI, Finland

The quantitative estimation of subjects' diet is the main methodological issue in nutritional studies. A color picture booklet of 126 foods in various portions was developed and validated in Finland in 1980s. Later in 2000's, 45 new photos of food portions have been produced. This study was carried out in 2005 to assess correct estimation of food servings against portions in picture booklet and in new photos. Rehabilitation clients and personnel in Petrea compared the food serving (26 per day) and food pictures with three to five ascending portions. Full estimation for 52 servings and background data was received from 146 persons (101 women, 45 men). Half of estimations were exactly correct, 29 % smaller and 21 % bigger than portions in pictures. The proportion of correct estimation was analyzed by background factors and by food groups. The estimation of non-corresponding servings failed more often than the others. A tendency toward medium portions was observed: portions of first places in the picture were overestimated and portions of latest places were underestimated. Estimates for some regularly used food items like bread failed more often than for other foods which emphasizes the importance of portion size assessment.

P12-10

The impact of weekend eating on nutrient intakes
Donna Rhodes, Linda Cleveland, Theophile Murayi, Alanna Moshfegh
U.S. Dept. of Agriculture, ARS, BELTSVILLE, MD, United States of America

Limited research suggests that energy intake is greater on weekend days (Friday to Sunday) than on weekdays. This study focuses on nutrient intake differences between weekend days and weekdays in a sample of 514 healthy, weight-stable men and women aged 30-69 yr. Three 24-hour dietary recalls were obtained using the USDA Automated Multiple Pass Method. Recalls were conducted 4-5 days apart and included at least one weekend day. Mean daily energy intake was 9% higher on weekend days than weekdays (2475 kcal vs. 2270 kcal, $p<.001$). This increase in energy intake was greater in obese subjects; 16% and 17% for females and males, respectively. Fat was the largest contributor to this higher energy intake. The increase in kilocalories from fat on weekend days compared to weekdays was 89 kcal overall, and 132 kcal for obese subjects. Mean intakes for other macronutrients and alcohol were also higher on weekend days. Differences are reported for several micronutrients. Results of this study illustrate the substantial differences in nutrient intakes between weekend days and weekdays and the importance of considering weekend/weekday effects in dietary assessment.

P12-11

Development of a Quantitative Food Frequency Questionnaire (QFFQ) to assess food, nutrient and heterocyclic amine intake in Japanese Brazilians

Sangita Sharma[1], M Iwasaki[2], C Kunieda[3], J Ishihara[2], GS Hamada[3], S Tsugane[2], L LeMarchand[1]
HONOLULU, HAWAII, United States of America
[2]Tokoy, TOKOY, Japan
[3]Sao Paulo, SAO PAULO, Brazil

The aim is to assess intakes of specific foods, nutrients and heterocyclic amines, in a case-control study of colorectal adenoma among Japanese Brazilians in Sao Paulo, Brazil. Two other companion studies are being conducted in Hawaii and Japan. We describe the development of a QFFQ to meet the unique needs of the study.
To identify foods for inclusion on the FFQ, a dietitian collected 24-hr recalls covering all days of the week on 60 outpatients (30 men, mean age 58 yrs; 30 women, mean age 57 yrs) without diseases causing change in diet. All foods reported at least once by any subject were included on the FFQ. The QFFQ will be analyzed using the Brazil, Japan and Cancer Research Centre of Hawaii's food composition tables (FCT). As FCT for mixed dishes are limited, we are collecting weighed recipes data for most composite dishes. The interview-administered QFFQ contains 100 food items, grouped into 12 food groups, and assesses frequency of consumption in 8 categories ranging. Amounts consumed are estimated using familiar household units or food models. A sub-study is planned using 24-hr recalls to calibrate results across countries. The QFFQ is expected to provide valid estimates of usual intake in this population.

P12-12

Comparison of item intrusion rates in the quicklist and forgotten-foods steps of the USDA 5-step multiple-pass dietary interview

Albert Smith[1], Nicole Morris[1], Joan Conway[2]
[1]Cleveland State University, CLEVELAND, OHIO, United States of America
[2]Agricultural Research Service, USDA, BELTSVILLE, MD, United States of America

Items reported in a 24-hour dietary interview are either matches—items that were actually eaten by the respondent during the target period—or intrusions—items that were not eaten. Some dietary reporting procedures ask respondents to report intake for the target period freely; others involve cuing during at least some part of the procedure (e.g., 'Report any fruits or vegetables.'). Some evidence suggests that, compared to free reporting, cues may increase intrusion rates without increasing match rates. The first pass of the USDA 5-step multiple-pass procedure (quicklist) is uncued: The respondent is to report all food items eaten on the preceding day. The second pass (forgotten foods) is cued: The respondent is to report anything that he or she has forgotten in each of seven different categories. We present analyses of data from subjects who, for one day, ate all meals at the USDA Beltsville Human Nutrition Research Center Human Study Facility while an observer recorded all items eaten and taken for snacks. The next day, each subject was interviewed using the USDA 5-step multiple-pass method. A comparison of intrusion rates in the quicklist and forgotten-foods passes will help illuminate whether cuing affects intrusion rates in this interview protocol.

P12-13

Coloured bread may be interpreted as bread with a high content of whole grain flour

Solveig Uglem[1], Margareta Wandel[1], Tonje Stea[2], Wenche Frølich[2]
[1]University of Oslo, OSLO, Norway
[2]University of Stavanger, STAVANGER, Norway

There is an increasing focus on the health benefits of bread with a high content of whole-grain flour. Unfortunately, bread marketed as wholegrain, often has a high content of white flour, and malt-colour is often added to give a 'healthier' appearance. The aim of the study was to assess how young men interpreted bread, both coloured and uncoloured, as wholegrain breads. Subjects included 593 male recruits (mean age 19.7) in a military camp. The recruits were offered different breads with low (5%) to medium (30%) content of whole-grain flour from a local bakery. Some of the breads contained malt. The recruits' consumption of bread was collected with a 4-day diary, showing an average consumption of total bread of 5.5 slices/day. Bread with low/medium content of wholegrain flour was interpreted by 38% of the recruits as bread with a high content (75%) of wholegrain flour at least once in the survey period. The fibre content in 5.5 slices of bread (165 g) containing 75% wholegrain flour is 12.1 gram. The fibre content in the same amount of bread containing 10% wholegrain flour is 6.3 gram. Methodologically, the misunderstanding and misreporting of food items could result in bias in estimates of intake.

P13-01

Can obesogenic food habits be detected with questionnaires? A matter of what we ask and how we analyse.

Christina Berg[1], G Lappas[1], N Aires[2], E Strandhagen[1], A Wolk[3], A Rosengren[1], K Torén[1], Dag S Thelle[1], Lauren Lissner[1]
[1]Göteborg university, GÖTEBORG, Sweden
[2]AstraZeneca, GÖTEBORG, Sweden
[3]Karolinska Institutet, STOCKHOLM, Sweden

The aim was to examine specific food habits among obese with various approaches. The study is based on data from the research programme INTERGENE with randomly selected 25-74 years old women and men in western Sweden (n=3602). Participants with measured BMI=30 were compared with other participants with respect to questionnaire data. In addition to a traditional semi quantitative food frequency questionnaire (FFQ), questions about meal patterns and portion sizes were included. Two separate analyses of FFQ were performed: calculation of nutrient intake and cluster analysis.
Being obese was associated with certain food intake patterns identified by cluster analysis as well as a meal pattern shifted to later in the day and larger self-reported portions of main meals. However, no significant relationships with intake of energy or macro nutrients were observed.
Questionnaires are frequently used because of simplicity and inexpensiveness, but are also criticised for poor validity. When estimating dietary intake from FFQs many assumptions are made, which might result in errors. An alternative approach is to assess dietary patterns. Furthermore, self-report of meal patterns and portion sizes appear to have less obesity-related bias than food frequencies. Results from these alternative approaches might also be easier to translate into dietary guidelines.

Application of the factors and clusters analysis for separation and characteristic of the nutrition models for youth from North-Eastern Poland

Roman Cichon[1], Anna Walus[2], Lidia Wadolowska[1], Roman Cichon[1]
[1]University of Warmia and Mazury, OLSZTYN, Poland
[2]Nicolaus Copernicus University, BYDGOSZCZ, Poland

Aim: Separation and characteristic of nutrition models for youth using the factors and clusters analysis.
Material and methods: The research included 431 pupils aged 16.1±0.44 from agricultural region of North-Eastern Poland. The nutrition manner was evaluated using 24-hour-recall method. The factors analysis was used to reduce the number of input data and to identify main components. The input data included the percentage of recommendation for nutrients. The clusters analysis enabled separating clusters that were recognized as specific nutrition models of youth.
Results: Three different nutrition models of youth were separated: Low Nutritive (59.2% of the population), Medium Nutritive (31.3%) and High Nutritive (9.5%). LN youth inhabited most often the country, declared poor economic status of the family and their fathers had farms. HN or MN youth inhabited most often big cities, declared better economic status of the family and their fathers earned as hired employees or by self-employment. The nutrition model did not depend on sex.
Results: The youth was characterized with different nutrition manners, which showed correlation with demographic and economic features. Family's low economic status, inhabiting the country and leading a farm by their father were conducive to low nutritive value of youth's food rations.

Dietary patterns and lifestyle factors in the Norwegian epic cohort the Norwegian women and cancer (NOWAC) study

Dagrun Engeset[1], Elin Alsaker[2], Eiliv Lund[2], Antonio Ciampi[3]
EIDSVOLL VERK, Norway
[2]Institute of Community Medicine, Univers, TROMSØ, Norway
[3]Department of Epidemiology & Biostatisti, MONTREAL, Canada

The aim of the study was to identify different dietary patterns in Norway using a combination of cluster and factor analysis.
The Norwegian EPIC cohort is a sub-cohort of the Norwegian Women and Cancer study (NOWAC), consisting 37.226 women aged 41-56 years who answered a food frequency questionnaire in 1998. The associations amongst 50 food variables were first investigated by using principal component analysis. Five important factors were found. The five principal components were used as input in the cluster analysis. Different socio-economic and lifestyle variables were examined.
Six dietary patterns were found: 'traditional fish eaters', 'healthy eaters', 'average, less fish, less healthy', 'western', 'traditional bread eaters', 'alcohol users'. 'Traditional fish eaters' and 'traditional bread eaters' were both highly represented in the north and west of Norway and were likely to be present among persons with lower income and lower education. 'Healthy' and 'alcohol users' were found mostly in the south and east and were likely to have higher income. The western group had highest percentage of three or more persons in household, indicating that families with children dominate this group. Our data indicates six different dietary patterns in Norway, each with different socio-demographic and lifestyle characteristics.

Dietary patterns and glycemic index in the Insulin Resistance and Atherosclerosis Study

Angela Liese, Mandy Schulz, Theodosha Gilliard
Arnold School of Public Health, COLUMBIA, SC, United States of America

Despite the increasing interest in dietary patterns, the glycemic index (GI) and glycemic load (GL) characteristics have not been described. Data on 980 middle-aged, non-diabetic men and women in the multi-ethnic Insulin Resistance Atherosclerosis Study was used. We previously identified six distinct dietary patterns by cluster analyses based on interviewer-administered food frequency questionnaire data. Published GI values were assigned to food items and dietary GI and GL derived. For each dietary pattern, average GI and GL was estimated by multivariate analysis of covariance.
Mean GI differed significantly between dietary patterns. The dark bread pattern exhibited the lowest GI (79), followed by the fruit/fruit juice pattern (81), and the wine/mixed drinks (82) pattern. The fries/sweets pattern (85) and the white bread pattern (86) had the highest average GI (p-value < 0.001) adjusted for demographic characteristics. Additional adjustment for energy intake had no impact. The differences in GL between dietary patterns were in part driven by energy intake, but the white bread pattern consistently showed the highest GL (p-value <0.001). In conclusion, although the cluster analyses incorporated information on all foods, the resulting dietary patterns differentiate well between level of dietary GI and GL which are characteristics of carbohydrate containing foods.

Sociodemographic and lifestyle determinants of dietary patterns

Janine Kroeger, Matthias Schulze, Kurt Hoffmann, Christin Heidemann, Cornelia Weikert, Heiner Boeing
German Institute of Human Nutrition, NUTHETAL, Germany

The purpose of this study was to identify dietary patterns in the EPIC-Potsdam cohort and to determine their sociodemographic and lifestyle correlates.
Dietary patterns were identified with principal component analysis (PCA) and reduced rank regression (RRR) among 26 479 participants of the EPIC-Potsdam Study based on consumption data of 39 food groups. Subsequently, multiple regression models were fitted to identify determinants of dietary patterns.
PCA revealed three major prevailing eating patterns ('traditional cooking', 'fruits and vegetables' and 'sweets'). The pattern score identified by RRR was positively correlated with consumption of fruits and leafy vegetables and plasma levels of HDL cholesterol und adiponectin and inversely with intake of beer, poultry, legumes, softdrinks and vegetable oils and levels of HbA1c and CRP. All dietary patterns except the 'sweets' pattern showed relatively strong associations with sex. Males were more likely to follow the 'traditional cooking' pattern while females scored higher on the 'fruits and vegetables' pattern and the RRR pattern. Age, BMI, smoking status, physical activity, education and supplement use showed only weak relationships with the patterns.
In conclusion, aside from sex, the dietary patterns identified by PCA and RRR in the EPIC-Potsdam cohort were only weakly associated with sociodemographic and lifestyle factors.

P13-06

Dietary patterns and risk of oral cancer: a case-control study in São Paulo, Brazil

Dirce Maria Marchioni[1], Maria do Rosario Latorre[1], Jose Eluf Neto[2], V Wunsch Filho[1], Regina Fisberg[1]
[1]School of Public Health - USP, SÃO PAULO, Brazil
[2]School of Medicine USP, SÃO PAULO, Brazil

To identify dietary factors related to oral cancer in the city of São Paulo, Brazil, was conducted a hospital-based case-control (366 incident cases and 469 controls). The risk associated with the intake of food groups defined a posteriori, through factor analysis was analyzed. The first factor, labeled 'prudent', was characterized for the intake of vegetables, fruits, cheese and poultry. The second, 'traditional', was the intake of rice, pasta, pulses and meat, while the third, named 'snacks' was characterized as the intake of bread, butter, salami, cheese, cakes and desserts. The last, 'monotonous', was associated inversely with the intake of fruits, vegetables and most of the other food items. Factor scores for each component retained were calculated for cases and controls. After categorization of the factor scores into tertiles, according to the distribution of controls, odds ratio (OR) and 95% confidence interval (CI) were calculated by unconditional multiple logistic regression. The traditional pattern was inversely related to oral cancer (OR 0.51; 95% CI 0.32-0.81, P value for trend 0.140), while the monotonous was positively associated (OR 1.78; 95% CI 1.78-2.85, P value for trend < 0.001). Our data suggest that the traditional Brazilian dishmay confer protection against oral cancer

P13-07

Dietary patterns and their association with other health behaviours in Lithuanian adult population

Janina Petkeviciene, Vilma Kriaucioniene, Jurate Klumbiene
Institute for Biomedical Research, KAUNAS, Lithuania

Aim: to evaluate the association of nutritional habits with physical activity, smoking and alcohol consumption.

Methods. In 1998-2004 four cross-sectional surveys were carried out within the Finbalt Health Monitor project. For every survey random sample of 3000 Lithuanians aged 20-64 was taken from the National Population Register. The study material was collected by mailed questionnaires. Factor analysis was employed in order to reduce the number of food items in the food frequency questionnaire. Four main factors were extracted. The associations between main factors and certain health behaviours were examined by applying logistic regression analysis.
Results. The likelihood of having positive values of 'Vegetable', 'Porridge' and 'Meat' factors was higher among physically active persons compared to passive ones. 'Vegetable' factor was inversely related to smoking in men. Nonsmokers and nondrinkers were more likely to consume porridges than smokers and those frequently drinking alcoholic beverages. 'Meat' factor was positively related to smoking and frequent consumption of spirits in men as well as frequent consumption of beer in women. Daily smoking women and both sexes frequently drinking beer and wine were more likely to use sweets.
Conclusion. Nutritional habits were related to other health behaviours in Lithuanian adult population.

P13-08

Asian students change their eating patterns after living in Turkiye

Nurhan Unusan
Selcuk University, KONYA, Turkey

The objective of the research was to collect information among foreign Asian students and Turkish students. A questionnaire designed to collect information about background, changes in dietary habits, and frequency of food consumption. Asian students were born in Kazakhstan, Uzbekistan, Mogolistan, Russia, Afghanistan or Kyrgyzstan and were aged 18 years or older. All subjects were required to have been residing in Turkiye for at least 3 months before the start of the study. T-tests were used to determine differences in eating patterns and frequency of food consumption between Turkish and foreign Asian students. 809 Turkish and 265 Asian students answered the questionnaires. The response rate was 89%. The number of students consuming breakfast per day did not differ significantly between Turkish and Asian students. No significant difference in the frequency of milk and milk products, fruit and vegetables, meat and meat products were found. Significant increases were noted in consumption of canned and frozen food in foreign Asian students. Results of this study could be useful to plan nutrition education programs for Asian groups so they can make decisions in adapting to new eating patterns and make wise food choices in their new environment.

P13-09

Food pattern and anemic women among Iranian tribes' people

Moosa Salehi Dehpagaei, Hassan Eftekhari
Public Health School, SHIRAZ, Isle of Man

In Tribes people, little information exists on the nutrition status and diet habits of women. Anemia is a widespread problem among nomadic women and is most likely caused by iron (Fe) deficiency. We examined anemia and dietary intake to determine whether dietary intake was related to hemoglobin (Hb) and serum ferritin (SF), if the intake of anemia pertinent nutrients differed between anemic and non anemic women. We measured the Hb, dietary intake (Mean of three days 24 Hour Recall), and background socio-economic data from 119 women. Dietary intakes (i.e. of Fe and Vitamin C and Folate) were below recommended levels in the greater part of the women. Women whose intakes of Fe and vitamin C or Folate around the Recommended Dietary Allowance (RDA) had significantly higher mean Hb and SF values. The results indicate that dietary intake of anemic women is lower in vitamin C and folate.
Author Keywords: Anemia; Iron deficiency; Dietary intake; Nomadic women.

P14-01

Fish consumption and breast cancer risk. The European Prospective Investigation into Cancer and Nutrition (EPIC)

Dagrun Engeset[1], Elin Alsaker[2], Eiliv Lund[2], Ailsa Welch[3], Kay-Tee Khaw[4], Françoise Clavel-Chapelon[5], Anne Thiébaut[5], Véronique Chajès[6], Timothy Key[7], Naomi Allen[7], Pilar Amiano[8], Miren Dorronsoro[8], Anne Tjønneland[9], Connie Stripp[9], Petra HM Peeters[10], Carla H Van Gils[10], Maria-Dolores Chirlaque[11], Elin Alsaker[2], Eiliv Lund[2], Ailsa Welch[3]
EIDSVOLL VERK, Norway
[2]Institute of Community Medicine, Univers, TROMSØ, Norway
[3]Department of Public Health and Primary, CAMBRIDGE, United Kingdom
[4]Clinical Gerontology Unit, School of Cli, CAMBRIDGE, United Kingdom
[5]INSERM, E3N-EPIC, Institut Gustave Rouss, VILLEJUIF, France
[6]CNRS, UMR 8125, Institut Gustave Roussy, VILLEJUIF, France
[7]Cancer Research UK, Epidemiology Unit, U, OXFORD, United Kingdom
[8]Public Health Division of Gipuzkoa, Heal, SAN SEBASTIAN, Spain
[9]Institute of Cancer Epidemiology, Danish, COPENHAGEN, Denmark
[10]Julius Centre for Health Sciences and Pr, UTRECHT, The Netherlands
[11]Epidemiology Department, Murcia Health C, MURCIA, Spain

Some in vitro and animal studies have suggested an inhibitory effect of marine n-3 fatty acids on breast cancer growth but the results from epidemiological studies on fish consumption and breast cancer risk in humans are inconsistent. We examined fish consumption and breast cancer risk in 310.671 women in the European Prospective Investigation Into Cancer and Nutrition (EPIC). The participants completed a dietary questionnaire between 1992-98 and were followed up for incidence of breast cancer for a median of 6.4 years. Hazard ratio for breast cancer by intake of total and lean and fatty fish were estimated, stratified by study centre and adjusted for established breast cancer risk factors. 4.776 invasive incident breast cancers were reported. No significant associations between intake of total fish and breast cancer risk were observed. Examining lean and fatty fish separately we found a positive significant association only in the highest quintile for fatty fish but test for trend was not significant (p=0.10). No associations with breast cancer risk were observed when the study participants were subdivided by menopausal status. Although the period of follow-up is relatively short, the results provide no evidence for an association between fish intake and breast cancer risk.

