

« Trends in food intake »

Editorial

The Global Burden of Disease study showed that dietary factors such as low fruit and vegetable intakes are among the top five risk factors for poor health. Measuring dietary intake across countries, and monitoring changes over time is an important element in our understanding of the relationships between diet and health. In spite of the methodological challenges in accurately assessing intake, the three papers highlighted in this issue illustrate the value of nutrition research to guide policy and practice.

The United Kingdom has a strong track record of monitoring diet, with national surveys dating back over many decades. In addition there are a series of prospective cohorts including dietary data and the paper by Pot et al., that shows changes in intake in the birth cohort born in 1946 that are broadly consistent with the trends across the wider population. By drawing on the lives of this one cohort, it is easier to see the changes in a wider social context. The paper notes how market level changes (e.g. availability of skimmed milk); policy recommendations (e.g. to increase vegetable products and decrease animal products) or even shifts in social standards (e.g. increased wine among women) have affected dietary patterns over time.

Global data presented by Imamura et al., highlights important changes in foods and nutrients relevant for their effects on obesity and non-communicable diseases over the last two decades. High- and middle-income countries have experienced improvements in healthy dietary factors (e.g. fruit, vegetables, fish, fibre, unsaturated fats, etc.) whereas consumption of these healthier foods and nutrients did not improve in the poorest regions. In parallel, consumption of other foods and drinks including sugar-sweetened beverages and meat has increased in most world regions, contributing to the rise in consumption of sugar and saturated fat.

In the context of obesity, dietary energy density is a known risk factor, positively correlated with intake of fat and sugar and negatively correlated with fruit and vegetables. In an Irish population, O'Connor et al., shows that diets with a higher energy density are associated with higher intakes of less healthy food groups (e.g. snacks, confectionery, sugar-sweetened beverages, alcoholic beverages, etc.) but, interestingly, the overall dietary energy density has remained stable from 2001-2010 despite marked increases in the prevalence of obesity. It is clear that more work is needed to identify an integrated measure of the health properties of the whole diet, which shows clear associations with obesity and other health outcomes.

This global perspective on trends in food habits provides a glimmer of hope of some recent improvement, at least among some subgroups in Europe and across the world. But the pace of change is slow and there is a pressing need to identify interventions which help lower- and middle-income countries to maximise the opportunities of the nutrition transition while avoid the damaging consequences of excess consumption of saturated fat and sugar.

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Trends in food consumption over 30 years in British

Focus on Fruit and Vegetables intake

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Over the past decades, food consumption patterns and food availability have changed drastically. This study aims to provide a comprehensive overview of changes in food consumption during 30 years of follow-up in the British birth cohort from the Medical Research Council National Survey of Health and Development.

The Medical Research Council National Survey of Health and Development (NSHD; 1946 British Birth Cohort) is the longest running birth cohort in the world and is unique in having collected detailed dietary information at a number of time points through the life course¹.

Methods

Dietary intakes were assessed using a 5-day estimated diet diaries. Only those who recorded ≥ 3 days at all four time points were included in the analyses. Dietary data of 989 participants (n = 438 men and n = 551 women) were collected at:

- 36 years (1982),
- 43 years (1989),
- 53 years (1999) and
- 60–64 years (2006–11).

All food and drinks consumed both at home and away were recorded using household measures, and portion sizes were estimated using detailed guidance notes and photographs provided at the beginning of the diary². Trends were tested using the Friedman test.

Results

In this ageing cohort, the changes in food consumption that were observed reflect a diet of improved diet quality, as indicated by changes such as replacement of white bread by granary and whole meal bread, lower consumption of red and processed meats, coffee, sugar and confectionery and higher consumption of fruit, vegetables and fish.

Few differences occurred between men and women, with the most striking difference being related to drink consumption: men consumed more alcoholic drinks than women; however, women at 60–64 years tended to drink more alcoholic drinks than previously, whereas men showed a small decrease in alcoholic drinks.

Energy intake changed over time, with the highest mean energy intake reported at the age of 43 years in both men and women.

Moreover, in this cohort the percentage of current smokers decreased with time and the percentage of physical inactivity increased with time, as did body mass index.

The consumption of fruit and vegetables has increased from 1982 to 2006-11: more than 70% for vegetables and 100% for fruits

Data on fruit and vegetable consumption for men and women are presented in Table 1.

