

National Diet and Nutrition Survey: headline results from Years 1, 2 and 3 combined (2008/9 – 2010/11)

Executive Summary

Introduction

The National Diet and Nutrition Survey (NDNS) is a programme of surveys designed to assess the diet, nutrient intake and nutritional status of the general population aged 1.5 years and over living in private households in the UK. The NDNS is jointly funded by the Department of Health (DH) in England and the UK Food Standards Agency (FSA)¹ and carried out by a consortium of three organisations: NatCen Social Research (NatCen), MRC Human Nutrition Research (HNR) and the University College London Medical School (UCL). The NDNS programme began in 1992 and comprised a series of cross-sectional surveys, each covering a different age group: pre-school children (aged 1.5 to 4.5 years);² young people (aged 4 to 18 years);³ adults (aged 19 to 64 years)⁴ and older adults (aged 65 years and over).⁵ Since 2008 the NDNS has been a rolling programme for people aged 1.5 years and over.

The NDNS provides the only source of high quality nationally representative data on the types and quantities of foods consumed by individuals, from which estimates of nutrient intakes are derived.⁶ Methods used in the NDNS are continually reviewed to ensure they remain the best practical methods available. Results are used by Government to develop policy and monitor progress on diet and nutrition objectives of UK Health Departments, for example those set out in the Healthy Lives Healthy People White Paper in England.⁷ The food consumption data are also used by FSA to assess exposure to chemicals in food, as part of the risk assessment and communication process in response to a food emergency or to inform negotiations on setting regulatory limits for contaminants.

This report presents combined results from Years 1, 2 and 3 of the rolling programme (2008/09 – 2010/11) for a sample of the UK population designed to be nationally representative. This report supersedes and replaces previous reports for the NDNS rolling programme,⁸ providing a larger sample size.

Sample and response rates

A sample of 9,990 addresses from 370 postcode sectors, drawn from the UK Postcode Address File, was issued between April 2008 and March 2011. Where there were multiple households at an address a single household was selected at random. For each household, either one adult and one child, or one child only were selected for inclusion.⁹ Selected individuals were asked to complete a diary of food consumption over four days. The survey also included an interview to collect background information on dietary habits, socio-demographic status and lifestyle, collection of a blood sample to assess biochemical indices of nutritional status and a 24-hour urine collection to assess salt intake.

The response rate for completion of the diary was 55% in Year 1 and Year 2 and 52% in Year 3. A total of 3,073 individuals aged 1.5 years and older completed diaries (1,491 adults aged 19 years and over and 1,582 children aged 1.5 to 18 years). Some participants dropped out when asked to agree to a nurse visit and a further percentage declined to give a blood sample. In Years 1, 2 and 3 (combined), 50% of adults aged 19 to 64 years (582) and 38% of children aged 11 to 18 years (256) who had completed a diary went on to give a blood sample.¹⁰

The data are weighted to minimise any bias in the observed results which may be due to differences in the probability of households and individuals being selected to take part; and to attempt to reduce non-response bias.¹¹

Contents of this report

The results in this report cover the following areas:

- Consumption of NDNS food groups based on food and composite dishes as eaten
- Consumption of meat, fish, fruit and vegetables using 'disaggregated' data for composite dishes
- The number of portions of fruit and vegetables consumed (calculated using 'disaggregated' data for composite dishes) and the proportion of participants meeting the "5-a-day" recommendation

- Intakes of energy, macronutrients (protein, fat and fatty acids, carbohydrates) and alcohol; Comparison of nutrient intakes with UK Dietary Reference Values (DRVs)¹²
- Comparison of selected vitamin and mineral intakes with UK DRVs, including and excluding dietary supplements
- Use of dietary supplements
- Blood status indicators for the following micronutrients: iron; vitamin C; vitamin B₁₂; vitamin B₁ (thiamin); vitamin B₂ (riboflavin); vitamin B₆; vitamin A (retinol and carotenoids); vitamin D; vitamin E; selenium; zinc. Results are also reported for blood lipids, homocysteine and C-reactive protein.¹³

Diet and nutrition recommendations

Recommendations for consumption of fruit and vegetables and oily fish are shown below.