P14-02

The protective effect of blue fish, tea and fresh herbs consumption on cutaneous melanoma

Cristina Fortes, Simona Mastroeni, Gianluca Antonelli, Maria Antonietta Pilla, Paolo Pasquini
Istituto Dermopartico Dell'Immacolata, ROME, Italy

The present study was designed to evaluate the role of dietary factors in malignant cutaneous melanoma.
During 2001-2003, a hospital-based case-control study of melanoma was conducted on 304 incident cases of cutaneous melanoma and 305 controls, frequency matched by sex and age (+- 5yr) , and admitted to the reference hospital of skin disease for center-south Italy, IDI-IRCCS in Rome. Exposures characteristics were obtained by interviewing study subjects. A food frequency questionnaire was used. Using logistic regression, odds ratios (ORs) for melanoma were computed for all dietary items.
In a multivariate model we found protective effects for for high consumption of fruits and cooked vegetables in general (OR: 0.43, 95%CI: 0.26-0.74 and OR: 0.44, 95%CI: 0.26-0.75 respectively), cruciferous vegetables (OR: 0.38, 95%CI: 0.22-0.64), leafy green vegetables (OR: 0.34, 95%CI: 0.20- 0.58) carrots (OR: 0.54, 95%CI: 0.35- 0.84), fish rich in n-3 fatty acids (OR: 0.46, 95%CI: 0.29-0.73), nuts (OR: 0.40, 95%CI: 0.21- 0.76) and tea (OR: 0.27, 95%CI: 0.10- 0.77). Regular consumption of fresh herbs (sage and rosemary) was also associated with a decreased risk of melanoma (OR: 0.36, 95%CI: 0.17- 0.72). Our results indicates that some food items typical of the Mediterranean diet are associated with decreased risk of melanoma.

P14-03

Development and validation of a dietary and hydration habits questionnaire for elite athletes

Marcela Gonzalez-Gross[1], Francisco Miguel-Tobal[2], Pedro J. Benito[1], Tatiana Garrigos[1], Agustin Melendez[1], Francisco Javier Calderon[1]
[1]Universidad Politécnica de Madrid, MADRID, Spain
[2]Universidad Complutense de Madrid, MADRID, Spain

There is no doubt about the importance of nutrition for athletes that has been defined as a main part of the invisible training. Although sport nutrition has improved during the last two decades, there is still a gap between theory and practical application by the athletes. This is due, partly, to the difficulty of obtaining data about the dietary and fluid-intake habits in an easy manner. The 7-day food record could be a valid method, but not practical during competition time. Validated food-frequency questionnaires found in the literature are orientated to sedentary people, and do not take into account specific sport-nutrition related aspects, as pre and post-competition dietary and fluid intake, need for dietary supplements, prevention of sport injuries, frequent traveling, body weight control, etc. Therefore, for several years we are working in the development and validation of a nutrition questionnaire which is specifically orientated to get data about dietary, fluid intake and supplement intake data, and other nutrition-related aspects of elite athletes. The items take into account the main guidelines proposed in the 'Position Statement' by the American College of Sports Medicine, together with the American Dietetic Association and the Canadian Dietetic Association, but also include other specific aspects.

P14-04

Estimated dietary Vitamin A intake in Dutch and Scottish population samples applying common and newly proposed conversion factors for carotenes.

Maria Kneppers[1], M Vossenaar[2], Noel Solomons[2], Marga Ocké[3], Jacob Seidell[1], Annie Anderson[4]
[1]Free University of Amsterdam, AMSTERDAM, The Netherlands
[2]CeSSIAM, GUATEMALA CITY, Guatemala
[3]RIVM, BILTHOVEN, The Netherlands
[4]University of Dundee, DUNDEE, United Kingdom

Background: Theoretical considerations and empirical evidence suggesting that vitamin A was only half as available from plant matrices as had traditionally been regarded challenged the validity of the 'Retinol Equivalent' (RE) unit; this led, in 2001, to the creation of a newer, 'Retinol Activity Equivalent' (RAE), expression by a United States Dietary Reference Intakes panel.
Objectives: To apply the principles of the RAE to European food composition values and assess the impact on dietary vitamin A intake estimates for selected Dutch and Scottish samples.
Design: RE and RAE values were applied to archival food-frequency data sets for 1045 Dutch and 849 Scottish respondents from the Concordance Project.
Results: In contrast to the mean 1287 RE (1011 RAE) intakes of vitamin A for the Dutch sample, the respective estimates of 1092 RE (830 RAE) for the Scottish were significantly lower (p<0.05). The prevalence of adequate vitamin A intakes declines for both samples with conversion to RAE, while the relative contribution of preformed vitamin A to total intake increases by 15%.
Conclusions: Any introduction of the new conversion factors has important implications for average population intakes and for hierarchical ranking of food sources of vitamin A in the Dutch and Scottish populations.

P14-05

Vitamins and risk of renal cell cancer (RCC) In a pooled analysis of 12 cohort studies

Satu Männistö[1], Stephanie Smith-Warner[2]
[1]National Public Health Institute, HELSINKI, Finland
[2]Harvard School of Public Health, BOSTON, United States of America

RCC incidence has been increasing without any clear explanations. Many substances in plant foods, e.g., vitamins, have been suggested to have anticarcinogenic capacity, but the epidemiological evidence does not support the hypothesis.

We analyzed the associations between vitamins (from FFQs) and RCC risk in 12 cohorts from North America and Europe. During 5-20 years of follow-up, 1,323 cases were diagnosed among 767,366 participants. RR and 95%CI were calculated for each study using Cox proportional hazards models. The study-specific RRs were pooled using a random effects model.

From foods only, the pooled multivariate RRs (95%CI) were 0.87 (0.73-1.03, highest vs.. lowest quartile) for vitamin A, 1.04 (0.89-1.21) for vitamin E, 0.80 (0.68-0.94) for vitamin C and 0.84 (0.72?0.98) for folate. No associations were found between RCC risk and total vitamin intake (food plus supplements). Multivitamin use did not decrease RCC risk compared to non-use (RR=0.93; 0.77-1.12). The associations observed were similar between cohorts and for both genders.

High vitamin C and folate intake from foods were associated with 15?20% lower RCC risk. No associations were observed when supplemental sources were also considered. Thus, other dietary compounds in fruits and vegetables may have partly accounted for the inverse associations.

P14-06

Impact of carbohydrate methodology on dietary intake

Alison Stephen
MRC Human Nutrition Research, CAMBRIDGE, United Kingdom

Two methods are used for carbohydrate content in food composition tables in different countries: direct analysis as available carbohydrate or ' by difference' from total dry weight of food minus protein, fat and ash. Carbohydrate intakes vary around the world through true dietary differences. However, intakes also vary because of the methodological difference, although the extent of difference is unknown. Western countries like the United States, which utilise carbohydrate by difference, report higher carbohydrate intakes than the UK where carbohydrate is measured directly. A typical day's food for both countries (breakfast: juice and cereal; lunch: sandwich and fries; supper: spaghetti bolognese and salad; snacks), was analysed using US (USDA) and UK (McCance and Widdowson) food tables. The same foods showed different carbohydrate content: eg orange juice (230g): US 22.7g , UK 20.2g ; cooked spaghetti (228g) 64.6g, UK 50.6g. Differences in the carbohydrate containing foods resulted in differences to the total day's intake of both carbohydrate and energy: US 2220 kcal, 315g carbohydrate (56.7% energy); UK 2008 kcal 280g carbohydrate (52.2% energy). 7day weighed records previously analysed in Canada are currently being assessed using McCance and Widdowson. Consistency in carbohydrate methodology would allow more reliable intake comparisons among different countries.

P15-01

Design and Development of Iranian National Nutritious Food Basket (NFB)

Morteza Abdollahi, Anahita HoushiarRad, Nasser Kalantari, Kambiz Kiyani, AliReza Siyami
TEHRAN, Iran

The nutritious food basket serves as a national standard for a nutritious diet at a minimal cost. This study was conducted to develop a nutritious food basket at national level as a tool for food policy and planning.
To obtain information on what people eat and its cost, NNFTRI conducted a food consumption survey on 8000 households in urban and rural areas in Iran(2001-2003). Food intake data were collected using a combination of weighing and 24 hour recall methods for 3 days. The kind, amount and cost of all the foods eaten at home were recorded. Seasonal variation was also measured. To formulate the NFB a mathematical optimization model was designed .The model minimizes deviations from average intakes for 12 food groups suggesting new consumption patterns meeting required dietary standards(RDAs) with maintain cost.
 The national Iranian NFB consisted of 12 food categories bread (320), rice(100), macaroni(20), meats(98), legumes(26), fruits(260), vegetables(280), potatoes(70), fats(40) and sugars(45) grams. The NFB meets 100% of RDA for energy, protein, vitamins A, C, B2 and 66% of RDA for Ca and Iron .
The NFB specifies the foods that an Iranian family of 5 could consume at home to obtain nutritious diet at minimal cost.

P15-02

Dietary indicators of healthy eating

Wulf Becker
Swedish National Food Administration, UPPSALA, Sweden

Regular monitoring of dietary habits is necessary for assessing how official recommendations at the nutrient and food level are met in a population.
Aim: Select food items that capture relevant dietary indicators in the Swedish diet and to develop a quality index based on these foods.
Methods: A food frequency questionnaire (FFQ) was developed containing a selection of foods which, based on national dietary surveys, explained a large part of the variation in saturated fatty acids, dietary fibre and sucrose. The FFQ was filled in by 198 adults living in Uppsala, who also completed 4 repeated 24-h recalls.
Results: A limited number of questions, e.g. choice of fat spread, consumption of e.g. vegetables, fruit, whole-grain bread, full-fat cheese and some sugar-rich foods, explained a large part of the variation in the energy adjusted intake of saturated fatty acids, dietary fibre and sucrose. A dietary index combining these questions showed correlations ranging from 0.3-0.5 (p<0.001) for these nutrients.
Conclusion: The questions can be used as a complement to regular dietary surveys in monitoring dietary quality and to assess intake of some key foods. Applicability of this approach in specific sub-groups of the population needs to be further explored.

P15-03

Dietary quality and associated factors among adults living in the State of São Paulo, Brazil.

Regina Mara Fisberg
University of Sao Paulo, SAO PAULO, Brazil

Objective: To analyze dietary quality and associated factors, among adults living in regions of the State of São Paulo.
Methodology: Cross-sectional population-based study of a sample of 3454 adults aged 20 years and over who were included in the Household Health Survey (ISA-SP). Dietary intake was measured by means of the 24-hour recall, and dietary quality was assessed by means of the Health Eating Index (HEI).Linear regression analyses were performed to evaluate the relationships between HEI and the demographic, socioeconomic and lifestyle variables.
Results: Among the individuals assessed, 5% presented a good diet, 74% a diet that needed some degree of improvement and 21% a poor diet. The means for HEI components were lowest for vegetables, fruits and dairy products. In the multiple regression analysis, the variables of numbers of consumer durable goods, schooling of the head of the family, energy intake and age had a positive association with the HEI. However, the association was inverse for the variables of smoking and body mass index.
Conclusions: Higher dietary quality is associated with higher income, higher schooling level, better nutritional status and being a non-smoker. Knowledge of these factors is important for implementing programs for preventive nutrition or intervention.

P15-04

Enhanced nutritional quality indices: evaluation of two new indices assessing the overall nutritional quality of diets

Kurt Gedrich[1], Wolfgang Sichert-Hellert[2], Mathilde Kersting[2], Georg Karg[1]
[1]Technische Universität München, FREISING, Germany
[2]Research Institute for Child Nutrition, DORTMUND, Germany

For studying the relationship between diet and disease, increasing attention is given to the overall quality of diets as an alternative to the consideration of individual constituents. To assess the overall nutritional quality of diets, two Nutritional Quality Indices (NQI) were recently developed, measuring either deficient (NQI-) or excessive (NQI+) nutrient intakes, based on comparisons of persons' intakes with corresponding scientific based recommendations (e.g. the Central European dietary reference values, DGE 2002). These NQIs will exemplarily be calculated for a sub-sample of German children and adolescents of the DOrtmund Nutritional and Anthropometric Longitudinally Designed (DONALD-) Study (Kroke et al. 2004). The results will be compared with indicators from alternative approaches e.g. the Mean Adequacy Ratio (Madden & Yoder 1972) and the fuzzy-logic based Prerow Value (Wirsam et al. 1997). The strengths and weaknesses of the various indicators will be analysed and the potential of the NQIs for comparisons of diets of population subgroups in epidemiological research will be evaluated.
References:

German Nutrition Society (DGE) ed. (2002) Umschau Braus
Kroke et al. (2004) Eur J Nutr. 43: 45-54
Madden & Yoder (1972) Penn Agr Exp Sta Bull 78: 1-119
Wirsam et al. (1997) Eur J Clin Nutr 51: 286-96

P15-05

Criteria for healthy meals

Alexia Hammiche
Unilever Food & Health Research Institut, VLAARDINGEN, The Netherlands

In the light of the global concerns over obesity and chronic diseases in developed countries, the emphasis is more and more shifting toward the implementation of healthy options, especially in the area of out-of-home eating. Apart from generic dietary guidelines and nutrient recommendations that exist nationally and internationally, globally accepted meal-specific benchmarks are not yet available. Therefore these daily dietary guidelines were translated into guidelines for a meal, also taking into account cultural differences. The approach is intended to general healthy adult population.
The methodology includes national specific benchmarks for the meal for:
- energy,
- total fats, protein, and total carbohydrates,
- saturated fats, trans fats, sugars and sodium
- fruits and vegetables and fiber.
By using these benchmarks, meals can be classified into 3 categories depending on the nutrient levels present in the meal, meeting the benchmarks based on the WHO dietary guidelines, based on national dietary guidelines or not meeting either of these.
Nutritionists and chefs are key for a successful implementation of this approach. Part of the approach is to integrate food variety and specific energy requirements as well.

P15-06

Dietary Balance Index (DBI) for Chinese people and its application in nutrition intervention project

Yuna He
China CDC, BEIJING, China

The Dietary Guidelines for Chinese residents motivated the selection of 8 food-based components for Dietary Balance Index (DBI). They are the intake of Cereals, Vegetable and Fruit, Bean and Dairy, Animal Food, Alcohol, Salt, Oil and the Food variety. These components were weighted and assigned cut-offs and point schemes based on the Chinese Food Pagoda. DBI can be used as a measurement to evaluate the dietary quality of the individual or the population. DBI diet patterns combine the scores of each components can be used to evaluate the individual's dietary quality. According to the indicators of DBI, a Rapid Assessment Table to evaluate the Chinese residents' dietary quality have been designed. The Balanced Diet Guidance Handbook have been designed to give pertinent recommendation on the basic principles of Dietary Guidelines for Chinese Residents combined with the result of DBI scoring. The nutrition education project had been conducted by using Rapid Assessment Table of Dietary Quality for Chinese Residents and Balanced Diet Guidance Handbook, results verified that DBI rapid assessment system can be applied to the nutrition intervention ,because it can assess the dietary quality of individual in time and provide immediate feedback so as to give relative nutritional interventions.

P15-07

Development of short data-base for assessing nutritional value of Iranian National Nutritious Food Basket (NFB)

Anahita HoushiarRad, Mina Esmaeili, Morteza Abdollahi, Nasser Kalantari
National Nutrition and Food Technology R, TEHRAN, Iran

The goal of NFB is to generate a nutritious consumption pattern based on food aggregated categories to meet the dietary recommendations (RDAs). To determine the nutritional adequacy of NFB, we developed a short data base for calculating the nutrient profile of models.
Data on food intake was obtained from the recent national household food consumption survey (2001-2003). 135000 food items were reported by 8000 HHs in form of three 24 hour recalls. Foods having similar nutrients were combined into 61 foods/ food groups by a team of experts. Nutrient contents were computed by multiplying the weight of foods consumed and its nutrient content. The mean nutritional value of each food category was calculated by considering the weight of each individual food item in this group. Twelve foods/food groups were chosen for assessing intake of 17 nutrients including energy, protein, fat, carbohydrate, vitamins, minerals and crude fiber.
The 12 foods/food groups comprised bread, rice, macaroni, legumes, meats (including lamb, beef, chicken, and fish), vegetables, potatoes, fruits, hydrogenated fats, oils, and sugars. The short data-base could cover efficiently the intake of energy and 17 nutrients. This database could be used in similar studies with aggregated food groups.

P15-08

Preparation & use of food based dietary quality index for Indian population.

Parmeet Kaur
All India Institute of Medical Sciences, NEW DELHI, India

India is passing though a transitional phase of socio-economic development, chronic diet related diseases like cardio-vascular disease, diabetes and cancer are becoming major contributors to the disease burden. The socio-economic costs of the diseases are so high that countries like ours can ill afford to spend its meager resources on the co-morbidities. Advice to the population regarding the consumption of best foods from each of the different food groups for disease prevention is important.The aim of the present study was to develop a food based dietary quality index to assess the risk gradient of diet related chronic degenerative diseases. Dietary recommendations given by National Institute of Nutrition, India 2003 were stratified into three groups of scoring. Individuals meeting dietary goal were given a score of zero. Those who did not meet a goal but had a fair diet were given one point and those who had a poor diet were given two points. These points were summed across eight diet variables to score the index from zero (excellent) to 16 (poor). Lower index scores were found to be positively associated with high intakes of other important measures of diet quality. Thus, index ranking were reflective of overall diet quality.

P15-09

The usefulness of the 'Four-food-group point method (KNU diet)' for the improvement of obesity.
Terue Kawabata, Keiko Kamachi, Chinami Kawamura, Naoko Adachi, Mari Suzuki, Terumi Watanabe, Hideki Kudo, Toshiharu Gomyo, Yoshiko Kagawa
Kagawa Nutrition University, SAITAMA, Japan

The KNU diet based on energy control was developed as a dietary guide by Kagawa Nutrition University (KNU) over five decades ago. In this method, all foods are classified into four groups :G1 (dairy products and eggs), G2 (meat, fish and beans), G3 (vegetables and fruits), and G4 (grains, oil and sugar). If we consume foods equivalent to a total calorie score of 9 (1 score=80 kcal) with 3 points each derived from the intake of foods from G1 to G3, it might be possible to satisfy almost all of the nutrient requirements according to the Dietary Reference Intakes (DRIs) in Japanese, except for the energy requirement. In addition, it is easy to adjust for energy intake by varying the intake of G4 foods according to individual requirement. In this study, we reviewed the standard intake of food groups according to the 'KNU diet' accompanying the revised DRIs, and discuss the usefulness of this method of dietary assessment. Furthermore, we administered a training program on the KNU diet for aged obese patients, and evaluated their improvement. We concluded that the KNU diet allowed intake of almost all nutrients in accordance with the DRIs, and resulted in improvement of obesity.

P15-10

Comparison of nutrient intakes does not explain different associations among measures of diet quality with nuclear cataract
Suzen Moeller[1], Paul Jacques[2], Julie Mares[1]
[1]University of Wisconsin-Madison, MADISON, United States of America
[2]Jean Mayer USDA HNRCA Tufts University, BOSTON, United States of America

Background and Purpose: The Healthy Eating Index for Food Frequency Questionnaires (HEI-f) was previously reported to have a stronger association with nuclear cataract than other measures of diet quality (J Nutr 134:1812-1819, 2004). The present analyses seek to determine whether this association was due to the improved ability of the HEI-f to capture the intakes of specific nutrients related to nuclear cataract.
Methods: A food frequency questionnaire was administered to 479 Nurses' Health Study participants, aged 52 to 73 years, 9-11 years before evaluation of nuclear lens opacities using the Lens Opacification Classification System III. Median intakes of specific nutrients were examined across quartiles of the following diet quality measures: daily servings of 1) fruits, 2) vegetables, and 3) whole grains; 2) Recommended Foods Score (RFS); and 3) HEI-f.
Results: No substantial differences were observed in the ability of any of the diet quality measures to capture intakes of specific nutrients or food groups. Intakes of most nutrients improved across quartile categories of all diet quality measures, even those not associated with nuclear opacities.
Conclusion: The HEI-f's association with nuclear opacities is not due to an improved ability to capture intakes of specific nutrients.