From 1982 to 2006-11, the average consumption of total vegetables (excluding potatoes) increased from 132 to 197g per day for men and from 114 to 194g per day for women. All cohort members reported eating some vegetables during the five days of recording at all four time points. Over 90% of cohort members consumed potatoes; the average weight of potatoes consumed per day decreased since 36 years, and the consumption of potato products increased in both men and women.

The consumption of total fruit had almost doubled since 36 years from 72.7g/day for men and 85.4g/day for women to 154g/day for men and 170g/day for women aged 60–64 years. At this most recent age, most cohort members reported consuming fruit over the 5-day recording period: 93% of men and 98% of women. This percentage increased since the age of 36 years, especially in men (from 85% at age 36 years) but not so much for women (92% at age 36 years).

In conclusion, the changes in food consumption in this British birth cohort over the past three decades are encouraging and reflect a healthier diet in the later years.

Table 1: Average daily consumption of fruit and vegetable (grams) at ages 36 (1982), 43 (1989), 53 (1999) and 60–64 years (2006–2011): all cohort members including non-consumers, mean, SD, and percentage consumers

	36 years			43 years			53 years			60-64 years		
	Mean	SD	% cons	Mean	SD	% cons	Mean	SD	% cons	Mean	SD	% cons
Men												
Fruit	72.7	68.5	84.7	94.8	97.9	87.0	145.7	124.7	90.2	154.0	122.2	93.4
Vegetables	131.7	62.9	100.0	148.4	82.3	100.0	160.2	86.1	99.3	196.6	100.7	99.5
Women												
Fruit	85.4	75.9	91.3	113.7	102.2	91.8	186.4	136.3	94.9	170.1	112.1	98.0
Vegetables	114.2	59.6	100.0	137.4	66.0	99.8	164.9	78.0	99.8	193.7	91.8	100.0

Based on: Pot GK, Prynne CJ, Almoosawi S, Kuh D, Stephen AM. Trends in food consumption over 30 years: evidence from a British birth cohort. *Eur J Clin Nutr.* 2014 Oct 29.

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Dietary energy density: Estimates, trends and dietary determinants

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Prevalence of obesity and cardio-metabolic disease are increasing rapidly worldwide. Although energy imbalance is generally considered the driver of this increase, changes towards more unhealthy dietary behaviours are likely to contribute additionally. These dietary behaviours are therefore worth evaluating and tracking in populations. However, the complexity of diet means that evaluating individual dietary behaviours provides limited information, yet measures that provide a more comprehensive picture are sparse.

Dietary Energy Density (DED), the amount of calories per weight of the diet, is positively associated with obesity and the metabolic syndrome¹. Higher DED is also associated with lower dietary quality^{2,3}, including lower fruit and vegetable intake, and an overall less-healthy lifestyle pattern⁴. Furthermore, DED has been suggested for use as a proxy of the nutritional quality of the diet^{5,6}. DED estimates may therefore be used as an indicator of overall dietary behaviours. These estimates provide a tool to track secular trends in diets and to examine dietary trends by population traits, for example age groups. Distinguishing dietary components that determine DED in free-living populations may be useful in explaining differences in DED estimates over time and tailoring public health guidelines aimed at improving diets.

A study of DED estimates, trends and dietary determinants:

Using data from a suite of national food consumption surveys in Ireland (www.iuna.net), DED estimates were calculated for 2,395 boys, girls, men and women, aged 5-90 years. For each survey, food intake data were assessed by way of detailed food records with careful attention to the estimation of portion weights.

Higher mean DED estimates were associated with a higher intake of energy. Higher DED was also associated with a

greater proportion of energy from fat, carbohydrate and sugars and, a lower proportion of energy from protein and dietary fibre. With regard to food intakes, higher DED was associated with higher intakes of white bread, ready-to-eat breakfast cereals, processed meat, chips, savoury snacks, chocolate, sweets, sugar-sweetened beverages and alcoholic beverages and lower intakes of vegetables, fruit, soup, potatoes, fresh meat, brown bread, fish, egg, pulses, cooked breakfast cereals (e.g. porridge) and nuts. DED estimates were inversely associated with age group and were consistently higher for men than women. Variation in the intakes of fruit, vegetables and sugar-sweetened beverages contributed to the largest variance in DED estimates and explained much of the difference in DED estimates by age group and between men and women. Further findings from the study revealed that DED estimates were remarkably similar in two comparable surveys of Irish adults (18-64y) carried out 10 years apart.

Public health and policy implications:

The intakes of fruit, vegetables and sugar-sweetened beverages appear to have the greatest influence on DED in the Irish population and are potential targets for public health interventions.