	Recommendation
Fruit and vegetables	At least 5 portions per day (equivalent to 400 grams for adults)
Oily fish	1 portion per week (140g)

Key DRVs for macronutrients are shown below. These apply to the whole population over the age of five years.

Macronutrient	Dietary Reference Value
Total fat	Population average no more than 35% food energy
Saturated fatty acids	Population average no more than 11% food energy
Trans fatty acids	Population average no more than 2% food energy
Non-milk extrinsic sugars (NMES)	Population average no more than 11% food energy
Non-starch polysaccharides (NSP)	Adult population average at least 18g per day

Adequacy of micronutrient intake is assessed by comparing intake with age/sex specific DRVs for each vitamin and mineral. Mean intake is compared with the Reference Nutrient Intake (RNI)¹⁴ and the proportion with intakes below the Lower Reference Nutrient Intake (LRNI)¹⁵ is assessed. The RNIs and LRNIs set for each vitamin and mineral are shown in tables 5.14 and 5.18.

There is also a recommendation that salt intake should not exceed the recommended maximum of no more than 6g/day. Information from the NDNS on salt intake in adults was published in June 2012.¹⁶

Blood analyte measures are compared with threshold values where these have been set. These generally indicate the proportion of people at greater risk of deficiency of a nutrient due to depleted body stores or tissue levels.¹³

With the exception of the blood analytes, results are presented for five age groups: 1.5 to 3 years; 4 to 10 years; 11 to 18 years; 19 to 64 years; 65 years and over, split by sex in all except the youngest age group. The results from analysis of blood samples for Years 1, 2 and 3 (combined) are presented for children aged 11 to 18 years and adults aged 19 to 64 years. Blood samples were also collected from participants aged 1.5 to 10 years and 65 years and over and these will be reported in the future when sample numbers have increased.

The report also includes the heights, weights, blood pressure and socio-demographic characteristics of the participants. These were in line with the general UK population which suggests that the sample was nationally representative.

Key findings

In general, the results in this report confirm those published last year in the Years 1 and 2 (combined) report.⁸

- Adults aged 19 to 64 years on average consumed 4.1 portions of fruit and vegetables per day (including the contribution from composite dishes) and older adults (i.e. those aged 65 years and over) 4.4 portions. 31% of adults and 37% of older adults met the “5-a-day” recommendation.¹⁷
- Mean consumption of fruit and vegetables for children aged 11 to 18 years was 3.0 portions per day for boys and 2.8 portions per day for girls. 11% of boys and 8% of girls in this age group met the “5-a-day” recommendation.
- Mean consumption of oily fish was well below the recommended one portion (140g) per week in all age groups. For example, mean consumption in adults aged 19 to 64 years was equivalent to 54g per week.
- Mean energy intakes for adults were 1882 kcal/day for those aged 19 to 64 years (2151 kcal/day for men and 1614 kcal/day for women) and 1690 kcal/day for adults aged 65 years and over (1934 kcal/day for men and 1501 kcal/day for women). In children mean energy intakes ranged from 1137 kcal/day for children aged 1.5 to 3 years, 1555 kcal/day for children aged 4 to 10 years and 1791 kcal/day for children aged 11 to 18 years.
- Mean intake of total fat met the DRV (no more than 35% food energy) in all age/sex groups except for men and women aged 65 years and over, for whom, on average, total fat provided 36.9% and 35.4% food energy respectively.
- Mean intakes of saturated fat exceeded the DRV (no more than 11% food energy) in all age groups. For example, mean saturated fat intake for adults aged 19 to 64 years was 12.7% food energy.