P15-11

Validation of a short dietary quality score. The Inter99 study
Ulla Toft
Rechearch Centre for Prevention and Heal, GLOSTRUP, Denmark

Objective: To assess the validity of the Short Dietary Quality Score (SDQS).
Subjects: A random sample of 13 016 subjects aged 30-60 years, invited for a health examination. A total of 6 542 were included in the statistical analysis.
Methods: The SDQS was developed using eight questions from a 48-item food frequency questionnaire(FFQ). The score was tested for associations with various attributes of dietary quality, including risk factors, socio-demographic and life-style factors. Furthermore the results were compared with the results of an extensive FFQ.
Results: Prudent dietary habits, according to the SDQS, were significantly negative associated with total cholesterol (P=0.0004), triglyceride (P=0.0097), LDL-cholesterol (P=0.0064), homocystein (P<0.0001), systolic blood pressure (P=0.0496) and the absolute risk of ischaemic heart disease (P<0.0001), adjusted for sex, age, smoking habits and physical activity level. A significantly positive association (P<0.0001) was seen with female sex, age, social position, non-smoking and physical activity level. Spearman's correlation coefficients between the intake estimated from the extensive FFQ and the dietary score ranged from -0,38 (fat energy percent) to 0,70 (fruits).
Conclusions: The Dietary Quality Score is a simple, valid and quick tool to make a rough classification of individuals into groups with overall prudent, average or non-prudent dietary habits.

P15-12

Seven-year changes in diet quality (the CARDIA Study): college educated and white individuals are most likely to improve their diets
Daisy Zamora[1], Penny Gordon-Larsen[1], David Jacobs[2], Barry Popkin[1]
[1]UNC-CH, CHAPEL HILL, United States of America
[2]University of Minesota, MINNESOTA, United States of America

Little is understood about the longitudinal dynamics of diet quality and their socioeconomic correlates. This study examined diet quality change over a seven-year period and its association with race and education. Data were obtained from 3,766 black and white adults measured in 1985-86 and in 1992-93 by the Coronary Artery Risk Development in Young Adults (CARDIA) study. Our diet quality measure- modeled after the validated UNC Diet Quality Index- accounts for dietary diversity and moderation, as well as consumption of grains, fruits, vegetables, meat, and dairy. Multinomial logistic regression analyses were used to assess the effect of race and education on diet quality, controlling for age and gender. White race and =2 years of college education at baseline were associated with increased likelihood of diet quality improvements. Similarly, white subjects who had =2 years of college education were less likely to decrease their diet quality. Results indicate that 1) better educated individuals are more likely to improve their diets, and 2) whites are improving more than equally-educated blacks. This increasing quality gap associated with race and education points to the need for more focused attention on lower educated and minority adults if dietary improvements are to be made.

Reporting accuracy for nutrients is misrepresented unless reporting errors are differentiated: a validation study of reporting accuracy over multiple interviews
Suzanne Domel Baxter[1], Albert Smith[2], Michele Nichols[1], James Hardin[1]
[1]University of South Carolina, COLUMBIA, United States of America
[2]Cleveland State University, CLEVELAND, OHIO, United States of America

Conventional nutrient variables indifferent to such reporting errors as intrusions (items not eaten) and overreported amounts misrepresent reporting accuracy in dietary validation studies. Fourth-grade children were observed eating school breakfast and lunch for one day (n=12), or for two (n=13) or three (n=79) nonconsecutive days separated by >4 weeks, and interviewed the morning after each observation day about intake the previous day. Reference (observed) and reported information were transformed to energy, protein, carbohydrate, and fat; transformed data were analyzed using repeated-measures ANOVA. Using conventional variables indifferent to reporting errors, report rates ([reported/reference] x 100) for energy and each nutrient did not vary systematically over interviews (ps>.51). Using variables sensitive to reporting errors, correspondence rates (genuine accuracy measures) for energy and each nutrient increased over interviews (ps<.03), indicating that reporting accuracy improved; inflation ratios (error measures) for energy and each nutrient decreased marginally over interviews (ps<.15), also suggesting that reporting accuracy improved. Report rates were higher than correspondence rates, indicating that reporting accuracy was worse than implied by conventional measures. Children's dietary reporting accuracy improves over interviews; conclusions about reporting accuracy from conventional variables indifferent to reporting errors mask improvements over interviews and overestimate accuracy. Funding: 43-3AEM-2-80101 (USDA/ERS/FANRP) and R01HL63189 (NHLBI/NIH).

Nutrient variables indifferent to reporting errors distort dietary reporting accuracy: data from a validation study concerning reporting-order prompts (reverse, forward)
Suzanne Domel Baxter[1], Albert Smith[2], Michele Nichols[1], James Hardin[1]
[1]University of South Carolina, COLUMBIA, United States of America
[2]Cleveland State University, CLEVELAND, OHIO, United States of America

Dietary validation studies which utilize conventional nutrient variables indifferent to such reporting errors as intrusions (items not actually eaten) and overreported amounts may misrepresent reporting accuracy. Each of 121 fourth-grade children (58 girls) was observed eating school meals on two days >4 weeks apart, and interviewed the morning after each observation day about previous-day intake. For each child, one interview was forward order (morning to evening) and one was reverse order (evening to morning). Mixed models were used to compare reference (observed) and reported information for energy, protein, carbohydrate, and fat. Using conventional variables indifferent to reporting errors, report rates ([reported/reference] x 100) were higher for the first than second interview for energy, protein, and carbohydrate (ps<.0494). Using variables sensitive to reporting errors, report rates are partitioned into correspondence rates (genuine accuracy measures) and inflation ratios (error measures). For energy and the three nutrients, correspondence rates were better for girls in forward order but for boys in reverse order (ps<.0414); for energy, carbohydrate, and fat, inflation ratios were worse in forward than reverse order (ps<.0446). Analyses using conventional variables indifferent to reporting errors distorted reporting accuracy and masked associations of sex and order predictors. Funding: 43-3AEM-2-80101 (USDA/ERS/FANRP) and R01HL63189 (NHLBI/NIH).

P16-03

Diet and overweight in preschool years: a comparison of 24-hour recall and short food frequency questionnaire from a Canadian population-based birth cohort study

Lise Dubois, Manon Girard
University of Ottawa, OTTAWA, Canada

We report on our research on a large birth cohort for which yearly data on child health and development are being collected in the province of Quebec (Canada). The Quebec Longitudinal Study of Child Development (QLSCD) uses a representative sample (n=2,103) of children born in Quebec in 1998. We are responsible for the diet and anthropometric measurements in this study. In relation to diet, data on the frequency of consumption of different types of food and of eating behaviours are collected every year as part of the regular data collection. Under our research supervision, a nutrition survey financed by the Quebec Ministry of Health and Social Services was done in 2004 with 4-year-old QLSCD children, the first Canadian nutrition survey ever done among a representative sample of preschoolers at the provincial or national level. This survey used 24-hour-recall methodology, repeated on 50% of the sample (to assess usual consumption). Data were collected at home and at daycare centres. We used the 24-hour recall data to assess the validity of a short food frequency questionnaire (14 items) to study weight trajectories and overweight in childhood, in relation with different social and behavioural factors.

P16-04

The impact of timing of dietary interview on the accuracy of children's estimates of portion size

Emma Foster, John Matthews, Ashley Adamson
University of Newcastle, NEWCASTLE, United Kingdom

A measure or estimate of amount of food consumed is required for food intakes to be converted into nutrient intakes. Methods for portion size estimation have been developed, however their application with children has not been investigated systematically.
In this study children's ability to estimate food portion sizes using perception, conceptualisation and memory skills was assessed.
Three portion size assessment tools (photographs, models and a computer based interactive tool) were developed for use with children, based on portion sizes consumed by a national sample of children. Participants were 201 children aged 4-11 years. Foods of known quantities were served and leftover foods were weighed. Portion sizes were estimated using each tool with the food in view, just after and 24hrs after the child had eaten the food (separate interviews administered in random order).
No significant differences were found in accuracy of portion size estimates with timing of interview. The mean ratio of the estimated weight:actual weight of food served was 1.06 for food in view, 1.12 for just after eating and 1.10 for 24hr recall. A 24-hour interval between eating and portion size had no effect on the accuracy of the estimates using the three portion size assessment tools.

P16-05

Changes and tracking of food choice and BMI of 16-18 year olds: evidence, influences and attributions.

Alison Hossack, Sarah Timothy, Amelia dr Lake, Emma dr Foster, Ashley dr Adamson
Newcastle University, NEWCASTLE UPON TYNE, United Kingdom

Background: Understanding when, how and why dietary changes occur over time is critical to developing strategies for intervention. A series of cross-sectional dietary surveys of approximately 400 children aged 11-12 years were carried out in the same seven schools in Northumberland, UK. These surveys looked at dietary change over 10 year periods (1980, 1990 and 2000). In 2000, a longitudinal survey of the 1980 cohort (aged 32.5 years) provided evidence of dietary change, and investigated factors influencing dietary change from adolescence to adulthood. Purpose: The purpose of this study is to investigate the changes that have occurred in the 2000 cohort in terms of diet and BMI, and the factors that influence these changes earlier in the lifecycle (16-18yrs). Methods: Two three-day food diaries, at six month intervals are being used to identify changes in eating patterns, between 11-12 and 16-18 years of age. A questionnaire will be used to identify factors (social, environmental and behavioural) that influence dietary intake, and changes in these eating patterns. Changes in BMI will be measured. Body composition will be measured using Tanita™ bio impedance equipment and activity will be measured using Accelerometer™ activity monitors. Results: Early results will be reported.

P16-06

Evaluation of questions about beverage consumption and physical activity among 9-year-olds

Inger Therese Lillegaard, Lene Frost Andersen
University of Oslo, OSLO, Norway

The objective was to compare intake of beverages measured with a short questionnaire with beverage consume assessed from precoded food diary, moreover to compare physical activity questions with energy expenditure (EE) measured by a validated position and movement monitor (ActiReg®). A total of 43 Norwegian 9-year-olds answered nine questions about how often they consumed different beverages (four types of milk, orange juice, soft drinks and fruit drinks with and without sugar), two questions about physical activity (how many times and how many hours per week with physical activity). The median Spearman correlation coefficient between the two dietary methods (single questions and precoded food diary) was 0.52, ranging from 0.17 for whole fat milk to 0.72 for semi-skimmed milk. No significant relation was observed between the physical activity and energy used on physical activity (total EE measured with ActiReg® – termic effect (10% of EE)- estimated BMR). However, there was a tendency (p=0.08) that those who were physical active 7 hours or more per week also had the highest energy used on physical activity. Evaluation of the questions used indicates that the beverage questions are more valid than the physical activity questions in this group of 9-year-olds.

P16-08

Assessment of physical activity levels and body weight in 9-10 year old schoolchildren

Sally McLure[1], Carolyn prof Summerbell[1], John dr Reilly[2], Alan dr Batterham[1]
[1]University of Teesside, TEESSIDE, United Kingdom
[2]Yorkhill Hospital, GLASGOW, United Kingdom

A consistent problem in epidemiological and intervention studies is the need for valid and reliable methods of measuring children's physical activity levels (PAL) and throughout the day. The objective of this study is to develop a novel computer-based tool, which will be user-friendly, cheap and fun to use for measuring PAL in school aged children. Approximately 350, 9-10y old, have been invited to participate from six randomly selected schools from different socio-economic backgrounds within two Local Education Authorities. Participating children are expected to wear an accelerometer to capture information on their PAL over a 5-day period. Within one week of the end of this 5-day recording period, children will be navigated through a novel computer-based tool and measurements of body fatness (weight, height and waist circumference) will be recorded. This tool will then be validated against the accelerometer to assess whether; reported PAL vary by socio-economic status; this variation differs between methods of assessment; and reported PAL varies by degree of body fatness. This single study is part of a larger project entitled 'Patterns of Eating and Activity in Schoolchildren at Teesside: peas@tees'. Data collection is due to be completed at the end of February 2006.

P16-09

Application of different dietary assessment tools in EsKiMo

Gert Mensink[1], Almut Bauch[1], Claudia Vohmann[2], Anna Stahl[2], Helmut Heseker[2]
[1]Robert Koch Institute, BERLIN, Germany
[2]University of Paderborn, PADERBORN, Germany

EsKiMo (Ernährungs-Studie als KiGGS-Modul) is a nutrition survey among 6-17-year-old participants of KiGGS, a representative health survey among children and adolescents in Germany.
From January to December 2006 the food and nutrient intakes of 2400 randomly selected participants will be assessed by the Robert Koch Institute and the University of Paderborn. Parents of children aged 6-11 years will conduct a 3-day estimated dietary record. The participants aged 12-17 years are interviewed about their dietary habits, using the dietary assessment software DISHES, a modified dietary history. It includes all available foods of the German Food Code and Nutrient Data Base (BLS). Therefore, it is highly standardized but still an open ended interview. DISHES was applied in previous studies and was updated for use in the National Nutrition Survey II.
A recently developed food frequency questionnaire which is also used in the initial KIGGS examination will be re-applied.
The study will give important information for nutrition monitoring and health reporting considering children and adolescents. It will complete the comprehensive health data collected in KiGGS. Since identical methods are used in the National Nutrition Survey II, a comparison of food intake in children, adolescents and adults is possible.

Energy intake assessed by a 24hr dietary recall validated against energy expenditure measured by DLW in 10 y-old Danish children
Birgit Marie Nielsen[1], Kirsten Bjørnsbo[1], Ole Hels[2], Berit Heitmann[1]
[1]Institute of Preventive Medicine, COPENHAGEN, Denmark
[2]Department of Human Nutrition, COPENHAGEN, Denmark

Background & aim: Valid assessment of dietary intake is crucial for all dietary investigations. The aim of the present study was to validate the 24hr dietary recall method used in the European Youth Heart Study with regard to total energy intake by comparing self-reported energy intake (EI) against total energy expenditure (TEE).
Methods: Totally 23 children (12 girls) aged 9.6 year were enrolled in the validation study. Over a14-days period TEE was measured by the doubly labelled water method (DLW). Dietary intake was assessed for the last day of the DLW period by the 24hr dietary recall method. Children were categorized as acceptable-, under-, or over-reporters of EI, defined by a 95% confidence level calculated to encompass specific variation components of TEE and EI.
Results: Mean TEE was 8.9MJ/day (SD 1.0), and mean EI was 9.0MJ/day (SD 3.0). Still, only 9 children were categorized as acceptable reporters, whereas 8 were categorized as under-reporters, and 6 as over-reporters of EI.
Conclusion: Even though the precision of reported EI was poor, mean EI was reported accurately. Hence, for the assessment of EI, the 24hr dietary recall method may be insufficient for use at the individual level, yet valid at the group level.

Development of a computer-based tool for measuring schoolchildren's diets: the peas@tees project
Mark Taylor[1], C Summerbell[1], B Lang[1], A Adamson[2], S Crooks[1]
[1]University of Teesside, ABERDEEN, United Kingdom
[2]University of Newcastle, NEWCASTLE, United Kingdom

Children's lifestyles, particularly diets and levels of physical activity, are currently cause for concern. The increasing levels of obesity in children have serious health implications in both the short and long term. The most frequently used method for assessing eating patterns in children is the food diary. However, this can be inaccurate (particularly in overweight children) and difficult (particularly in children with poorer literacy skills) for the children to complete. In addition, analysis of data from 5 days recording requires considerable amounts of researcher time.
A new computer website has been designed and programmed, allowing schoolchildren to report their usual diets in a fun and interactive way, and saving many hours of researchers' time. The website also asks about physical activity, facilitating more complete analyses of children's lifestyles with respect to energy balance.
Pilot study data from a protoype version of the tool showed underreporting of food intake to the website (3547kJ vs. 6900kJ), but significant correlation between these values and those obtained from a conventional food diary ($p<0.05$, Pearson's r=0.353). The presentation will describe the design and development of the website as well as being the first opportunity to present the completed results from the updated version.

P16-12

Over-reporting of energy intake on a food record by preadolescent children with cystic fibrosis.

Jillian Trabulsi[1], Joan phd Schall[1], Richard phd Ittenbach[1], Irene phd, rd Olsen[2], Babette phd Zemel[1], Virginia md Stallings[1]
[1]The Children's Hospital of Philadelphia, PHILADELPHIA, PA, United States of America
[2]Drexel University, PHILADELPHIA, PA, United States of America

Background: Suboptimal growth and nutritional status are common among children with cystic fibrosis (CF) suggesting chronic negative energy balance. Understanding the causes of this imbalance requires the simultaneous measure of energy intake, expenditure, loss, and growth; within the context of dietary reporting accuracy. Aim: To evaluate the accuracy of reported energy intake in preadolescent children with CF. Methods: Energy Expenditure (EE) by doubly labeled water (DLW); Energy Intake (EI) by 7-day weighed food records; and fecal loss (FL) by 72-hour stool samples were measured at Baseline and 24-months in 6 to 10 year old children with CF. Results: The median EI to EE ratio (EI:EE) at Baseline and 24-months was 1.15 and 1.18, respectively; and decreased to 1.09 and 1.10, respectively, when adjusted for fecal loss (EI -FL:EE). Weight gain over 24 months was age appropriate at 8 g/d. At Baseline, subject reporting accuracy included: 7% under-reporters (UR), 64% accurate reporters (AR), 23% over-reporters (OR); with similar percentages at 24-months. Conclusions: The EI -FL:EE ratios were higher than expected, without concomitant higher weight gain. These data suggest a weakness of the diet record method for use at the individual level in children with a nutrition-related chronic disease such as CF.

P16-13

Validation of a new method for the assessment of the diet of infants and young children

Ellen Trolle[1], Tue Christensen[1], Majken Ege[2], Birgitte Hermansen[2], Kim Fleischer Michaelsen[2], Inge Tetens[1]
[1]Danish Inst Food &Vet research, SØBORG, Denmark
[2]KVL, FREDERIKSBERG C, Denmark

Measurements of dietary intake among infants and young children require special methodology.
The aim of the present study was to validate a new method, which records the total diet at individual level and uses precoded forms to enable fast data treatment.
The method development was based on the method used in the nation-wide dietary survey among 4 – 75 years old Danes, which is a combination of a personal interview (background data) and a self-administered diet record for 7 consecutive days.
The method development was an ongoing process with adjustments of the precoded booklets, and development of new series of pictures for estimation of portions sizes:
a study using weighed records among 53 infants/young children;
a study validating the picture series,
a pilot-study among 52 infants/young children.
Finally a semi-validation of the method was conducted by comparing the food and nutrient intake calculated from the weighed records and the intake calculated from the weighed records translated to the final method. The preliminary results show a good correlation between the two calculation methods. A final adjustment of specific portion sizes needs to be done, before the final version of the dietary method for infants and young children can be applied.

P16-14

The effect of Ca intake on growth and the intake of other nutrients in Korean Preschool Children

Jin-Sook Yoon, Mi-Nam Lee, Young Hye Jeong
Keimyung University, DAEGU, South-Korea

This study was intended to compare the Ca status of children and their mothers and to investigate whether dietary Ca insufficiency is related to overall nutritional status of preschool children. We collected dietary information from 141 preschool children 5-6 yrs and their mothers for 2 days by using food record method. The 2005 DRIs for Koreans was used to evaluate the adequacy of Ca intake level. Food diversity was assessed by dietary diversity score(D VS.). It was found that 75 % of mothers and 31 % of children took Ca less than the EAR . While 37 % of children with Ca inadequate mothers belonged to the Ca inadequate group, only 12 % of children with Ca adequate mothers were found to be Ca inadequate. Also, children whose Ca intake level was lower than the EAR showed significantly lower intake of other nutrients. D VS. was also significantly lower in the Ca inadequate group. Research findings showed that the Ca intake level was significantly higher in children with higher Z-score for height and weight(> 0.5), when compared to others. These results suggest that Korean children should acquire a sufficient amount of Ca intake to maintain overall dietary adequacy and physical growth.