In the Irish population, DED estimates trended inversely with age and were lower in women than in men. Estimates did not change appreciably in 10 years, suggesting an absence of a generational effect and supporting the observation of a trend with age. The age and sex stratified estimates from this study can serve as a baseline for comparison for other works and for public health campaigns.

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fruity breakfast

Based on: L. O'Connor, J. Walton and A. Flynn (2015) Dietary energy density: estimates, trends and dietary determinants for a nationally representative sample of the Irish population (aged 5-90 years) *British Journal of Nutrition*. 113: 172-18.

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Dietary quality among adults in 187 countries between 1990 and 2010

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The aim of the study was to characterize global trends in dietary patterns nationally and regionally in 1990 and 2010 across 187 nations and to assess heterogeneity by age, sex, national income, and type of dietary pattern.

325 surveys studied, 10 healthy dietary items and seven unhealthy dietary items

Consumption data were evaluated from 325 surveys (71.7% nationally representative) covering 88.7% of the global adult population. Two types of dietary pattern were assessed:

- one reflecting greater consumption of healthy diet (10 items) and
- the other based on lesser consumption of unhealthy diet (seven items) – cf. Table 1.

Table 1:

This study based on ten healthy dietary items and seven unhealthy dietary items

Healthy dietary items	Unhealthy dietary items
Fruits	Unprocessed red meats
Vegetables	Processed meats
Beans and legumes	Sugar sweetened beverages
Nuts and seeds	Saturated fat
Whole grains	Trans fat
Milk	Dietary cholesterol
Total polyunsaturated fatty acids	Sodium
Plant omega-3s	
Dietary fiber	

The mean intakes of each dietary factor were divided into quintiles, and each quintile was assigned an ordinal score, with higher scores being equivalent to healthier diets, from 0 (less healthy) to 100 (more healthy). The dietary patterns were assessed by hierarchical linear regression including country, age, sex,

national income, and time as exploratory variables.

Diets based on healthy items improved globally while consumption of unhealthy items worsened across the world

From 1990 to 2010, it was observed that consumption of healthier foods and nutrients has modestly increased during the past two decades (by 2.2 points, 95% UI 0.9–3.5). By contrast, global dietary patterns based on fewer unhealthy items worsened (-2.5; 95% UI -3.3 to -1.7), indicating concomitant increased consumption of these unhealthy foods and nutrients. In 2010, the global mean scores were 44.0 (SD 10.5) for the healthy pattern and 52.1 (18.6) for the unhealthy pattern, with weak intercorrelation ($r=-0.08$) between countries.

Diets and their trends were very heterogeneous across the world regions

These trends that were observed were weakly correlated across countries ($r=-0.08$ overall, range -0.15 to 0.09 in the four national-income categories; $p>0.05$ each). These trends did not significantly vary by age or sex ($p>0.4$ each), but significantly varied by national income ($p<0.02$ each). Nations with higher incomes had larger improvements in diet patterns based on healthy items than did nations with lower incomes.

Although most world regions showed modest improvements in dietary patterns between 1990 and 2010 on the basis of more healthy items, such improvements were generally not noted in the poorest regions, including in sub-Saharan Africa and the Andean states of Latin America. Conversely, most regions of the world showed substantial declines in diet quality based on increased consumption of unhealthy items. The exceptions included many of the wealthiest regions including the United States and Canada, Western Europe, Australia, and New Zealand, where consumption of these unhealthy items modestly decreased.

Better diets were observed for older adults and women

On average, better diets were seen in older adults compared with younger adults, and in women compared with men ($p<0.0001$ each).

To our knowledge, this is the first study to evaluate dietary patterns among adults across the world. In 187 countries between 1990 and 2010, dietary patterns and their trends over time varied substantially depending on differences between healthy and unhealthy foods. The global variations were largely undetectable if one scale of diet quality was evaluated, as has been previously done^{1,2}.

Global public health should recognise diverse dietary trends based on healthy versus unhealthy foods, identify determinants of this diversity, and improve strategies for global, transnational, and domestic policy actions with a joint consideration of both healthy and unhealthy foods.

Based on: Imamura F, Micha R, Khatibzadeh S, Fahimi S, Shi P, Powles J, Mozaffarian D; Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE). Dietary quality among men and women in 187 countries in 1990 and 2010: a systematic assessment. *Lancet Glob Health*. 2015 Mar;3(3):e132-42. .

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