- Mean intakes of *trans* fatty acids provided 0.7-0.8% of food energy for all age groups, thus meeting the DRV (no more than 2% food energy).
- Mean NMES intakes exceeded the DRV (no more than 11% food energy) for all age groups most notably for children aged 11 to 18 years where mean intakes provided 15.3% food energy.
- 58% of adults aged 19 to 64 years and 52% of adults aged 65 years and over consumed alcohol during the four-day recording period. Adults aged 19 to 64 years who consumed alcohol during the four-day recording period obtained 9% of energy intake from alcohol; older adult consumers obtained 7%.
- Mean intakes of Non-Starch Polysaccharides (NSP) for adults aged 19 years and over were 13.3-13.8g per day, below the DRV set for adults of at least 18g per day.
- Mean intakes of reported vitamins (except vitamin D) from food sources were close to or above the Reference Nutrient Intake (RNI)¹⁴ for all groups. Intakes of vitamin D were below the RNI even after including the contribution from dietary supplements.¹⁸ For children aged 11 to 18 years, 13% had vitamin A intakes and 21% of girls had riboflavin intakes below the Lower Reference Nutrient Intake (LRNI).¹⁵ The contribution of dietary supplements did not reduce the proportions below the LRNI.
- Mean intakes of reported minerals from food sources were below the RNI for some age groups, in particular children aged 11 to 18 years. In addition, a substantial proportion of this age group, particularly girls, had intakes below the LRNI. Mean intakes of iron were below the RNI for girls aged 11 to 18 years and women aged 19 to 64 years and 46% of girls and 23% of women aged 19 to 64 years were below the LRNI. Use of supplements had little effect on the proportions below the LRNI. Mean intakes of all minerals were above the RNIs for younger children aged under 11 years and few children in this age group had intakes below the LRNI.
- 23% of adults aged 19 to 64 years and 39% of adults aged 65 years and over reported taking at least one dietary supplement during the four-day recording period.
- There is evidence of iron-deficiency anaemia (as indicated by low haemoglobin levels) and low iron stores (plasma ferritin) in a proportion of adult women and older girls. The proportion of girls aged 11 to 18 years and women aged 19 to 64 years who had a haemoglobin and ferritin concentration below the lower limit of the

normal range were 5.6% and 3.3% respectively. Iron deficiency anaemia has health implications.

- There is evidence of low vitamin D status in adults aged 19 to 64 years and children aged 11 to 18 years, both male and female. The proportion of boys and girls aged 11 to 18 years and men and women aged 19 to 64 years who had 25-OHD concentrations below the lower threshold for vitamin D adequacy was 19.3%, 20.4%, 17.1% and 18.6% respectively. This has implications for bone health, including increased risk of rickets and osteomalacia.
- A substantial proportion of adults and older children have erythrocyte glutathione reductase activation co-efficient (EGRAC) values above the generally accepted upper threshold for normal riboflavin (vitamin B2) status. However recent research has suggested that this threshold (1.30) may be set too low, so overestimating the prevalence of low riboflavin status.
- There is little evidence of low status for other micronutrients where normal ranges or thresholds for low status have been set. Mean values for vitamin C, B₁₂, thiamin, retinol (vitamin A)¹⁹ and vitamin E fell within the normal range.
- Nearly half of adults had elevated concentrations of serum total cholesterol associated with increasing risk of cardiovascular disease. This is well known and in line with findings from health surveys.

Methodological issues

Misreporting of food consumption

Misreporting of food consumption, generally under-reporting, is known to be an issue in NDNS as in all dietary surveys. The degree of under-reporting needs to be borne in mind when interpreting findings from this survey. The doubly-labelled water (DLW) technique has been used to measure total energy expenditure in a sub-sample of NDNS participants to assess the extent of misreporting of energy intake. Results of the DLW analyses will be published at a later date.

Diet and nutritional status

Results based on assessment of food consumption over the four-day diary period tell us about diet over a relatively short period. Analysis of blood samples can provide an indication of the nutritional status of the population over a longer period. Nutritional status is the level of nutrients available to the body (after absorption) for use in metabolic processes.

It is not possible to make direct comparisons between the dietary results and blood results presented in the report partly due to the elapsed time between the diary recording period and blood sampling (a gap of at least eight weeks in Year 2 onwards) and also because many of the blood indicators reflect longer term body stores of a nutrient rather than recent intake.