P17-01

Dietary intake of heterocyclic amines in relation to socioeconomic, lifestyle and other dietary factors: Estimates in a Swedish population

Ulrika Pettersson[1], Elisabet Wirfält[1], Irene Mattisson[2], Bo Gullberg[1], Kerstin Skog[3]
[1]Malmö Diet and Cancer, MALMÖ, Sweden
[2]National Food Administration, UPPSALA, Sweden
[3]Department of Food Engineering, LUND, Sweden

Estimated intake of heterocyclic amines (HAs) was examined in relation to socioeconomics, lifestyle and other dietary factors in a sub-sample of 8599 women and 6575 men of the Malmö Diet and Cancer (MDC) cohort. Baseline examinations were conducted between 1991 and 1994. Data were obtained from a modified diet history, a structured questionnaire on socioeconomics and lifestyle, anthropometrical measurements and chemical analysis of HAs. HA intake was cross-classified against meat and fish intake. The likelihood of being a high consumer of HAs was estimated by logistic regression. Dietary intakes were examined across quintiles of HA intake, using analysis of variance. The mean daily HA intake was 583 ng for women and 821 ng for men. The subjects were ranked differently with respect to HA intake compared to intake of fried and baked meat and fish. High HA intakes were associated with overweight, sedentary lifestyle, smoking, low intakes of dietary fiber, fruits and fermented milk products, but with high intakes of selenium, vegetables, potatoes, alcohol (among men) and non-milk based margarines (among women).
The results suggest that lifestyle factors and exposure to other dietary components may confound the associations between HA intake and disease.

P17-02

Estimation of cadmium exposure level in Japanese residents: Consideration on the maximum level of cadmium in selected foods

Yasuhiro Matsumura[1], Kunihiko Hayashi[2], Satoshi Nakai[3], Hiroshi Nitta[4]
[1]National Institite of Health & Nutrition, TOKYO, Japan
[2]2)   Gunma University School of Health Sci, MAEBASHI, Japan
[3]3)   Graduate School of Environment and In, YOKOHAMA, Japan
[4]4)   National Institute for Environmental, TSUKUBA, Japan

Purpose: The exposure assessment of various pollutants is an important basis of risk assessment. The purpose is to estimate cadmium exposure of Japanese as a whole by studying statistical methods for inferring cadmium exposure due to food.
Subjects and Methods:
The information on food intake was taken from the National Nutrition Survey from 1995 to 2000. Cadmium concentrations in food were taken from field surveys on cadmium contained in agricultural products and the like. The Monte Carlo simulation was used to estimate cadmium intake distributions for seven different scenarios of cadmium maximum levels of several food items and differences in cadmium distribution
Results: When no maximum level was set, the mean, median, and 95 percentile of the estimated cadmium intake were 3.47, 2.93, and 7.33 (µg/kg body weight/week), respectively. Scenario, which used the Cd maximum level of 0.4mg/kg only for rice and omitted data containing higher concentrations, is deemed to reflect the actual situation in Japan. The mean Cd intake was 3.44 in the scenario and it corresponds to 199 µg/person/week. These estimations contain various uncertainties. The effects of the uncertainties on the results of the cadmium exposure estimation were examined as quantitatively as possible.

P17-03

Use of probabilistic modelling in assessing the safety of vitamin fortification

Sue OHagan, Joanne mrs Dick
Unilever Colworth, BEDFORD, United Kingdom

Fortification of food has long been used as a means of improving the nutritional status of a population. However, concerns about safety have meant that in some countries compulsory fortification is now less favoured as a public health measure. The publication of upper safe intake levels (ULs) for vitamins and minerals and the forthcoming EU legisation on food fortification means that new risk assessment approaches are required to support the addition of vitamins and minerals to food. One such approach is the use of probabilistic modelling to determine what impact food fortification will have on the total dietary intake of a nutrient. This approach has been used to assess the safety of fortifying margarine with folic acid, vitamin B6 and vitamin B12. Data from the UK National Diet and Nutrition Survey programme were used to calculate the potential daily intakes of these vitamins when margarine was fortified to contain the RDA of each of the vitamins per 20g. A form of probabilistic modelling was then used to examine the impact of this new source of B vitamins in the diet on the total daily intake of these vitamins and whether it would result in ULs for the vitamins being exceeded.

P17-04

Asessment of the prospective intake progression of plant sterols by functional foods using a simulation method

Birgit Niemann[1], Oliver Lindtner[1], Almut Bauch[2], Karolin Kuhlmann[3]
[1]Federal Inst. for Risk Assessment, BERLIN, Germany
[2]Robert Koch Institut, BERLIN, Germany
[3]1University of Applied Sciences, MÜNSTER, Germany

In the context of the safety assessment of functional food ingredients we simulated the anticipated intake progression of plant sterols by multiple dietary sources in the german population. We constructed three different scenarios to find a safe strategy for adding plant sterols to foods, based on the consumption data of the German National Food Consumption Study (carried out from 1985 to 1988 with 23,209 participants) and a German food composition table. For this, we fortified ten common foods with different doses of plant sterols per daily serving of the relevant food and calculated the prospective plant sterol intake by stepwise accumulation of the different foods. We found a plant sterol intake satiation at eight enriched food items. An enrichment amount of 2 g plant sterols per proposed food serving resulted in an intake maximum of 13 g per day per. In conclusion, the restriction of food groups added with effective doses of plant sterols seems to be indispensable.

P17-05

Arsenic exposure from seafood in healthy adult Norwegians – a randomized controlled diet trial

Marianne Molin[1], Lisbeth Dahl[2], Vibeke Helen Telle[1], Stine Marie Ulven[1], Jens Sloth[3], Arne Oshaug[1], Anne Katrine Lundeby Haldorsen[2], Kåre Julshamn[2], Helle M. Meltzer[4]
[1]Akershus University College, LILLESTRØM, Norway
[2]NIFES, BERGEN, Norway
[3]Danish Inst. for Food and Vet. Research, COPENHAGEN, Denmark
[4]Norwegian Institute of Public Health, OSLO, Norway

Seafood is the main source of arsenic in the Norwegian diet, most of it being present in the non-toxic arsenobetaine form. However, little is known about the stability of organic arsenic during food processing and human metabolism. Increased focus on food safety has led to the need for better documentation of potentially harmful substances in seafood. In order to assess the toxicological impact of arsenic intake on human health, specified data on exposure and excretion of arsenic species are required. The aim of the present study was to investigate the dietary intake, metabolism and excretion of organic and inorganic arsenic species naturally occurring in seafood. A randomized controlled diet intervention trial (RCT) was performed. Forty volunteers divided into four groups (n=10), consumed the same amount, but different kinds of seafood. Arsenic speciation analysis was performed before and after processing of all seafood served to ensure the exact intake of arsenic. Arsenic speciation analysis of human urine were determined using gradient elution anion or cation exchange high-performance liquid chromatography (HPLC) coupled with inductively coupled plasma mass spectrometry (ICP-MS). A detailed description of the study design and the preliminary data will be presented and discussed in the poster.

Micronutrient intake assessment of amateur cyclists by means of the ear-cut-point method

Christina Breidenassel[1], Sinidu Deneke[2], Marcela Gonzalez Gross[3], Peter Stehle[2]
[1]Universität Bonn, BONN, Germany
[2]IEL-Ernährungsphysiologie, BONN, Germany
[3]Facultad de CC de la Activitad Fisica, MADRID, Spain

Nutrient requirement and therefore the need (or not) of specific dietary recommendations (DR) for athletes are still controversial. Consensus exists about the importance that athletes cover at least the DR established for the general population. Aim of the study was to assess the dietary and supplement intake of young cyclists. Dietary intake including supplements of 11 male amateur cyclists (mean age 25.7+/-1.8 years; mean hours of training 2.30+/-0.54h/day) was determined by using a 7-day weighed dietary record and analysed with the program EBISpro 2001. The EAR-Cut-Point Method was used for assessing nutrient adequacy. Energy expenditure was estimated calculating Basal Metabolic Rate (BMR) and physical activity level (PAL). Mean energy (16.0+/-2.8MJ), carbohydrate (7.3+/-1.7g/kgBW), protein (1.7+/-0.3g/kgBW), and fat (1.6g+/-0.3g/kgBW) intake were adequate. There was a probability of inadequate intake for nearly all micronutrients, except for phosphorus, calcium and pantothenic acid. Use of supplements reduced the incidence of an inadequate supply only for vitamin E, B6, niacin, and folate. In conclusion, the studied athletes were able to achieve the macronutrient but not the micronutrient DR. Supplement use can be denominated as random, as the micronutrients, which were under-supplied in the diet, were not contained in sufficient amounts in the supplements.

Physical activity profiles of Swedish women using accelerometers

Nicola Orsini, Alicja Wolk
Institute of Environmental Medicine, STOCKHOLM, Sweden

This talk deals with the synthesis and description of the data coming from accelerometers, measuring free-living physical activity among 137 Swedish women aged 56-75 years. The rich information provided by accelerometers makes them an invaluable tool in understanding the complex nature of physical activity behavior. Time spent doing physical activity has been put forth as perhaps the most relevant for public health research because of its link to current physical activity recommendations. Custom programs developed in our research group allow quick and easy data reduction and processing of multiple accelerometer files. A detailed profile of the amount and intensity of an individual's physical activity will be present, together with a description of when and how physical activity is accumulated during the day. These results are important in epidemiological research because physical inactivity is a risk factor for obesity and many other chronic diseases.

Reliability of physical activity recall from the distant past: longitudinal data from the CARDIA study

Ashley Smith[1], Kathy Cronin[1], David Jacobs[2], Rachel Ballard-Barbash[1], RP Troiano[1]
[1]National Cancer Institute, BETHESDA, MD, United States of America
[2]University of Minnesota, MINNEAPOLIS, United States of America

PURPOSE: We investigated the reliability of 15-year physical activity (PA) recall in the population-based Coronary Artery Risk Development in Young Adults (CARDIA) study. METHODS: Participants included 3607 Black and White men and women. PA was reported at Baseline and recalled using the same instrument 15 years later. Two Likert-scale questions assessed High school (HS) and past-year PA. Moderate and vigorous scores were calculated from reported months of participation in specific activities. RESULTS: PA recall for HS showed better agreement (weighted kappa=.41) than past-year PA (weighted kappa=.19). Correlations were r=.35 for moderate and r=.42 for vigorous scores. Recall of specific activities (yes/no) showed better agreement for vigorous (weighted kappa=.28 to .48) than moderate activities (weighted kappa=.20 to .37). Regardless of originally reported number of months, most participants recalled either no activity (0 months) or activity during all 12 months. CONCLUSIONS: Associations were modest, but comparable to shorter duration studies. Recall was better for vigorous than moderate activity; however, there was misclassification of months of activity participation. PA in HS appeared easier to recall than the year prior to Baseline, a less structured time of life. Findings suggest that PA recall from the distant past is modestly reliable.

Relative validity of carotenoid and tocopherol estimates from the U.S. National Cancer Institute's Diet History Questionnaire

LB Dixon[1], Amy Subar[2], L Wideroff[2], Frances Thompson[2], Lisa Kahle[3], N Potischman[2]
[1]New York University, NEW YORK CITY, United States of America
[2]National Cancer Institute, BETHESDA, MD, United States of America
[3]Information Management Services, Inc., SILVER SPRING, MD, United States of America

Data from The Eating at America's Table Study (EATS) were used to determine the relative validity of estimates for carotenoids and tocopherols from the U.S. National Cancer Institute's Diet History Questionnaire (DHQ), using concentration biomarkers. In EATS, 163 participants provided 1 or 2 fasting blood samples and completed the DHQ and four 24-h dietary recalls (24HR) over the course of a year. For both the DHQ and the 24HR, crude correlations between serum and diet were generally highest for the provitamin A carotenoids (a-carotene, b-carotene, b-cryptoxanthin), modest for lycopene, and low for lutein/zeaxanthin. The individual dietary tocopherols were weakly correlated with the serum tocopherols, but total vitamin E from food and dietary supplements was strongly and positively correlated with serum a-tocopherol and strongly and inversely correlated with serum g-tocopherol for both instruments. Adjustment for energy, BMI, smoking status, serum cholesterol and triglycerides did not appreciably change the correlations. Using the method of triads, validity coefficients for the DHQ were comparable to the 24HR and were especially strong (>0.8) for a-carotene, b-cryptoxanthin, lutein/zeaxanthin, and total vitamin E in men and g-tocopherol and total vitamin E in women. In this study, there was no advantage of 2 blood samples over 1 sample.

Carotenoids as biomarkers of increased intake of vegetables and fruits in obese subjects

Mette Svendsen[1], Rune Blomhoff[2], Serena Tonstad[3]
OSLO, Norway
[2]Department of Nutrition, University of O, OSLO, Norway
[3]Department of Preventive Cardiology, Cen, OSLO, Norway

Objective: To test the use of serum concentrations of carotenoids as biomarkers for changes in intake of fruit and vegetables.
Methods: Subjects were 125 men and women aged 48.2 (SD 9.0) y with BMI 36.7 (SD 5.8) kg/m2 who participated in a controlled intervention study for 3 months. The dietary goals were to increase the intake of vegetables (400g/d) and fruit (300 g/d). Dietary intakes were assessed with a dietary interview. Six carotenoids were determined in serum by HPLC.
Results: The mean difference in intake of fruit and vegetables between the groups was 485 g (95%CI 351, 619) as was reflected in the difference in concentrations of a-carotene (0.044 microM, P=0.0021) and ß-carotene (0.115microM, P=0.0019). In the intervention group, changes in intakes of vegetables were correlated to changes in concentrations of a-carotene (rs=0.323, P=0.0103). Including the control subjects in the analysis, changes in the intake of vegetables were correlated to changes in serum concentrations of ß-carotene (rs=0.229, P=0.0159), lutein (rs=0.255, P=0.0073) and a-carotene (rs=0.422, P<0.0001) while changes in the intake of fruit was correlated to changes in a-carotene (rs=0.221, P=0.0198).
Conclusion: Serum concentrations of carotenoids particularly a-carotene may be used as biomarkers for enhanced intake of fruit and vegetables.

Diet and Total Antioxidant Performance (TAP) in the Jackson Heart Study (JHS)

SA Talegawkar[1], K-J Yeum[2], EJ Johnson[2], TC Carithers[3], HA Taylor Jr[4], Katherine Tucker[2]
BOSTON, United States of America
[2]JM USDA HNRCA at Tufts University, BOSTON, United States of America
[3]University of Mississippi, UNIVERSITY, United States of America
[4]University of Mississippi Medical Center, JACKSON, United States of America

We examined associations between TAP, a measure of antioxidant capacity in both the hydrophilic and lipophilic compartments of serum, and ß-carotene and a-tocopherol intakes (assessed with a regionally specific food frequency questionnaire), in African Americans (164M, 249F aged 34-84y) participating in the JHS. Mean (±SD) serum TAP values in the population showed 73.2±7.6 % protection. Total and dietary ß-carotene intake (log transformed) were associated with TAP (Crude ß total: 2.34±0.97; dietary: 2.32±0.97; each P<0.05). Associations remained after adjustment for covariates. Serum uric acid (UA), mainly produced endogenously, but also affected by diet, was strongly associated with TAP. UA was also a significant negative confounder between total a-tocopherol intake and TAP. We examined the association between a residual measure of TAP, after adjustment for UA, and a-tocopherol (log transformed). Total but not dietary a-tocopherol intake was associated with this adjusted TAP measure (Crude ß: 0.89± 0.18, P<0.05). Fruit and vegetables are major sources of antioxidants in the diet. Vegetable, but not fruit intake (servings/d), was associated with TAP (Crude ß: 2.40±1.06, P<0.05). These results demonstrate that dietary intake of vegetables, ß-carotene & total a-tocopherol are associated with TAP. However, the relationship between a-tocopherol & UA with TAP needs further investigation.

P19-04

Serum lipossoluble vitamins as biomarkers of dietary intakes among low income women living in São Paulo, southeast Brazil

Luciana Yuki Tomita, Lana Almeida, Lucila Pereira, Marly Cardoso
School of Public Health-University of SP, SÃO PAULO-SP, Brazil

Nutritional biomarkers have been used to assess food frequency questionnaires (FFQ) as an independent method for evaluation of dietary exposure. This study evaluated the association between individual serum lipossoluble vitamins (beta-carotene, lycopene, alpha and gama-tocopherols adjusted by total cholesterol; vitamin A) and dietary intakes recorded by a validated FFQ. Overall, 944 low-income women (18-66 years) were included in the present analysis. The study population was a sub-sample of participants in a case-control study on micronutrients and cervix cancer. Energy-adjusted dietary intakes were calculated by residual method. Fasting blood samples were collected protected from the light, stored at -70°C and measured by HPLC. Using linear regression models, serum beta-carotene levels were associated with dietary intakes of vitamin A, dark-green vegetables, alpha and beta-carotenes, fruit/fruit juice, and vitamin C, after adjusting for age, season (summer/spring or fall/winter), BMI, fasting status, and smoking. Serum lycopene levels were associated with dark-green vegetables, alpha-carotene, fruit/fruit juice and vegetables group, adjusted for age, season, BMI and alcohol consumption. Serum vitamin A levels were associated with calcium and milk group. In conclusion, specific dietary intakes as measured by our FFQ are good predictors of individual serum levels of beta-carotene, lycopene, and vitamin A.
 Sponsorship: Fapesp and CNPq

P20-01

Dietary diversity is predictive of the nutrient density of complementary foods for breastfed children in developing countries

Mary Arimond
International Food Policy Research Inst, WASHINGTON, D.C., United States of America

Lack of simple indicators has hampered progress in measuring and improving the quality of complementary feeding in developing countries. Adequate nutrient density is one key element of quality, but is difficult to measure. Using nutrient intake data for infants (6-11 mo) from four countries (Bangladesh, Guatemala, Honduras and Peru), this study tested whether a simple food group diversity (FGD) indicator could predict the nutrient density adequacy of complementary foods. FGD was defined as the number of food groups included in the child's diet. Mean nutrient density adequacy (MNDA) was defined as the percent of desired density for 9 'problem' nutrients. Both FGD and MNDA varied by age group and country. FGD was significantly correlated with MNDA in all sites (coefficients ranged from 0.38 to 0.74); MNDA increased with higher FGD, but the relationship was not always linear. Sensitivity and specificity were calculated and showed fair consistency across countries. Further analyses with a broader range of countries and age groups are on-going. Selection of indicators and cut-offs will ultimately depend on proposed uses for assessment, targeting, or monitoring and evaluation.
Data analysis supported by USAID Cooperative Agreement No. HRN-A-00-98-00046-00 to the Academy for Educational Development for the FANTA project.

Urban practice of agriculture, food security and dietary diversity among households of people living with HIV/aids (plwha) in Uganda

John Bukusuba[1], Joyce Kikafunda[2], G Whitehead[3]
[1]MAKERERE, KAMPALA, Uganda
[2]Department of Food Science & Technology, KAMPALA, Uganda
[3]Cambridge, UK, United Kingdom

Given the challenges that food insecurity poses to successful medication in HIV/AIDS and targeting of other interventions, it is important to monitor food security and dietary diversity, which have been shown to be indicators of dietary quality and intake among households of PLWHA. A cross sectional study was thus undertaken to examine practice of urban agriculture, access to food aid, food security and dietary quality among households of people living with HIV/AIDS. Data was collected from 145 HIV-positive adults (15–49 years) using qualitative methods from urban areas of Jinja district.
Using SPSS version 12.0, bivariate analyses indicated that dietary diversity was significantly associated with household Socio-Economic Status ($F1, 143 = 7.323$, $P = 0.008$), Food Security Score [$r (N=145) = 0.357$, $P = 0.000$] and Urban Practice of Agriculture ($F1, 143 = 5.987$, $P = 0.016$). The study also identified Socio-Economic Status and Urban Agriculture to be the foremost predictors of household food security. Urban Practice of Agriculture is therefore one of the more sustainable measures that will prevent over dependency on food aid and enhance development of sustainable programs that do more than offer food.
Key Words: Dietary Diversity; Food Security; UPA; PLWHA

The contribution of food access strategies to dietary diversity of farmworker households in the Fouriesburg District, South Africa (SA)

Rozanne Kruger
University of Pretoria, PRETORIA, South Africa

Introduction: Lack of resources to produce and acquire food often lead to food insecurity, due to limited dietary diversity.
Aim: To describe the contribution of food access strategies to dietary diversity of farmworker households, to assess their dietary diversity level and its contribution to household food security.
Methods: A cross-sectional survey was conducted. The sample included women, aged 18-65, responsible for food in farmworker households. Data on demographics, food access strategies (food production, purchasing, bartering, gathering, payment in kind), and dietary variety were gathered.
Results: The two most common food accessing strategies used were purchasing and gathering wild foods. Most people depended on food production by cultivating vegetables (spinach) and fruit (peaches). Food bartering was seldom practised due to customs and lack of knowledge, but most received foods as payment in kind (maize meal). The choice methods of food access was buying, gathering and producing. People seldom ate outside their own homes. Dietary diversity was very limited for individual foods consumed in seven days although most food groups were used.
Conclusion: These results indicate limited use of food access strategies resulting in limited dietary diversity. Interventions should focus on increased use of food access strategies to improve dietary diversity.