Differences between the previous surveys and the current rolling programme

There are a number of methodological differences between the previous cross-sectional surveys and the current rolling programme. The surveys of adults aged 19 to 64 years and children aged 4 to 18 years used a seven-day diary whereas the current survey uses a four-day diary. The survey of children aged 1.5 to 4.5 years used a four-day diary which over-sampled weekend days. Differences in number of days have little effect on comparisons of mean consumption of food groups or mean nutrient intakes between surveys but do affect comparisons for percentages consuming food groups and meeting dietary recommendations. Another key methodological difference is that all the previous

surveys used weighed diaries whereas the rolling programme uses estimated weights for quantities eaten.

For blood analytes, the current rolling programme collects blood samples following an overnight fast for all age groups (except those aged 1.5 to three years and diabetics not willing to fast who are asked to provide a non-fasting blood sample). Data from fasting blood samples are considered to be more informative because some analytes are affected by recent food consumption. This is a change in methodology from the previous NDNS of adults aged 19 to 64 years carried out in 2000/01, which collected non-fasting samples and means that comparisons with that survey cannot be made for nutrients affected by recent consumption. In addition, some of the analytical methods have changed since previous NDNS in 1997 and 2000/01 and the new analytical methods are not always comparable with those used in the previous surveys. Because of these methodological changes we have not made comparisons between the blood results in this report with those in previous NDNS surveys.

Future reports

Combined data for Years 1-4 of the rolling programme are due to be published in 2013. That report will update information about food consumption and nutrient intakes and will include comparisons within the rolling programme i.e. Years 1 & 2 combined vs Years 3 & 4 combined. Results from blood analytes will be provided, including, for the first time, results for older adults (aged 65 years and over) and younger children (aged 1.5 to 10 years). The report will also contain results from 24-hour urine analyses and an assessment of physical activity.

¹ Responsibility for nutrition policy in England and Wales transferred from FSA to Health Departments in 2010. Management of NDNS also transferred to the Department of Health in England at that time.

² Gregory JR, Collins DL, Davies PSW, Hughes JM, Clarke PC. National Diet and Nutrition Survey: children aged 1 ½ to 4 ½ years. Volume 1: Report of the diet and nutrition survey London: HMSO, 1995.

Hinds K, Gregory JR. National Diet and Nutrition Survey: children aged 1½ to 4½ years. Volume 2: Report of dental survey. London: HMSO, 1995

³ Gregory JR, Lowe S, Bates CJ, Prentice A, Jackson LV, Smithers G, Wenlock R, Farron H. National Diet and Nutrition Survey: young people aged 4 to 18 years. Volume 1: Report of the diet and nutrition survey. London: TSO, 2000.

Walker A, Gregory J, Bradnock G, Nunn J, & White D. National Diet and Nutrition Survey: young people aged 4 to 18 years. Volume 2: Report of the oral health survey. London: TSO, 2000

⁴ Henderson L, Gregory J, Swan G. National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 1: Types and quantities of food consumed. London: TSO, 2002.

Henderson L, Gregory J, Irving K, Swan G. National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 2: Energy, protein, carbohydrate, fat and alcohol intake. London: TSO, 2002.

Henderson L, Irving K, Gregory J, Bates CJ, Prentice A, Perks J, Swan G, Farron M. National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 3: Vitamin and mineral intake and urinary analytes. London: TSO, 2003.

Rustin D, Hoare J, Henderson L, Gregory J, Bates CJ, Prentice A, Birch M. National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 4: Nutritional status (anthropometry and blood analytes), blood pressure and physical activity. London: TSO, 2004

Hoare J, Henderson L, Bates CJ, Prentice A, Birch M, Swan G, Farron M. National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 5: Summary report. London: TSO, 2004

⁵ Finch S, Doyle W, Lowe C, Bates CJ, Prentice A, Smithers G, Clarke PC. National Diet and Nutrition Survey: people aged 65 years and over. Volume 1: Report of the diet and nutrition survey. London: TSO, 1998.