P20-04

Sensitivity and specificity of a dietary diversity score tested in South African children

Nelia Steyn
Medical Research Council, CAPE TOWN, South Africa

Objectives: To assess the sensitivity and specificity of a food variety score (F VS.) and a dietary diversity score (DDS) as indicators of nutrient adequacy
Methods: Secondary data analyses were undertaken with nationally representative data of 1-8 year old children (n= 2200). An average F VS. (mean number of different food items consumed) and DDS (mean number of food groups) , were calculated. A nutrient adequacy ratio (NAR) is a ratio of a subject's nutrient intake over the requirement calculated using FAO/WHO (2002) recommended nutrient intakes for children. The Mean Adequacy Ratio (MAR) was calculated as the sum of NARs for all evaluated nutrients, divided by the number of nutrients evaluated. Height and weight data were also collected and transformed to z-scores.
Results: There was a high correlation between MAR and F VS. (r= 0.726; p< 0.0001) and DDS (r= 0.657; p<0.0001) indicating that either F VS. or DDS can be used as indicators of nutrient adequacy. A DDS of 4 and a F VS. of 6 were shown to be the best indicators of a MAR since they provided the best sensitivity and specificity.
Conclusion: Either F VS. or DDS can be used as indicators of micronutrient adequacy of the diet.

P20-05

Dietary variety and diversity across population samples of the concordance project

Marieke Vossenaar[1], Noel Solomons[1], Evelyn Mayorga[1], Roxana Valdés-Ramos[2], Marga Ocké[3], Jacob Seidell[4], Mike Lean[5], Annie Anderson[6]
[1]Center for Studies of Sensory Impairment, GUATEMALA CITY, Guatemala
[2]Universidad Autonoma del Estado México, TOLUCA, Mexico
[3]National Inst for Public Health & Enviro, BILTHOVEN, The Netherlands
[4]Free University, AMSTERDAM, The Netherlands
[5]University of Glasgow, GLASGOW, United Kingdom
[6]University of Dundee, DUNDEE, United Kingdom

Background: The 1997 WCRF/AICR report recommends a 'varied diet, based primarily on foods of plant origin', yet no operational criterion for 'variety' exists, for compliance or evaluation.
Objective: To provide greater operational context to the meaning of 'dietary variety' in cancer prevention, specifically related to predominantly plant-based diets.
Methods: Population-specific FFQ with additional open-ended questions were used to assess habitual diet in 18-70y/old adults across four nations: self-administered in 1053 Dutch and 849 Scottish adults; predominantly face-to-face in 823 Mexican and 875 Guatemalan adults. Diversity/variety scores (percentage of food-groups/items consumed at least weekly) were calculated for: 1) the total diet (35 food-groups); 2) plant-based foods (26 food-groups); 3) fruits, vegetables, pulses, and minimally-processed starchy foods.
Results: Median overall dietary diversity was 51.4%, 51.4%, 57.1% and 60.0% for the Dutch, Scottish, Mexican and Guatemalan samples respectively. Diversity for plant-based foods had lower values, except in Guatemala (61.5%). Fruit variety was ~20% for all samples, except in Guatemala (39.1%). Vegetable variety was greater than fruit variety for all samples. Variety for pulses was greater in Mesoamerican samples.
Conclusions: As total diet variety scores produced the greatest diversity, health is not necessarily a function of the crude numerical scoring.
Funded by the WCRF

P21-01

Self-report physical activity level in relation to maximum oxygen uptake in a volunteer sample of adult men and women

Mette Aadahl[1], Jens Halkjær Kristensen[2], Torben Jørgensen[1]
[1]Research Centre for Prevention and Healt, GLOSTRUP, Denmark
[2]Rigshospitalet, afsnit 4124, KØBENHAVN, Denmark

Introduction: Valid measurement of physical activity level is essential, when exploring the association between physical activity and different health aspects, when monitoring interventions aimed at increasing physical activity and when estimating the balance between dietary energy intake and energy expenditure. Physical activity is often measured by self-report in large study populations and it is therefore important to establish how self-report methods relate to objective measures of physical capacity.
Aim: To assess the validity of a new self-report physical activity questionnaire in relation to maximum oxygen uptake.
Material: 102 volunteer men and women between 35 and 65 years of age, recruited from the 5-year follow-up of an on-going population-based intervention study, the Inter 99 study.
Methods: Participants filled out a self-report questionnaire on 24-hour physical activity on an average weekday and aerobic capacity was measured on an electrically-braked Krogh bicycle- ergometer. Oxygen uptake and heart rate was measured continuously during the test and the peak value was regarded as max V02. Relationship between physical activity level and max V02 was explored by spearman correlation and linear regression.
Results: Testing of 49 women and 53 men has recently been terminated, data are being analysed and results will be available april 2006.

P21-02

Harmonization around common operative-criteria for estimating target energy expenditure in a multicentric field-survey applying disparate data-collection instruments: the Concordance Project

Virginia Alvarado Salguero
CeSSIAM, GUATEMALA, Guatemala

Background: An increasing number of health guidelines set targets for physical activity. Functional and valid survey procedures to assess usual activity levels are needed.
Objectives: To devise a common methodology to classify individuals regarding the sufficiency of their daily activities to satisfy the WCRF/AICR recommendation to ?maintaining physical activity? from disparate survey instruments.
Design: The ?Concordance Project? applied prospectively-designed protocols based on self-administered (Netherlands, Scotland) or interviewer-based (Mexico, Guatemala) questionnaires. In Europe, sentinel activities (i.e. commuting, household, recreation and activities at work) formed the basis of assessment, whereas a comprehensive probe-guided daily-activity frequency recall was applied in Mesoamerica.
Results: Weekly minutes of the sentinel activities were multiplied by an intensity factor (based on an average MET-value per activity category, reported intensity, and age) to constitute a numerical total activity score. In Guatemala, the total activity score was lower for men (12203 ± 6273) than women (13507 ± 5460) ($p<0.001$), and higher in rural areas (14786 ± 6241) than in urban marginal (11678 ± 5384) or urban elite (10034 ± 4263) areas ($p<0.001$).
Conclusions: By prudent modelling, we harmonised operative criteria for estimating protective physical activity practices, and activity scores were higher for women and for the rural sample.

P21-03

Body composition and physical activity in elderly osteoporotic women.

Patrícia Genaro[1], Giselle Pereira[1], Vera Szjenfeld[2], Marcelo Pinheiro[3], Lígia Martini[1]
[1]São Paulo University, SÃO PAULO, Brazil
[2]São Paulo federal University, SÃO PAULO, Brazil
[3]São Paulo Federal University, SÃO PAULO, Brazil

Aging is associated with metabolic, physiologic, and functional impairments, in part through age-related changes in body composition (decreasing lean and bone mass and increasing fat mass) and absence of physical activity. The aim of the present study was evaluate, physical activity and body composition in elderly osteoporotic women. Forty-five postmenopausal women, mean age (63 ? 8 years old) and BMI (25 ? 4 kg/m²) assisted at São Paulo Hospital osteoporosis outpatients clinic were invited to participate. Body composition analysis was performed in all participants using DEXA technique (Lunar DPx) and habitual physical activity was assessed using Beacke questionnaire. Body composition analysis demonstrated that 82% of the participants were classified as obese according to fat mass percentage (mean % body fat = 39%) and 15% of the participants had low skeletal muscle index – SMI, (mean SMI = 6 kg/m2). In this study was also observed a correlation between % fat mass and Occupational Physical Activity (r= - 0.308 p= 0.040). The results demonstrate high prevalence of obesity and low lean mass in some patients. This study emphasizes the importance of physical activity to improve body composition in patients with osteoporosis in order to optimize adjuvant interventions to their pharmacological management.

P21-04

The relationship between body composition and physical activity in Japanese middle-aged and elderly

Rumi Kozakai[1], ITSUKO KITAMURA[1], Michiko Koda[2], Wataru Doyo[1], FUJIKO ANDO[1], HIROSHI SHIMOKATA[1]
[1]National Institute for Longevity Science, OBU, AICHI, Japan
[2]Chukyo Women's Univ., OBU, AICHI, Japan

Purpose: The purpose of the present study was to assess physical activity by the classification based on body composition (skeletal muscle mass and fat mass) in Japanese middle-aged and elderly.
Methods: Subjects were 1139 males (59.2±10.9 years) and 1119 females (59.2±10.9 years). Appendicular skeletal muscle mass (ASM) and fat mass was measured using Dual-energy X-ray absorptiometry. On the basis of ASM normalized for height (ASM/height2) and percent body fat, subjects were divided into 4 groups; Normal (N), Obese (O), Sarcopenic (S) and Sarcopenic Obese (SO). Total physical activity score (TPA) was assessed by summantion of the intensity multiplied duration time of each activity in one day using a questionnaire.
Results: Number of subjects in N,O,S and SO group were 650,178,257 and 54 in males,576,244,237 and 62 in females. As the results of analysis of covariance controlled for age, N group had significantly higher TPA than O and SO group in males. As for females, N group had significantly higher TPA than O group (p<0.05).
Conclusion: Appendicular skeletal muscle and fat mass was significantly related physical activity in the present study.

P21-05

Validation of a new physical activity questionnaire for assessment of energy expenditure
Jeppe Matthiessen, Anja Biltoft-Jensen, Lone Banke Rasmussen, Margit Velsing Groth, Sisse Fagt
Danish Institute for Food and Veterinary, SØBORG, Denmark

Objective: To validate energy expenditure (EE) estimated from a new physical activity questionnaire against EE measured with a validated position and motion instrument (ActiReg®).
Methods: Volunteers in the age group 20-60 years were recruited within the Copenhagen area. A total of 138 subjects (69 men and 69 women) completed the study. The subjects recorded their physical activity for seven consecutive days in a questionnaire and wore ActiReg® for the same days. ActiReg® is a novel electronic instrument which uses the combined recording of body position and movement to measure EE. The questionnaire was a modified version of the long self-administered International Physical Activity Questionnaire and is used in the Danish nationwide dietary survey.
Results: The mean values for estimated EEest and measured EEmea were respectively 11.58 ± 2.47 MJ/d and 12.02 ± 2.54 MJ/d. The mean difference between EEest and EEmea was -0.44 MJ/d (–3.7%), and the limits of agreement were 2.34 and –3.22 MJ/d. Spearman rank correlation coefficient between EEest and EEmea was 0.87 (p<0.01).
Conclusion: The physical activity questionnaire seems to provide a good estimate of EE in adults at the group level. The ability of the questionnaire to rank individuals according to EE was high.

P21-06

Physical activity and cardiovascular disease risk factors in Mexican adolescents
Roxana Valdes-Ramos, Alejandra Benítez-Arciniega, Fernando Farfán-González, Maribel Peña-Corona, Saby Camacho-López, Guadalupe Zúñiga-Torres
Universidad Autonoma Estado de Mexico, TOLUCA, ESTADO DE MEXICO, Mexico

To evaluate the association between physical activity (PA) and cardiovascular risk factors (RF) in Mexican adolescents, after parents' and children's consent, we measured waist circumference, systolic and diastolic blood pressure obtaining venous blood for triglyceride, HDL-cholesterol and glucose analysis. PA was measured by a semi-quantitative questionnaire including 13 different activities and the amount of time spent in each of them per week; data were converted into individual activity and total minutes per day. 151 female and 62 male subjects were evaluated. RF were categorized according to adult ATPIII cut-off values and PA was categorized for =30 min/day, or =1 hr/day, or =2 hr/day. Triglycerides were abnormal in 23 and 24.2%, HDL-cholesterol was low in 90.5 and 67.7% female and male subjects respectively. 71.5% girls and 80.6% boys showed PA above 1 hr/day. Chi-squared tests showed no significant associations between the RF evaluated here and PA levels. It is possible that the cut-off points used are not appropriate for this age group or that PA may not be related to these RF at the stage of growth as they are in adult populations. It is necessary to explore these relationships in children and adolescents in order to implement adequate preventive measures.

Impact of Nutrition and Physical Activity Programs on Heath Status of Older Adults Participating in Government Sponsored Programs

Shahla Wunderlich
Montclair State University, MONTCLAIR, United States of America

The purpose of this study is to investigate the impact of nutrition and exercise programs on the health status of older adults. Nutrition and physical activity education were provided to seniors who were participating in government sponsored meal programs. A total of 82 individuals participated in this study. Anthropometric measurements, Body Mass Index (BMI), blood pressure, cholesterol levels, pulse rate, balance, and strength repetitions were determined. The mean BMI was high, borderline for overweight and obesity. The mean BMI for women was 28.3 ± 5.6 and for men 26.8 ± 4.6. Slight improvement was observed in BMI after the nutrition education program. Women participants showed much more improvement in overall health status than men. Women showed a significant decrease in blood pressure from $147.0 \pm 23.4 / 82.7 \pm 12.9$ pre-Exercise Program (EP) to $132.9 \pm 17.8/74.0 \pm 10.3$ post-EP ($p < 0.001$). Among the subjects mean cholesterol levels increased from 194.38 to 202.46. The mean pulse rate decreased from 75.85 to 70.63. Balance and strength repetitions increased significantly ($p < 0.05$) for both females and males. These parameters have some limitations in determining at risk individuals. Further studies are needed for evaluating the effectiveness of these assessment markers.

The use of armspan measurement to assess the nutritional status of adults in six Iranian ethnic groups.

Ilghar Abiar
NNFTRI, TEHRAN, Iran

Abstract: Objectives: To investigate the use of armspan as a proxy for height in the assessment of nutritional status using body mass index (BMI) for six ethnic groups in Iran.
Design: Cross-sectional study.
Setting: Twenty two civil districts in Tehran metropolitan, Iran.
Subjects: A total of 3945 (1820 males and 2125 females) Iranians aged 28 ± 4.4 y from six different ethnic groups.
Methods: Anthropometric measurements (weight, height and armspan) were obtained using standard techniques. BMI using height (BMI-ht) and using armspan (BMI-as) were calculated, t-tests were used to compare means, and linear regression to investigate the relationship between BMI-ht and BMI-as.
Results: There were significant ethnic and sex differences in the relationship between height and armspan, and their derived variables (BMI-ht and BMI-as).Armspan and height, and BMI-ht and BMI-as, were highly correlated in all ethnic groups.
Conclusion: In using armspan as a proxy for height to estimate BMI, proper caution should be taken; because, the relationship between the two measures varies with ethnicity and sex. Ignoring sex- and ethnicity-specific cut-offs, may pose incorrect estimation of BMI, with major consequents on other height-correlated measures of nutrition assessment.

Session Code – Session name: P22 - Assessing nutritional status
Session Date :29/04/2006
Presentation Time : 13:45 - 14:45

Impact of obesity-related factors on urinary incontinence in the middle-aged and elderly women
Fujiko Ando, Itsuko Kitamura, Rumi Kozakai, Tomoko Imai, Hiroshi Shimokata
National Institute For Longevity Science, Obu, Japan

Purpose: Obesity is one of the risk factors of urinary incontinence (UI), but less is known about the relationship of abdominal obesity with UI. The purpose of the present study is to assess the impact of obesity-related factors on UI in the middle-aged and elderly women.
Methods: The subjects were comprised 1,105 Japanese women aged 40 to 82. The experence of urinary incontinence (EUI) was assesed by questionnair. Weight, body mass index (BMI), percent body fat (%Fat), waist circumference and area of intra-abdominal fat were used as indicators of obesity or abdominal obesity. A logistic regression model was applied to estimate impact of each indicator on the likelihood of EUI after adjusting for the comfounding factors.
Results: The prevalence of EUI was 50.2%. The prevalence of EUI increased significantly with 1.s.d. increment of BMI (odds ratio: 1.324, 95% CI: 1.168-1.500), weight (1.288, 1.136-1.460), %Fat (1.199,1.058-1.357), waist circumference (1.354, 1.192-1.538), and area of intra-abdominal fat (1.208, 1.061-1.376).
Conclusion: The indicators of abdominal obesity, as well as those of obesity, related with EUI. Although waist circumference showed the highest odds ratio, there were no statistically significant defferences in the likelyhood of EUI among the indicators of obesity and abdominal obesity.

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Dietary factors associated with malnutrition: an analysis of three hundred hospitalized patients in São Paulo, Brazil
Rita Aquino, Sonia Tucunduva Philippi
University of São Paulo, SÃO PAULO, Brazil

Introduction. Malnutrition in hospitalized patients has showed a high prevalence in the world and is consequence of several factors that include dietary factors. Objective. To identify dietary factors associated with malnutrition in hospitalized patients. Methods. In this cross-sectional study, three hundred patients randomly selected, ranging from 18 and 64 years of age, were screened within 48 hours from the time of admittance. Were evaluated with a full nutrition assessment included clinical features, anthropometrics measurements and dietary history. A statistical analysis was carried out using multiple logistic regression and malnutrition was established as the dependent variable. Results. Malnutrition was present in 60,7% of the patients and the variables that showed associated with malnutrition were decreased of appetite, recent changes in dietary intake and inadequate energy intake. Decreased of appetite were reported by 39,7% of patients and 92,4% were malnourished. Inadequate energy intake, obtained by dietary recall method, was found in 48% of patients and the mean intake were different (p<0,05): 1916,1 kcal (SD=655,5 kcal) in no malnourished patients and 1241,7 kcal (SD= 763,8) in malnourished patients. Conclusion Most of the hospitalized patients did not cover their estimated needs and these findings form the basis of the strategy to improve nutritional care.

P22-04

Mini Nutritional Assessment (MNA)- 'at risk' of what?

AM Beck
Danish Veterinary and Food Research, SOEBORG, Denmark

The purpose of MNA is to detect the presence of malnutrition and the 'risk' of developing malnutrition among elderly. Several studies have demonstrated the association between MNA and adverse health outcome. However none of the studies have calculated the positive predictive values (PPV) for the groups identified as being 'at risk' of malnutrition.
A search on the database PubMed was performed.
Ten studies were identified. Prevalence (PP) and PPV for the group 'at risk' of malnutrition could be calculated for 6:
Geritaric patients (1-4 studies):
Mortality: PP 2-6%, PPV 0,02-0,07
Adverse events: PP 19%, PPV 0,2
To nursing home/hospital: PP 16-46%, PPV 0,18-0,52
General practitioner (1 study):
Weight loss: PP 6%, PPV 0,11
Acute disease: PP 23%, PPV 0,28
Hospital: PP 26%, PPV 0,38
Mortality: PP 3%, PPV 0,09
Healthy (1 study)
Weight loss: PP 17%, PPV 0,62
Acute disease: PP 25%, PPV 0,39
Hospital: PP 26%, PPV 0,56
Mortality: PP 24%, PPV 0,49
PPV for the group 'at risk' of malnutrition seems to depend on the prevalence, but is generally low. Erroneous identification may cause physical and psychological detriments and unnecessary treatment.
MNA should not be used routinely among elderly, since the consequence of being 'at risk' is uncertain.

P22-05

Explore the adequacy of MNA as a nutritional screening tool for Taiwan elderly

LC Chan[1], MMS Lee[2]
[1]Tri-Service Gnereal Hospital, TAIPEI, Taiwan
[2]Department of Public Health; National De, TAIPEI, Taiwan

The six components of MNA make it faster and easier as a nutrition screening tool, however, if the different characteristics of the elderly between races could be considered, we can apply MNA with more accuracy and less expense. The purpose of this study was to find out the six discriminative items of MNA for the elderly in Taiwan through exploring the elderly under healthy examination in hospitals and those living in the institutions. 172 elderly are enrolled in this study. They are conscious clear, without fever, infection and surgeries during one month. We used Stepwise regression to look for influential factors in serum albumin. The results showed that calf circumference?loss of appetite?weight loss during the last 3 months?BMI?mode of feeding and self view of nutritional status are most correlated($R2=0.89$). When we utilized these factors for nutrition assessment, the false classification rate decreased(0.10 vs.. 0.15;0.09 vs.. 0.12);the pearson correlation of total scores and serum albumin elevated(0.92 vs..0.90;0.63 vs..0.61);the sensitivity and specificity increased (0.92 vs..0.90;0.48 vs..0.44);and Kappa is 0.64. All data were significantly different.

P22-06

Achieving the US Dietary Recommendations and the contribution of juice consumption to total nutrient intakes: NHANES 2001-2002 Data

Catherine Champagne, Raymond Allen
Pennington Biomedical Research Cetner, BATON ROUGE, LA, United States of America

The objective of this research was to determine how well Americans achieved recommended nutrient intakes and particularly the contribution of fruit juices to total nutrient intakes. We utilized the National Health and Nutrition Examination Survey (NHANES) 2001-2002 data to determine the percentages of individuals in various age groupings who met those recommended intakes. Secondly, juice consumption in helping to achieve those nutrient intakes was of interest since there has been much controversy regarding juice intake in contributing to the obesity epidemic. A total of 9598 subjects completed the 1 day intake used for this analysis. Those achieving specific health recommendations varied: fat, 34-47%; saturated fat, 30-58%; cholesterol, 49-83%; sodium 22-66%; fiber 5-24%. Approximately half the subjects met the calcium recommendation but less than 30% met the magnesium recommendation. Vitamin E intakes ranged from 39% to 72% for individuals above 1 year old. Other vitamins and minerals were not of concern. Fruit juices contributed on average about 2-3% of calories, but remain a significant source of vitamin C, meeting about 1/3 of the daily requirement. These results suggest continued counseling to achieve health recommendations and encouraging juice consumption as it relates to adequate intakes of vitamin C without impacting weight status.

P22-07

Dietary practices and nutritional status of 0-24-month-old children from Brazilian Amazon.

Teresa Gontijo de Castro[1], Teresa Castro[1], Larissa Baraldi[1], Pascoal Muniz[2], Marly Cardoso[1]
[1]Faculdade de Saúde Pública, SÃO PAULO, Brazil
[2]Universidade Federal do Acre, RIO BRANCO, Brazil

A cross-sectional population-based study was carried out to assess dietary practices of 0-24-month-old children in Brazilian Amazon. The dietary intake of the infants and toddlers was obtained from diet history data, coupled with 24 h recall. The nutrient composition database used was derived from the World Food Dietary Assessment System, version 2.0. Iron status was assessed using fasting venous blood samples. Of the total of 75 randomly selected children, 40.3% were anaemic, 63.1% had serum levels of ferritin < 12 µgl-1 or transferrin receptor > 8.3 µgl-1 and 7.0 % were stunted. Despite early feeding of complementary foods, breast-feeding was prolonged, with median duration of 5 months. Dietary pattern reflected a high intake of carbohydrate-rich foods, with irregular intakes of fruit, vegetables and meat. All infants and 92.3 % of toddlers were at risk of inadequate iron intakes. Iron from animal foods contributed on average 0.5 % and 14.3% of total dietary iron among infants and toddlers, respectively. Nutrition intervention programs should address micronutrient deficiencies focusing on complementary diets with high bioavailable iron to improve iron stores among young children in Amazon area.

Nutritional status of urban schoolchildren of high and low socioeconomic status in Quetzaltenango, Guatemala: a profile of emergent nutrition transition.

Iris Groeneveld[1], Noel Solomons[2], Colleen Doak[1]
[1]VU University, AMSTERDAM, The Netherlands
[2]CeSSIAM, GUATEMALA CITY, Guatemala

Background: The prevalence of overweight and obesity is increasing in many developing countries in children, enhancing chronic disease risk.
Objective: To assess nutritional status in 8-10 year old schoolchildren of high and low socio-economic status (SES) in Quetzaltenango, Guatemala.
Study design: We conducted a cross-sectional, anthropometric survey among 583 children of private and public elementary schools. The CDC2000 height-for-age Z-scores (for stunting), weight-for-age Z-scores (for underweight) and BMI centiles (for excess weight) were used as the diagnostic reference.
Results: Mean height, weight and BMI were significantly higher in HSES children (n=327) than in LSES (n=256), across sexes and age-groups. The prevalence of stunting (27.0% vs.. 7.3%, p<0.01) was significantly higher in LSES compared to HSES subjects, as for underweight (14.1% vs.. 4.6%, p<0.01, respectively). By contrast, the respective prevalence of overweight (10.5% vs.. 17.7%, p<0.01) and obesity (2.3% vs.. 14.4%, p<0.01) were higher in HSES. Prevalences of stunting (LSES) and of overweight and obesity (HSES) exceeded the CDC2000 reference values.
Conclusions: This area of the Guatemalan highlands is clearly in the process of a nutrition transition. A high prevalence of both stunting and excess body weight has been documented in this urban Guatemalan population, with notable contrasts between social classes.

C-peptide in urine samples of healthy children is long-term stable after adjustment for dietary glycaemic load

ALB Günther, AE Buyken, S Hahn, Y Kellerhoff, A Kroke, T Remer
Research Institute of Child Nutrition, DORTMUND, Germany

This study analysed whether C-peptide in frozen urine samples of healthy children remains stable over the long-term.
Among participants of the DOrtmund Nutrition and Anthropometric Longitudinally Designed Study with 24-h urine collections and simultaneously recorded dietary diaries, three comparable groups of 7-8 year old children (n=40 each) from 1990, 1996, and 2002 were randomly selected. Urinary C-peptide (UCP) was measured in 2004 by ELISA. Equivalence was examined by inverse hypothesis testing, applying critical values based on the ratio of the maximum pairwise difference in sample means to the samples´ standard error.
UCP excretions did not differ between the periods (median (Q1, Q3) UCP 1990, 1996 and 2002: 6.9 (5.0,10.4) vs. 7.2 (5.6, 10,0) vs. 7.5 (5.5, 10.8) nmol/day, p=0.7), but were not equivalent (mean (SD) log-transformed UCP: 1.91 (0.63) vs. 1.97 (0.44) vs. 2.04 (0.40) nmol/day, p>0.10). However, adjustment for body weight and dietary glycaemic load (GL) yielded equivalence (mean (SD) log-transformed UCP: 0.92 (0.68) vs. 0.91 (0.45) vs. 0.96 (0.43) pmol/(kg*g), p<0.05).
C-peptide in the urine of healthy children remained stable for 12 years when accounting for physiological variations associated with the individuals' body weight and GL.
Overall, retrospective analyses of UCP can be regarded as reasonably precise.

Assessing excess body weight change among children using BMI centiles and BMI Z-score reference values

Sofia Iqbal[1], Berit L. Heitmann[2]
[1]Institute of Preventive Medicine, COPENHAGEN K, Denmark
[2]Research Unit for Dietary Studies, COPENHAGEN K, Denmark

Background: There is a need for identifying and examining overweight measures that take into consideration age, sex, and the growth among children and adolescents.
Aim: Examination of excess body weight change among Danish children using BMI centiles and BMI Z-scores.
Methods: From the Danish part of European Youth Heart Study, 398 boys and girls between 8-10 years were enrolled in 1997-98 and followed up in 2000-01. Overweight was defined as 85th centile of the extrapolated BMI and as 1.05 SD of age- and sex-specific BMI Z-scores.
Results: The prevalence of overweight was 14.6% at baseline but decreased to 9.6% at follow-up when calculated as BMI centile. However, when using the BMI Z-score the prevalence of overweight was 27.1% and increased to 29.9% at follow-up. Mean ?Z-score was +0.1 and +0.4 for boys and girls, respectively.
Discussion: It is unknown whether the true prevalence of overweight in the present study is 14.6% or 27.1% at baseline and whether there is a decrease or increase in the prevalence of overweight. Even though, results from some studies show a high correlation between BMI, BMI centiles, and BMI Z-scores the results from the present study show a large discrepancy between the two examined measures.

Nutritional status assessment of elderly hospitalized patients

Mala Manral
A.I.I.M.S., NEW DELHI, India

Introduction: The prevalence of under nutrition in geriatric hospital population is known to be high, running between 30% & 60%. Several studies confirm deterioration in the nutritional status of elderly during hospital stay and after hospital discharge.
Background: Malnutrition is a well-recognised problem in hospital. Since aging & chronic diseases are risk factors for protein energy malnutrition, the nutritional status of hospitalized elderly patients was assessed.
Setting: Cardiothoracic & Neurosciences Center, A.I.I.M.S
Method: 100 subjects (29 women and 71 men) hospitalized in the CN Center aged 65- 89 years were assessed .The Mini- Nutritional Assessment (MNA) scale (0-30 points) was used, consisting of 18 point-weighted questions in four categories, i.e. anthropometry, global, dietary issues and self assessment. Three consecutive 24-hour recalls were used to describe usual dietary intake.
Result: According to MNA, 29% were malnourished (MNA<17 points), 52% at risk for malnutrition (17 - 23.5 points) and 19% well nourished (>23.5points). The mean MNA score was 19.03. 17% of the patients had BMI lower than 21 and 55% had BMI more than 23. Mean intake of energy was found to be lower than RDA, i.e. 1313 kcal ± 294. Mean intake of protein was found to be 44g ± 8 .Chewing and swallowing problems along with reduced appetite were more often reported by those at risk of being malnourished as compared with the well nourished study participants. Nutritional deficits varied with risk level with most common being inadequate fluid and calcium intake. The most commonly reported nutritional symptoms were anorexia, constipation, dysphasia, diarrhea & early satiety.
Conclusion: Poor nutritional status as measured by MNA was associated with increased in-hospital mortality, a higher rate of discharge to nursing homes and a longer length of stay. The study clearly demonstrated the high prevalence of malnutrition and the clinical usefulness of the MNA scale in elderly.

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Nutritional evaluation and cardiovascular risk in executives submitted to a check-up in a private hospital in São Paulo, Brazil.

Sonia Tucunduva Philippi[1], Thelma Feltrin Rodrigues[2]
[1]University os Sao Paulo, SAO PAULO, Brazil
[2]University of Sao Paulo, SAO PAULO, Brazil

Objective: To evaluate nutritional status and cardiovascular risk among executives. Methodology: A cross-sectional study. 329 executives of both gender, (31-70y) were evaluated during health check-up. The variables related to weight, height and waist circumference were measured and Body Mass Index (Kg/m2) was determined. Dietary intakes of total fat and fiber were assessed by the Simplified Food Frequency Questionnaire. Blood pressure and serum levels biochemical were analyzed. Physical activity was evaluated by International Physical Activity Questionnaire and cardiovascular risk was estimated by Framingham Scoring. Results: The mean age was 44.6 (SD=6.8), with male predominance (89.7%), 17% were tobacco smokers and 7.3% sedentary. The mean values found were the following: blood pressure 117x78.6mmHg (SD=12x8.3), total cholesterol 200.5mg/dL (SD=35.9), LDL-c 121.8mg/dL (SD=29.9), HDL-c 52.2mg/dL (SD=10.9), triacilglicerol 133.7mg/dL (SD=76.8), glucose 96.3mg/dL (SD=20.5). The BMI mean for all executives was classified as overweight (26.1kg/m2;SD=6.8). Waist circumference was normal in women (79.6cm;SD=7.3) and indicated high risk level of chronic disease for men (96.1cm;SD=8.9). The average score of dietary consumption of fat was 15.8 (SD=5.6) and for fiber was 18.3 (SD=5.3). The average Framingham Risk was 5.7%. Conclusions: The executives were overweight, had low fiber consumption and they presented low cardiovascular risk, according to the Framingham Scoring.

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Clinically identifiable risk factors for undernutrition in geriatric patients

Ingrid Poulsen
Hvidovre University Hospital, HØRSHOLM, Denmark

Background: Undernutrition is frequent in elderly patients; however, no consensus exists regarding nutritional screening measurements suitable for elderly patients.
Aim: To identify clinically identifiable risk factors for undernutrition in geriatric patients on admission.
Methods: Newly admitted patients (n=196, mean age 83.7 years) were examined for nutritional risk factors by the nursing staff. Analyses of variance and multiple regression analyses were used to identify risk factors for undernutrition.
Results: Undernutrition was present in 41% of the patients using a Body Mass Index cut-off <22 (kg/m²) as definition of undernutrition. Poor appetite, oral cavity problems, constipation and nausea or vomiting were frequent problems; the patients also used a high number of drugs, including nausea inducing drugs. No help with cooking before admission, poor appetite, oral cavity problems and high age were all significantly associated with undernutrition.
Conclusion: To improve nursing care and to prevent undernutrition, it is recommended to routinely examine the patient's oral health on admission and to assess patients not only for their physical condition (appetite, oral health and nutritional status), but also for their living conditions e.g. help with cooking.

The application of carpal epiphysis width measurement as an auxiliary criterion for epidemiological investigation into assessing population nutritional status

Katarzyna Przybylowicz
University of Warmia and Mazury, OLSZTYN, Poland

The aim of this study was to determine the possibility of supplementing an epidemiological investigation assessing the nutritional status of the population with the measurement of carpal epiphysis width as an auxiliary criterion. This would make BMI classification more precise for different types of body build in order to more precisely assess body mass composition and, thus, more accurately determine obesity prevalence. methods: The study covered 2,847 people, aged 20-26. Anthropometrical measurements involved determination of the body mass and height, the width of carpal epiphysis and the thickness of four skin and fat folDS. Body build categories were determined on the basis of the carpal epiphysis width. Three body build categories were determined and correlation with BMI values and particular anthropometrical parameters was studied.
Results: A statistical analysis revealed a significant variety of values of basic anthropometrical parameters and BMI among people in different body build categories. After the creation of three body build categories, an increase in the correlation coefficient between BMI and parameters determining body composition was found.
Conclusions: This study demonstrates that the application of a population division based on carpal epiphysis width is useful for body mass assessment on the basis of BMI.

Fat tissue content evaluation by anthropometric and spectrofotometric methods and metabolic risk factors of chronic diseases

Katarzyna Przybylowicz
University of Warmia and Mazury, OLSZTYN, Poland

OBJECTIVE: Comparison of fat tissue content evaluated by anthropometric and spectrofotometric methods for menopausal women with regards to chosen chronic diseases risk factors.
METHODS: Study included 356 women aged 36-60. Studied women body content was characterized on the basis of the anthropometric measurements: body mass (kg), height (cm), four skinfolds thickness (mm), waist (cm) and hips circumference (cm) and calculated on their basis indices: the BMI (kg/m2), fat content in the body %FM (%) and the WHR. Body content was determined by spectrofotometric method using the Futrex apparatus. Biochemical analysis included evaluation of total cholesterol TChol, HDL and LDL, triglicerids (TG) concentrations in the blood and glucosis.
RESULTS: Comparing the percentage fat tissue content determined by anthropometric and spectrofotometric methods it was found that anthropometric method enabled including more features (glucosis, HDL, LDL, TG) and obtaining higher correlation levels. Spectrofotometric method was found to correlate percentage fat content in the body with glucosis, triglicerids and total cholesterol level.
CONCLUSIONS: On the population level anthropometric and spectrofotometric methods should be regarded as equivalent to determine fat content in the body for chronic diseases risk evaluation.

Armspan and wrist circumference measurements in Iranian physically disabled people: Implications on energy needs.

Reza Rastmanesh, ILGHAR ABIAR, Parnian Golfam
NNFTRI, TEHRAN, Iran

Objectives: To investigate the implications of armspan and wrist circumference application on energy needs in Iranian physically disabled people (PDP).
Design: Cross-sectional study.
Setting: Hamedan Province, Welfare Organization, Iran.

Subjects: A total of 1138 (646 males and 492 females) Iranian PDPs aged 54.5±11.3 y.
Methods: Armspan measurement and wrist circumferences were obtained using standard techniques. Body mass index (BMI) using height (BMI-ht) and using armspan (BMI-as) were calculated, t-tests were used to compare means, and linear regression to investigate the relationship between BMI-ht and BMI-as.
Results: Use of armspan measurements may overestimate height, and hence, underestimate BMI in PDP who are wheelchair-confined (WC); while in users of other walking aids (WA), it, in most of cases, underestimates height and hence, overestimates BMI. On the other hand, in our survey, there were no significant differences in wrist circumference measurements-which may be used to classify body frame-between 'WC' PDPs and users of other WAs. This may pose risk of energy overestimation in WCs-who are already prone to obesity/overweight; and energy underestimation for users of other WAs -which may be more physically active.
Conclusion: We call for multi-centered investigations to gather data to establish PDP-specific, and mentally disabled-specific BMI charts.

Association between intake of foods and urinary iodine concentration: Example from Mali

LE Torheim[1], GI Granli[2], A Oshaug[1]
[1]Akershus University College, LILLESTRØM, Norway
[2]Rikshospitalet, OSLO, Norway

Background: Although universal salt iodization is the recommended and preferred method for fighting iodine deficiency, it may be useful to identify other locally available dietary sources of iodine.
Objective: To investigate whether intake of any specific food was associated with urinary iodine concentration (UIC) among women in a rural area in Mali
Design: Cross-sectional study with assessment of women's dietary intake (by 24-hour recall), their UIC and iodine level in household salt.
Setting: Fifteen villages in the Kayes region.
Subjects: Women aged 15-45 years (n=423).
Results: Median UIC was low (27 µg/L), and 94% had UIC below 100 µg/L. Fifty-nine percent lived in households that used non-iodised salt. Bivariate analysis showed a strong relationship between UIC and intake of iodised salt. Women living in households using non-iodised salt had median UIC of 19 µg/L. Looking at iodine sources in this group, only intake of fish showed a positive correlation with UIC (r=0.14, p=0.02). However, intake of fish was low, consumed by 25% among whom median intake was 0.5 g.
Conclusion: The study indicates a lack of dietary iodine sources in this area of Mali. Action is needed to ensure adequate iodine intake through salt iodisation.

P22-18

Orthorexia - a real eating disorder?

Solfrid Bratland-Sanda, Monica Klungland Torstveit, Jorunn Sundgot-Borgen
Norwegian School of Sports Sciences, OSLO, Norway

Orthorexia has been presented as a new eating disorder (1). PURPOSE: to review the literature and determine whether orthorexia is fully described and discuss whether it deserves further attention.
METHODS: A literature search on the word orthorexia was conducted at BIBSYS, SPORTS DISCUS, MEDLINE and ISI WEB OF SCIENCE in august 2005. Exclusion criteria were publication language other than Scandinavian, English or German.
RESULTS: A total of five articles were found (2-6), one of these articles was original research (2). Orthorexia is characterized by obsession about healthful eating, symptoms are preoccupation with food quality, diet guidelines are followed to the extreme and the person is feeling guilty when planned diet is not followed. Donini et al (2) found an orthorexia prevalence of seven percent in the examined population by using the criteria proposed by Bratman and Knight (1).
DISCUSSION: A more systematic investigation of the proposed criteria, descriptions and possible clinical relevance of orthorexia as a separate diagnosis is needed. One must also examine whether the obsession is with food only, or if the orthorexic are obsessed with an overall healthy life style including exercise.