Steele JG, Sheiham A, Marcenes W, Walls AWG. National Diet and Nutrition Survey: people aged 65 years and over. Volume 2: Report of the oral health survey. London: TSO, 1998

⁶ Ashwell M, Barlow S, Gibson S, Harris C (2006) National Diet and Nutrition Surveys: the British experience. Public Health Nutrition 9(4) 523-530

⁷ Department of Health Healthy Lives, Healthy People: Our Strategy for public health in England White Paper [Online] Available:
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_121941
(accessed 04/05/2012)

⁸ Bates B, Lennox A, Swan G (2010) National Diet and Nutrition Survey; Headline results from year 1 of the rolling programme (2008/09) [Online]. Available:
<http://tna.europarchive.org/20110116113217/tna.europarchive.org/20110116113217/http://www.food.gov.uk/science/dietarysurveys/ndnsdocuments/ndns0809year1> (accessed 02/02/12)

Bates B, Lennox A, Bates C, Swan G (2011) National Diet and Nutrition Survey; Headline results from years 1 and 2 (combined) of the rolling programme (2008/09- 2009/10) [Online]. Available: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_128166 (accessed 02/02/12).

⁹ In some core sample households (where up to one adult and one child could be selected), it was possible to end up with an adult participant only, either because the selected child was not able/did not wish to take part or because there was no resident child eligible for selection.

¹⁰ All individuals visited by a nurse were asked if they were willing to provide a blood sample. Blood results for older adults (aged 65 years and over) and younger children (aged 1.5 to 10 years) are not included in this report but will be included in future reports when sufficient numbers have been accumulated.

¹¹ Non response bias occurs if those who respond to the survey (or elements of the survey) differ from those who do not respond. Data were weighted to reduce such bias.

¹² Report on Health and Social Subjects 41 *Dietary Reference Values (DRVs) for Food Energy and Nutrients for the UK*, Report of the Panel on DRVs of the Committee on Medical Aspects of Food Policy (COMA) 1991. The Stationery Office. London

¹³ For some micronutrients, status can be assessed by directly measuring the level of the nutrient in blood, while for others it is assessed by a functional measure such as the activity of vitamin-dependent enzymes. For example, riboflavin status can be assessed by measuring the activity of the red cell enzyme glutathione reductase which is dependent on a co-factor derived from riboflavin. Threshold values, below or above which low status is indicated, have been set for some, though not all, micronutrients. A value indicating that the individual has low status for that micronutrient usually means that body stores or tissue levels are depleted and the individual is at greater risk of deficiency. This may reflect dietary inadequacy or health issues such as blood loss. However, a value indicating low status does not necessarily mean that the individual is clinically deficient, rather that they are at risk of becoming deficient.

¹⁴ The RNI for a vitamin or mineral is the amount of the nutrient that is sufficient for about 97% of people in the group. If the average intake of the group is at the RNI, then the risk of deficiency in the group is judged to be very small. However, if the average intake is lower than the RNI then it is possible that some of the group will have an intake below their requirement.

¹⁵ The adequacy of vitamin or mineral intake can be expressed as the proportion of individuals with intakes below the LRNI. The LRNI for a vitamin or mineral is set at the level of intake considered likely to be sufficient to meet the needs of only 2.5% of the population.

¹⁶ Sadler K, Nicholson S, Steer T, Gill V, Bates B, Tipping S, Cox L, Lennox A and Prentice A (2012) Assessment of Dietary Sodium Levels Among Adults (aged 19-64) in England, 2011" [Online] Available: <http://transparency.dh.gov.uk/2012/06/21/sodium-levels-among-adults/> (accessed 10/07/12).

¹⁷ The Health Survey for England (HSE) is used to monitor "5-a-day". HSE estimates of fruit and vegetable consumption are based on a recall of consumption over the previous 24 hours and are therefore different from NDNS estimates which are based on a four-day diary. NDNS estimates are higher than HSE estimates, at least in part because NDNS is better able to capture the contribution from composite dishes containing fruit and vegetables.

¹⁸ For vitamin D, RNIs are only set for those aged up to 4 years and those aged 65 years and over.

¹⁹ Vitamin A can be obtained in two forms: as preformed vitamin A (retinol) and from some carotenoids that can be cleaved in the body to provide retinol.