P23-01

Nutritional, microbiological and sensory quality assessment of Kunun zaki, a home-prepared traditional Nigerian beverage

Paulina Adeniji
University of Ibadan, Nigeria, IBADAN, Nigeria

Beverages are food items that are quite different from other foods because they are consumed in liquid state. The home produced non-alcoholic beverage includes Kunun Zaki (KZ). The home produced traditional beverage originated from the northern parts of Nigeria but are now consumed in Ibadan. The objectives were to assess the nutrient content, microbiological and acceptability of the home-prepared beverage and improve its nutrient content using Soybean.
Nutrient values were evaluated on the vendor samples and fortified samples usingA.O.A.C(1981) while bacterial counts were analysed using nutrient and MacConkey agar. A sensory evaluation was made on the local beverage fortified with Soybean.
Results showed that KZ fortified with Soybean had an average protein content of 8.1±1.2g compared to 3.1±0.1g of protein in the commonly home prepared beverage offered for sale to the public. Similarly, carbohydrate values of fortified KZ were found to be higher (values of 6.0±0.9g compared to vendor samples 4.0±0.6g). Likewise, a fat value of fortified sample was 18.0±3.1g compared to 17.3±2.7g of vendor sample.
 In conclusion, the beverage fortified with soybean had an increase in macronutrient and was widely accepted. Hence, the fortified beverage should be introduced into the market to improve nutritional status of consumers.

P23-02

Calcium intakes and food sources in the U.S. population and the role of fortification: results from NHANES 1999-02

Ann Albertson, Norton Holschuh
General Mills, Inc., MINNEAPOLIS, United States of America

Calcium intakes for most population groups in the U.S. have been declining over the past 20 years and only a small percentage of the population meet their Adequate Intake (AI) level. Calcium consumption and food sources were examined utilizing NHANES 1999-02, 24-hour dietary recall. Data were analyzed using SUDAAN? software. The mean daily calcium intake ranged from 695 mg/day for older females to 1138 mg/day for teen males. Less than one-third of the total population was above their AI for calcium. This percentage ranged from 66% for children 2-5 years to 12% for females 51+ years. Estimates were not adjusted for within-individual variation. Foods consumed at home contributed over two-thirds of total daily calcium. The calcium contributions from breakfast, lunch, dinner and snacks were 24%, 22%, 31% and 21%, respectively. Overall in the diet, the leading sources of dietary calcium were milk and milk products (26%), cheese (12%), and grain products and grain-based mixtures (28%). Calcium fortified cereal contributed approximately 2% of total daily calcium and when the contribution of milk consumed with cereal was considered, the calcium contribution increased to 8% of total population intake, on average.

P23-03

Food sources of plant sterols in the British diet

Sofia Andersson[1], Henrik Andersson[1], Angela Mulligan[2], Ailsa Welch[2], Sheila Bingham[3], Susan Andersson[1], Lars Ellegård[1]
[1]Sahlgrenska Academy, GOTHENBURG, Sweden
[2]University of Cambridge, CAMBRIDGE, United Kingdom
[3]MRC Dunn Human Nutrition Unit, CAMBRIDGE, United Kingdom

Background and aim: Plant sterols (PS) are bioactive compounds found in all vegetable foods at varying concentration. A high intake of natural dietary PS is inversely related to total and LDL cholesterol levels. The aim of the present study was to identify major dietary sources of PS in the British diet.
Method: A database of the PS (campesterol, ß-sitosterol, stigmasterol, campestanol and ß-sitostanol) content in more than 330 foods was linked to nutritional intake data from FFQs in the EPIC-Norfolk population of approximately 25000 men and women aged 40-79 years.
Results: Mean (sd) total intake of PS was 300 (108) mg/d for men and 293 (100) mg/d for women. Bread and cereals were the major food sources, together representing 19% of the total PS intake, followed by fats and vegetables 18% each, cakes scones and chocolate 15%, and fruits 12% of the total PS intake respectively.
Conclusion: Bread and cereals, vegetables, and oils, are the major food sources of plant sterols in the British diet. The serum cholesterol lowering effect of PS from the natural diet is probably underestimated. The natural content of PS in foods should be considered in the prevention of CVD.

P23-04

The food system: An up-to-date system for computerized work with Dietary surveys and fooddata

Marianne Arnemo
NFA, UPPSALA, Sweden

Description: The system is a Windows application based on .NET with a Microsoft SQL Server database. It includes programmes to record, process and calculate Dietary surveys and fooddata. It also includes parts to put together consumption data and for planning menus.
Background: Our old 'Food database' included 1400 excel files, one Access database and one excel based program for Recipe calculation. One version of the 'Food database' existed in 15 copies.. Every performed Dietary survey generated several excel files. It was very time-consuming and circumstantial to work with and it did not fulfil our demands of quality.
 Materiel och methods: The Database is a Microsoft SQL Server and Window applications based on .NET.
Guidelines for references, descriptors, calculations, factors in the system is Eurofoodsrec, LanguL, Nutrient Losses and Gains, NNR 2004 and SNR 2005. NFA has guidlines for development of datasystems and when running our systempossessmodell secures management.
Result Conclusion: The Foodsystem makes it possible to in less time and with less complicated processes have much higher quality on the result. Technicality makes it dependable and flexible.
The system will simplify collaboration and distribution of data both at NFA and with external participants.

P23-05

Improving dietary assessment of phytoestrogens: modifying an FFQ and selecting foods for laboratory analysis using data from a population food survey

Beatrice Boucher[1], M Cotterchio[2], N Kreiger[2], LU Thompson[2]
[1]Cancer Care Ontario, TORONTO, Canada
[2]University of Toronto, TORONTO, Canada

Phytoestrogens may be associated with hormone-related diseases, although data are conflicting possibly due to limitations in dietary assessment and analytic values. Dietary assessment and analyses have focused on soy and isoflavones rather than lignans, the class most relevant to Western diets. Additionally, selection of foods for laboratory analysis is often based on convenience rather than population-based data on types and brands consumed.
To modify the Block98 FFQ, sources of isoflavones, lignans and coumestans were identified from food analysis and intake literature. 67 food items were added to the FFQ, including 14 soy foods. Questions on types of cereals and processed foods (source of hidden soy) were also added. The final FFQ had 178 food items, and 119 plant-based items were selected for phytoestrogen assignment.
To identify food types and brands for laboratory analysis, a 12-page questionnaire was developed and mailed to 533 random population-based controls in a breast cancer case-control study. Those items most frequently reported by 409 women (77%) were selected for phytoestrogen analysis.
Modifications to FFQ and laboratory analyses may improve phytoestrogen intake and disease risk assessment.

P23-06

Estimated iron intake and adequacy in Iran change when newer values for iron in commonly consumed foods are applied

Mina Esmaeili, Anahita HoushiarRad, Morteza Abdollahi, Nasser Kalantari, Mahin Azar
National Nutrition and Food Technology R, TEHRAN, Iran

Public health nutrition activities, nutritional and epidemiological research, and government planning and policies concerning nutrition and agriculture all depend on accurate knowledge of what nutrients are provided by foods. The food composition tables commonly used in Iran were published in 1975, and because of limited resources to undertake detailed chemical analysis for building nutrient food composition databases, errors are expected in the Iranian food composition tables. Many reports indicate high iron intakes (30/mg/day) while at the same time iron deficiency is a major public health problem in Iran. Therefore, we have modified the aforementioned Iranian Food Composition Tables by replacing older values of iron with new ones obtained from chemical analysis of samples of commonly consumed breads and USDA nutrient databank (Release 15). Significant differences in estimated iron dietary intake and adequacy were found with newer values
This study shows that up-to-date chemical analysis of foods selected on the basis of a high frequency of consumption and a large contribution of the nutrients in focus is a useful approach in improving the quality of food composition tables, resulting in greater accuracy of estimated nutrient intakes and adequacies.

P23-07

The development of values for Vitamins E and B12 for fortified foods in the United States

Susan Gebhardt, Joanne Holden, David Haytowitz
USDA, Beltsville, MARYLAND, United States of America

Nutrient data from the USDA National Nutrient Database for Standard Reference (SR) form the foundation of the Food and Nutrient Database for Dietary Surveys (FNDDS). Of the 7,000 foods in SR about 2,700 foods are used in the FNDDS. Complete nutrient profiles for >60 nutrients, including vitamins E and B12 are provided for these foods. Changes in the Dietary Reference Intakes for the United States and Canada created the need for additional forms of vitamins in the database. The UL for vitamin E is based on vitamin E as a supplement or food fortificant. The EAR and RDA for vitamin B12 recommends that adults, 51 years and older, should meet most of their requirement by consuming foods fortified with vitamin B12 or a B12 containing supplement. In SR18, values were included for added vitamins E and B12 for foods used for the FNDDS. Excluding infant formulas, there are ~200 foods in the database fortified with vitamin B12. Of these, over 75% are breakfast cereals and ~10% are soy-based meat substitutes and meal replacements. There are ~100 foods fortified with vitamin E. Almost half are breakfast cereals and ~40% are meal replacements. Procedures used to estimate these values will be described.

The effect of cooking and blanching on potassium contents of vegetables in Taiwan

Huai-Yu Hu
Tri-Service General Hospital, TAIPEI, Taiwan

Vegetables are good sources of potassium (K). Patients with chronic renal failure (CRF) are usually instructed to avoid dietary vegetable consumption or to reduce vegetable K contents by blanching. The purposes of this study were to determined K contents of 60 kind of vegetables and to compare the efficiency of cooking cut vegetable from cold water until boiling with blanching vegetables for 1 or 3 min in reducing their K contents. Vegetables are categorized into high (>225mg/ 100g), medium (125~225 mg/100g) and low (<125mg/100g) K groups based on their K contents per 100g edible portion. Leafy vegetables and mushrooms are classified into high or medium K groups. The modes of K loss for 1 or 3 min of cooking or blanching are 10%~20% and 30%~50% for leafy vegetables, 1%~10% and 10%~20% for gourd and fruit vegetables, 5%~10% and 10% ~20% for roots and tubers, and 20%~30% and 30% ~40% for mushrooms, respectively. Since soaking and little influence, whereas blanching and cooking from cold water had similar effect on K loss, CRF patients are recommended to blanch their vegetables after cleaning and cutting in order to reduce K contents while maintaining nutrition value and crispy texture of vegetables.

Effect of cooking loss on vitamin intake for epidemiological data in Japan

Minatsu Kobayashi[1], Helena Yukari Adachi[2], Junko Ishihara[3], Shoichiro Tsugane[3]
[1]Showagakuin Junior College, CHIBA, Japan
[2]Beneficencia Nipo-Brasileira, SAO PAULO, Brazil
[3]National Cancer Center, TOKYO, Japan

Background: Very little research about the effects of cooking loss on vitamin intake has been conducted, much less about the same effects using biomarkers. Methods: Seven-day dietary records and a fasting blood sample were collected from 102 men and 113 women in August of 1994 or 1995. Vitamin intakes were estimated using two food databases, one composed of only raw food, and the other composed of cooked food. Each estimate was compared with blood levels. Results: Water-soluble vitamin intake using a food database including cooked food was lower than when using a food database composed of only raw food except for pantothenic acid intake. In particular, vitamin B1 intake was 30% below in men and 26% in women. The relationship between serum carotenoid and plasma vitamin C, B6, B12, folate concentration and corresponding vitamin intake did not improve when the vitamin intake was calculated using a food composition database including cooked food. Conclusion: When vitamin intake is estimated in epidemiological study, although the cooking loss has a great effect on the absolute value, this may not have a significant impact on the ranking of subject intake.

Iron intake of Brazilian women in fertile age, before and after iron fortified diet

Karina Ochsenhofer
University of São Paulo, SÃO PAULO, Brazil

One study done at 1968 by the WHO concluded that the anemia prevalence for women in fertile age in low development countries was 50%. Iron balance results from the loss, intakes and physiological necessity. Any study that investigates iron deficiency etiology must estimate populations iron intake. In Food Frequency Questionaries it isn't necessary estimate the absolute iron intake, but just the mean.
The objective of this study was to analyse the 24h Recall of 103 healthy women in fertile age, focus on iron, during 2 consecutive months of the year 2005, before and after iron fortified diet and evaluate the adequate with DRI's.
The mean age of the population is 32,2 years (SD 11,66). About nutritional status, 56% are eutrophic, 10% underweight, 20% pre-obese and 14% obese. The mean iron intake is 9,60 mg (5,36 SD) in the 2 months and increases 99,58% going to 19,16 mg (8,49 SD). Before iron fortified diet, 40,78% of the women are below EAR, 56,31% between EAR and RDA and 0,49% above UL. After fortified diet, 8,25% are below EAR, 42,23% between EAR and RDA and 1,46% above UL.
We concluded that food fortification can be a cheap and simply way to prevent anemia.

Current status of dietary assessment and food composition database development in Nigeria

Victor Ohuruogu, Isaac Akinyele
University of Ibadan, IBADAN, Nigeria

Introduction: The Nigeria Food Consumption and Nutrition Survey - 2001 (NFCNS) exposed a gap in our database for nutrient contents of foods generally consumed in Nigeria. This gap highlighted the huge numbers of missing foods/nutrients.
Objective: The objective of this future study is to evaluate the gaps presented by the NFCNS with a view to reducing the gap, and to assess the current dietary pattern of Nigerians.
Method: It therefore becomes important to first develop a comprehensive databank of all foods being consumed in the country and further expand the opportunities provided by the first NFCNS.
Significance: The implication is that this will make for a better estimation of the food intake of Nigerians. Relationship can then be established between the eating behavior of individuals and the onset or prevalence of risk factors and chronic diseases for identification of the vulnerable group at risk of malnutrition.
Keywords: Food, Composition Tables, Database, Nutrient, Food Consumption, Survey, Dietary Recall.

P23-12

What's in the foods you eat search tool: a free and accessible database

Nancy Raper
U.S. Dept. Agriculture, BELTSVILLE, MD, United States of America

The What's In The Foods You Eat Search Tool is a search program that allows a user to easily find information on the nutrient content of foods typically eaten in the U.S. The Search Tool expands the use of a valuable dietary assessment tool, the Food and Nutrient Database for Dietary Studies (FNDDS), to the general public and nutrition professionals. The FNDDS is used to process and calculate nutrient intakes for the dietary recalls collected in What We Eat in America, the dietary component of the National Health and Nutrition Examination Survey. The Search Tool includes descriptions for over 13,000 foods and 30,000+ common portions and weights for those foods. The user can define an amount based on a portion size. A complete profile of food energy and 60 nutrients/food components is included for each food. The Search Tool is on the internet at http://www.ars.usda.gov/foodsearch. Online and downloadable versions are available. The features of the search tool will be described and examples of how it can be used by researchers will be highlighted.

P23-13

Criteria for products with fruit and vegetable claims

Caroelien Schuurman, Els Groene, de, Jolanda Mathot, Susan Vermunt, Annet Roodenburg, Rianne Leenen
Unilever Food and Health Research Instit, VLAARDINGEN, The Netherlands

Current intakes of fruit and vegetables (F&V) are well below the recommendations (400 g. F&V per day according to the WHO) Processed foods, providing F&V are a potential option to bridge the gap in the diet by offering attractive options. Because they are lacking, Unilever has developed criteria for F&V claims in processed foods.
Key nutrients in F&V were defined: vitamin C, fibre, total carotenoids, total polyphenols, folate, and potassium.
Two approaches were investigated to assess the nutrient retention in industrial products. Analytical data of the product was compared 1) with calculated nutrient data based on the recipe using 4 composition tables; and 2) with analyses of home-prepared products using the same recipes.
This approach was used in the underpinning of the claim of Knorr Vie shots:â?? Provide the goodness of at least half the recommended daily intake of 400 gramâ?   . Knorr Vie shots compared well with expected nutrient values based on nutrient databases and the home prepared products, with the exception of fibre, which was lower.
Based on this approach Unilever is developing guidelines for the underpinning of F&V claims of other products as well. These guidelines aim to help in the development of healthy F&V options.

P24-01

Nutrition and healthy lifestyle program in the city of São Paulo, Brazil

Sonia Tucunduva Philippi, Vanessa Maria Silva Mendes, Carolina Menezes Ferreira, Carolina Vieira Mell Pimentel, Fernanda Marchetto d Silva, Erika Yassunaga
University of Sao Paulo, SAO PAULO, Brazil

Objectives. To improve the nutritional state of the clients, create a Reference Center for training in nutrition assessment and propose public politics about Nutrition and Healthy Lifestyle. Methodology. Questionnaire about demographics (family and individual profile) and characteristics social economics, anthropometrics (weight, height, circumferences, skin fold thickness and body density), food consumption (FFQ and food diary), physical activity (IPAQ-08, steps counting) and culinary workshops will also allow changes in client's food. Results. Food consumption, energy intake, macronutrients (Virtual Nutri), grams of food intake (Brazilian Nutrition Tables), food intake (Brazilian Food Pyramid), physical activity level, statistics analysis, variables relation, application of statistics tests to evaluate significance level and bloxplots. 300 students of the Nutrition undergraduate and graduate programs were trained to take care of 50 patients. These were part of the CLINUT´s Nutrition and Healthy Lifestyle Program, linked to Geraldo de Paula Souza´s School Health Center from University of São Paulo (USP). Every material and methods applied were standardized for students and patients. Conclusion. The planning, intervention and evaluation of the activities of this program will allow the production of knowledge to teaching, to search and to extent it to communities. Its results should become a reference for another nutrition programs.

P24-02

Diet and lifestyle factors and mortality of elderly people in Poland

Joanna Frackiewicz, Joanna Kaluza, Wojciech Roszkowski, Anna Brzozowska
Warsaw Agricultural University (SGGW), WARSAW, Poland

The study was carried out in 1993 and 1999 among 190 men and 221 women aged 75-80 years from the Warsaw region. Data on the intake of energy and nutrients were collected using a 3-day recall method. The mortality follow-up period lasted until December 31, 2003. During this period, 81 men and 82 women died. Survival curves were generated according to the Kaplan-Meier analysis, and the log-rank test was used to compare the survival distribution between two groups of subjects: those with the intake of energy and nutrients below the median and those with the intake above the median. The Cox-proportional hazards model was used to examine the relationship between diet, lifestyle factors and mortality. Reduced the risk of mortality was obserwed among men with higer intake of saturated fatty acids, vit. E, iron, good healthy status, physically activity and supplementation practice and among women with higher intake of protein, lower intake of fibre and phosphorus, non-smoking and physically activity.

Dietary intake of phytoestrogens, estrogen receptor-beta polymorphisms and the risk of prostate cancer.

Maria Hedelin[1], Katarina Augustsson Bälter[2], Ellen Chang[2], Åsa Klint[2], Rino Bellocco[2], Jan-Erik Johansson[3], Fredrik Wiklund[4], Camilla Thellenberg-Karlsson[4], Hans-Olov Adami[2], Henrik Grönberg[4]
[1]Karolinska Institutet, STOCKHOLM, Sweden
[2]Department of Medical Epidemiology and B, STOCKHOLM, Sweden
[3]University Hospital and Center for Asses, ÖREBRO, Sweden
[4]Department of Radiation Sciences/Oncolog, UMEÅ, Sweden

Based on evidence that phytoestrogens protect against prostate cancer and that phytoestrogens bind tightly to the estrogen receptor-beta, we investigate the synergistic effects between phytoestrogen intake and estrogen receptor-beta gene polymorphisms.
 We performed a population-based case-control study in Sweden; participants reported their phytoestrogen intake and donated blood. We identified four htSNPs and genotyped these in 1314 cases and 782 controls. Odds ratios were estimated by multivariate logistic regression. Interactions were evaluated considering both multiplicative and additive effect scales.
 High intake of food items rich in phytoestrogens was associated with a decreased risk of prostate cancer. We found a significant multiplicative interaction (p=0.04) between intake of phytoestrogens and a promoter SNP in the estrogen receptor-beta gene, but not with any of the three other htSNPs. Among carriers of the variant alleles, we found inverse associations with increasing intake of total phytoestrogens (OR for highest vs.. lowest quartile=0.43;(95% CI:0.27-0.67), isoflavonoids (OR=0.63;95% CI:0.39-1.00), coumestrol (OR=0.57;95% CI:0.38-0.84). We found no association between phytoestrogens and prostate cancer among carriers of the wild type allele.
 Our study provides strong evidence that high intake of phytoestrogens substantially reduce prostate cancer risk, especially among men with specific polymorphic variation in the promoter region of the estrogen receptor-beta gene.

Calculation of estimated nutrition intake based on clinical laboratory tests in hemodialysis patients

Hiromi Ikeda
Kagawa Nutirion University, SAKADO-CITY, SAITAMA, Japan

Clinical laboratory tests were used to estimate nutritional intakes for 116 hemodialysis outpatients at a dialysis center (O Clinic) in Hiroshima Prefecture. Validity of estimating formulas was examined in comparison with the dietary records of the same patients. The results were as follows:
1) Protein intake and phosphorus intake could be estimated based on a formula using BUN cited references by Lawrie, Kimura and Nakamura et al.
2) Salt intake could be estimated based on the formula by Niizato.
3) Potassium intake could be estimated by the following formula.
Estimated potassium intake = 0. 39× (([K+] 2×V2- [K+] 1×V1) ×24÷ (dialysis interval- (dialysis time (min./1 time) ÷60))) +1. 9
4) Formula in the literature for estimating energy was not applicable. We deviced the following new formula by the step-by-step multiple linear regression analysis.
Estimated energy intake = 8. 17×estimated protein+1257
Estimating nutritional intake is useful as basic information when a registered dietitian grasps the nutrition intake tendency of the group and/or supports the nutrition self-control of the hemodialysis patient.

Vitamins intake in Eastern Croatian adults estimated by 24-hours recall

Daniela Kenjeric[1], Ljiljana Primorac[1], Mirna Mandic-Puljek[2], Antonija Perl[1], Milena L Mandic[1]
[1]Faculty of Food Technology, OSIJEK, Croatia
[2]University Hospital for Lung Diseases, ZAGREB, Croatia

The role of vitamins in nutrition of Croatian population is still underestimated and insuffitiently investigated though they have important protective effects in human nutrition. The aim of this research was to examine vitamin A, riboflavine, vitamin B6, niacine and ascobic acid intake in 120 adults, aged 18-54 years (mean 33,8 yr). The research was conducted using 24-hour recall method, and was repeated 10 times during one year. Participants were separated according the age into two groups (=30 yr, and >30 yr), as well as according the sex. There were no significant differences in vitamins intake between age groups. When divided by sex, significant difference in vitamins intake was found. When nutritive density was considered, significant difference was found for more vitamins regarding age, and less regarding sex. In conclusion, considering recomendations our examined population took adequate amounts of vitamins.

Comparative food consumption pattern studies of patients with and without breast cancer in a major hospital in Iran, 2003-2004.

Shiva Mehran
Shaheed Beheshti Medical University, TEHRAN, Iran

Introduction: The effects of certain nutrients on breast cancer incidence are well documented in either epidemiological or experimental studies. These data are lacking considering Iranian dietary pattern, therefore this study was designed to evaluate the dietary pattern of female breast cancer patients of a major hospital in Tehran and compare it to that of patients in other wards of the same hospital during a one year time period.
Methodology: Total of 88 patients participated in this study, of which 29 were breast cancer patients and the rest of patients were from orthopedic, surgery, endocrinology and other wards of Imam Khomeini hospital, Tehran. A 23-item food frequency and demographic data questionnaires were filled by the trained staff. Chi-square and t-test were used to assess the significance difference among the qualitative and quantitative data, respectively. The significance level was $p<0.05$.
Results: Monthly consumptions of orange, peach, apricot, green bean, cauliflower, broccoli, carrot and fish were significantly lower for the cancer patients. Conversely, the monthly intakes of bread and baked potato for these patients were significantly higher.
Conclusion: This study seems to suggest that the higher intake of different fruits and vegetables may have a role in preventing breast cancer in females.

Analysis of dish intake for people with and without hypertension in 2001 Korean National Health and Nutrition Examination Survey(KNHNS)

Hyun-Kyung Moon, Ji-yeon Jeong, Junghyun Park
Dankook University, SEOUL, South-Korea

Recently, there are changes in the diet and incidence of hypertension in Korea. In order to investigate relationship between diet and hypertension, dish groups are analyzed by sex, age and region. Dishes are classified mainly by cooking methods. The data was obtained from 9,968 participants who participated in 2001 KNHNS, finished the 24hours recall. Both male and female with hypertension consumed more in soup, kimchi (P<0.05). By age groups with hypertension, the group of 30~49 consumed more in rice dish, noodle, pot stew• chowder, alcohol (p<0.05). The group of 50~64 consumed more in noodle, kimchi(p<0.05). The group of 65 over consumed more in salted vegetable(p<0.05). By age groups without hypertension, the group of 20~29 consumed more salad(p<0.05). The group of 30~49 consumed more fried dish, beverage, fruit(p<0.05). The group of 50~64 consumed more fruit(p<0.05). The group of 65 over consumed more gruel (p<0.05). Participants with hypertension have higher intake of rice dish and kimchi and participants without hypertension have higher intake of vegetable and fruit. With these results, it is not possible to show that difference in dish intake prevented or caused hypertension. But this study show the difference by the dish group which is classified by cooking method.

Fruit and vegetables food-groups as a contribution to dietary intake in Guatemala schoolchildren

Gabriella Montenegro[1], Noel Solomons[2], Colleen Doak[3]
[1]Cessiam, GUATEMALA CITY, Guatemala
[2]Cessiam, GUATEMALA CITY, Guatemala
[3]The Free University, AMSTERDAM, The Netherlands

Background: Children in developing countries are gaining excess weight, and insufficient fruit and vegetable consumption may be a factor.
Objectives: To assess one day's total food intake for children of higher and lower socioeconomic status SES) in Quetzaltenango City in the western highland of Guatemala; and to estimate contribution from fruits and vegetables.
Study Design: We had 449 elementary school children (LSES, n=219; HSES, n=230) of both sexes aged 7-14 years old, prospectively create a pictorial record of all beverage, food and snack items consumed over a single 24-h period. Estimated portion-sizes of items were assigned in a dietician interview.
Results: Of 295 different food and beverages recorded across the population, 55 (18.6%) were fruits or fruit-based and 49 (16.6%) were vegetables or vegetable-based. The one-day consumption of food and beverages with a fruit or vegetable contribution ranged from 0 to 2138g, with a median of 330g; 43% of children exceeded 400g intake on the recorded day. Those reporting no fruit or vegetable items on the day of record constituted 6.3% HSES boys, 19.8% LSES boys, 4.2% HSES girls, and 12.4% LSES girls.
Conclusions: This juvenile population gets less than the desirable intake from the fruit and vegetable food-groups.

P24-10

America's Nutrition Report Card: Comparing nutrient intakes to dietary reference intakes

Alanna Moshfegh[1], Linda Cleveland[2], Joseph Goldman[2]
[1]Food Surveys Research Group, BELTSVILLE, MD, United States of America
[2]Food Surveys Research Group, ARS, USDA, BELTSVILLE, MARYLAND, United States of America

National dietary data along with related nutritional status measures are powerful tools for assessing the nutritional status of a country's population. How diets measure up to dietary standards established to maintain health and prevent chronic disease are critical to assuring the health and well-being of the population. The National Academies of Science have developed new dietary standards for the United States and Canada called Dietary Reference Intakes. National dietary data collected in the United States in 2001-2002 were analyzed to determine estimates of mean usual nutrient intakes and compared to the Dietary Reference Intakes. For many nutrients, the American diet is adequate. However, many Americans are falling short in a number of nutrients including vitamins E, A, and C, and magnesium. Other nutrients that may be potential problems include calcium, vitamin K, potassium, and dietary fiber. The challenge to improve American diets and health will not be in additional food intake to meet these nutrient shortfalls but in careful food choices that are nutrient-dense.

P24-11

Dietary intake of adolescent male soccer players

Benja Muktabhant[1], Suparb Boonjaroen[1], Sutin Chanaboon[2]
[1]Faculty of Public Health, KhonKaen Unive, KHON KAEN, Thailand
[2]Sirinthorn Public Health Colle, KHON KAEN, Thailand

The aim of this study was to investigate the dietary intakes of adolescent male soccer players. The stydy subjects were 65 male soccer players from grades 7to12 at the Sport School, Khon Kaen Province,Thailand. Nutrient intake was assessed by using 24 hour recall for 3-days and the frequency of food intake was assessed using 7-day food records. Energy and nutrient intake were analyzed using Thai software programe(INMUCAL).These data were collected from January to March, 2004.The results showed that the mean age of the study subjects was 15.8+1.7 SD years old. The mean energy intake was 2919 kcal/d (53.2 kcal/kg/day), which was 134.2%+18.9 SD of the Thai RDA for general adolescents and 89.0%+14.9 SD of the RDA for adolescent soccer athletes, calculated according to their specific training schedule. The mean protein intake was 2.3 gm/kg/day, 201.7%+34.9 SD of Thai RDA. Average carbohydrate and fat intakes were 7.8+2.4 SD and 1.4+0.3 SD gm/kg/day, respectively. The average energy distribution from carbohydrate, fat and protein were 58.1%, 24.8% and 17.1%, respectively.

P24-12

Dietary intake and physical fitness of adolescent male soccer players at Khon Kaen Sport School, Thailand

Benja Muktabhant[1], Suphap Boonjaroen[2], Sutin Chanaboon[3]
[1]Faculty of Public Health, KhonKaen Unive, KHON KAEN, Thailand
[2]Health Center 6, Khon Kaen,Ministry of H, KHON KAEN, Thailand
[3]College of Public Health, KhonKaen, KHON KAEN, Thailand

This cross-sectional study was aimed to investigate the dietary intake and physical fitness of adolescent male soccer players. The subjects included 65 male soccer players, aged 13-18 years from grades 7 to 12 at Khon Kaen Sport School of Thailand. Dietary intake was assessed by interviewing 24 hour recall for 3-days and analyzed using specialized Thai software (INMUCAL). Frequency of food intake was obtained using 7-day food records.Bicycle ergometry and bioelectric impedance analysis were used for measuring maximum oxygen uptake and body fat of the athletes respectively.The results showed that the mean(±SD) energy intake of the subjects was 2919±370 kcal/day (53.2kcal/kg/day), of which 58.1% was from carbohydrates, 24.8% from fat, and 17.1% from protein.The mean(±SD) protein, carbohydrate and fat intake was 2.3±0.7, 7.8±2.4 and 1.4±0.3 gm/kg/day, respectively. The food intake of these athletes was based on rice, meat, milk and fried food, which were consumed 2-3 times/day. Vegetables and fruits were consumed 1-2 times/day.Egg,seafood, soft drinks and snacks were consumed 2-3 times/wk. The average maximum oxygen uptake(VO2 max) of the subjects was 51.8±11.3 ml/kg/min. The average body fat of the subjects was 14.0%+2.8. VO2 max was significantly related to the intake of energy and carbohydrate of the athletes(P<0.001).

P24-13

Dietary survey of Swedish children: age 4, 9 and 12 years old

Monica Pearson, Heléne Enghardt Barbieri, Wulf Becker
Swedish National Food Administration, UPPSALA, Sweden

2600 Swedish children participated in a national dietary survey conducted by the Swedish National Food Administration. A 4-day dietary record was carried out by schoolchildren age 9 and 12 and carers of 4-year-old children. Five levels of estimated physical activity were recorded. A questionnaire provided additional information on some specific foods and socioeconomic background variables such as parents education and profession, geographic location, BMI, ethnicity and other factors. Whole school classes were recruited which resulted in a good participation rate.
An open record method was chosen to obtain up-to-date information of which specific foods children presently preferred. Furthermore, the results showed, as expected, an underestimation of the energy intake, which was evident for the oldest children. The 4-year-olds had a recorded energy intake close to the expected reference value, but the schoolchildren had an underreporting between 20 to 25 percent. The questionnaires were read optically. This caused a major effort to check and understand the answers to the open ended questions.
Results will be presented on the intake of foods and nutrients in relation to age, sex and socioeconomic variables.

P24-14

Energy intake and expenditure in a sample of 45 Bolivian urban Adolescents

Federico Perez-Cueto Eulert[1], Sabrina Eymard-Duvernoy[2], Bernard Maire[2], Patrick Kolsteren[1]
[1]Prince Leopold Institute of Tropical Med, ANTWERPEN, Belgium
[2]Institut de Recherche pour le Développem, MONTPELLIER, France

Objective: To describe the levels of physical activity and energy intake in a sample of Bolivian Adolescents.
Setting: La Paz, September-October 2004.
Methodology: 45 secondary school students (19 males; 26 females; mean age 15.6 SD 1.25) wear accelerometers (Actigraph-7164; http://www.theactigraph.com) during three days. Anthropometric measurements were registered. A semi-quantitative food-frequency-questionnaire was used to estimate food and energy intake.
Results: The mean BMI (kg/m2) of boys was 20.5 (SD 2.96) and 20.8 (SD 2.68) of girls. Prevalence of overweight was 15% among girls. Mean energy intake was 2298 kcal (SD 879) in boys and 2124 (SD 626) in girls. Mean energy expenditure was 2641 kcal (SD 724) in boys and 2000 kcal (SD 506) in girls. Boys tended to be more active (P=0.001) and slimmer (P<0.05) than girls. BMI was significantly correlated to physical activity (Pearson's coeff.=0.347 P=0.02).
Conclusions: Bolivian adolescent boys are apparently more physically active than their female peers. This finding may explain the higher levels of overweight in adolescent girls. Interventions should focus on promoting physical activity as a healthy lifestyle particularly among female adolescents.

P24-15

Vitamin D intake and prevalence of Vitamin D deficiency in Brazilian adolescents

Barbara Peters, Luana Santos, Betzabeth Slater, Ligia Martini
USP/ Public Health School, SAO PAULO, Brazil

Background: For several decades vitamin D deficiency was not expected in sunny countries. However, recent data demonstrated a significant prevalence of this nutritional deficiency worldwide. Objective: To evaluate the nutritional status of vitamin D in Brazilian adolescents. Design: 77 adolescents, mean age 13,03(1,03) y old were selected from public schools in spring 2004. Information on dietary intake was obtained by a semiquantitative food frequency questionnaire. Serum levels of 25(OH)D3 and anthropometric data were obtained. Results: Mean dietary calcium and vitamin D intake were 746.1(284.6) mg/day and 181.4(105.6)IU/day, respectively. Only 3,9% of the students met the adequate intake (AI) recommendation of calcium/day, and 35,1% met the AI recommendation of vitamin D/day. Boys had a significantly higher mean daily vitamin D intake. Eating breakfast was associated with higher calcium and vitamin D intake. Overall, 59.7% of the students had hipovitaminosis D and 40.3% had desirable serum vitamin D status. Boys presented a significantly higher mean serum vitamin D. Conclusions: Only a minority of students met the AI for calcium and vitamin D and the prevalence of hipovitaminosis D was elevated. Our findings have important implications for public health strategies in order to prevent future complications related to hypovitaminosis D during adolescence.

Primary prevention of childhood obesity through sessions at child health centers about healthy eating habits and physical activity.

Mikaela Pettersson[1], Christel Larsson[2], Ata Ghaderi[3], Berit Heitmann[4], Lars Bernfort[5], Margareta Blennow[1], Margaretha Magnusson[3], Claes Sundelin[3], Björn Wettergren[3], Eva Lannerö[1], Finn Rasmussen[1], Christel Larsson[2], Ata Ghaderi[3], Berit Heitmann[4], Lars Bernfort[5], Margareta Blennow[1], Margaretha Magnusson[3], Claes Sundelin[3], Björn Wettergren[3], Eva Lannerö[1], Finn Rasmussen[1]
[1]Karolinska Institute, STOCKHOLM, Sweden
[2]Umeå University, UMEÅ, Sweden
[3]Uppsala University, UPPSALA, Sweden
[4]University of Copenhagen, COPENHAGEN, Denmark
[5]Linköping University, LINKÖPING, Sweden
The Primrose study – a randomized population-based study

Children's eating habits and physical-activity (PA) patterns are founded early in life, and their parents' health behaviors are of major importance in this process. Several studies have found associations between high intakes of sugar-sweetened drinks and television-viewing and childhood obesity. Early promotion of healthy eating habits and physical activity may prevent childhood obesity. The overall objective of the present study is to develop a structured primary prevention program for Swedish Child Health Services on healthy eating habits and PA, and to evaluate its effects and costs. This program (intervention) will be based on social cognitive theory (SCT), which has been shown to be successful in changing health behaviors in previous intervention studies. The goal is to change unhealthy eating habits and sedentary living among preschool children through their parents and to reduce the risk for development of childhood overweight/obesity.

Alimentary consumption of children between 2-6 years old, with relation to the fluoride, in Bauru's city - São Paulo

Sonia Tucunduva Philippi
University of São Paulo, SÃO PAULO, Brazil

Considering that the prevalence of dental fluorosis has been increasing, both in fluoridated and non-fluoridated regions, it will be highlighted that, despite fluoridated water, it is important to evaluate the contribution of foods and beverages consumed by children at the age of risk to fluorosis. Objective. To describe the alimentary consumption of children between 2-6 years old, with relation to the fluoride. Methods. The research was carried throught in the quarters of the city of Bauru. The sample was calculate by city sector, based on the managins plan of the city. 379 children at the age of risk to fluorosis had been carried through and applied the questionnaire of alimentary frequency to the responsible or parents. Results. Considering it maximum frequency consumption (2 or more times day), it was verified that the foods with bigger concentration of fluoride had been the cookies Danyt's and the cereals Neston, consumed for 1,05 and 1,35% of the children, respectively. Conclusion. The results show that the foods with bigger concentration of fluoride habitually are not consumed by children, but it is fundamental that food industries follow the recommendations, in order to contribute for the reduction in the prevalence of fluorosis.

P24-19

Effects of dietary supplementation of citrus juice in hypercholesterolemic subjects

Farideh Tahbaz, Rahil Rostami
Faculty of Nutrition, TEHRAN, Iran

Background and aim: Citrus juice has bioflavenoids, pectin and vitamin C and other nutrients which may have beneficial influence on lowering plasma cholesterol. This study was aimed to investigate the effects of citrus juice consumption in a group of hypercholesterolemic subjects.
Methods and Materials:Twenty two subjects with mild to moderate hypercholesterolemia aged between 45 to 60 years participated in this cross over clinical trial. Patients were randomly divided into 2 groups for following step 1 diet and step 1 diet plus one glass of citrus juice daily (orange and grapefruit juice in equal amount). After 6 weeks these 2 groups stopped their diet and put on wash out period for 2 weeks and later the diet were switched between the 2 groups and this time diet continued for another 6 weeks. Anthropometric measurements, blood pressure, dietary intake, serum lipid levels and blood pressure were determined at the beginning and the end of each test period.
Results: Analyzing data showed that BMI, blood pressure, HDL-C, TG and TC/HDL-C were not influenced by treatment and period effect and did not show significant changes. Total cholesterol decreased and HDL-C/LDL-C increased significantly (p=0.014 for both) by treatment effect.

P24-20

Effect of nutrition education intervention on the body composition and nutritional biomarkers of exercising school children

Fu-Chun Tang[1], Rang-Dian Lin[1], Su-Ping Lai[1], Pei-Ling Cheng[2]
[1]National Taiwan Normal University, TAIPEI, Taiwan
[2]National Taipei University of Education, TAIPEI, Taiwan

Purpose of study was to investigate the effect of 12-week nutrition education intervention on body composition and nutritional biomarkers of exercising school children. Based on body fat (BF) percentage and gender, children (9-11 years, BMI>20kg/m2) were grouped: control-boys (NNNM, n=18), control-girls (NNNF, n=14), exercising-boys (NNEM, n=17), exercising-girls (NNEF, n=13), exercising-boys/nutrition-intervention (YNEM, n=20), and exercising-girls/nutrition-intervention (YNEF, n=14). Before and after intervention, body composition, plasma glutamine, alanine, valine, leucine, isoleucine, f-tryptophan, cholesterol, triacylglycerol, HDL, LDL, and glucose; urinary hydroxyproline and 3-methylhistidine concentrations were determined. After intervention, BMI, triceps skinfold thickness, BF, and BF percentage decreased significantly in YNEM, whereas fat free mass (FFM) and muscle mass (MM) percentage increased significantly. Increases in FFM percentage and MM percentage of YNEM were significantly larger than those of NNNM. Plasma triacylglycerol of YNEM decreased significantly. Decrease in triacylglycerol of YNEM was significantly larger than that of NNEM. Plasma amino acid concentrations were not affected. However, 3-methylhistidine excretion of YNEM increased significantly after intervention. The combined effects of nutrition education and exercise enhanced the body composition and fasting plasma triacylglycerol of school boys. These results, however, were not found with school girls. The mechanism could be due to the influence of estrogen in those school girls.