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National Diet and Nutrition Survey

Results from Years 5 and 6 (combined) of the Rolling Programme (2012/2013 – 2013/2014)

A survey carried out on behalf of Public Health England and the Food Standards Agency

NatCen
Social Research that works for society

MRC Human Nutrition Research

About Public Health England

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Published September 2016
PHE publications gateway number: 2016248

Acknowledgements

We would like to thank all of those who gave up their time to be interviewed and who welcomed interviewers and nurses into their homes. We would also like to acknowledge the professionalism and commitment of interviewers and nurses who worked on the survey and who are so important to the survey's success.

We would like to thank everyone who contributed to the survey and the production of this report. In particular, we would like to thank:

- colleagues at NatCen Social Research (NatCen): Steve Edwards, Lynne Gold, Coral Lawson, Natalie Maplethorpe, Caireen Roberts, Keeva Rooney and Katharine Sadler
- team members no longer at NatCen: Olu Alaka, Pauline Burge, Claire Deverill and Nina Sal
- members of the teams at the MRC Human Nutrition Research (HNR):
    - reporting: Nida Ziauddeen and David Collins
    - programmers and data management: Iain Bayes, Darren Cole, Alison James and Jonathan Last
    - the dietary assessment team: Birdem Amoutzopoulos, Sarah Elsey, Clare Evans, Anna Harvey, Rachael Mack, Kirsty Trigg and Jenny Winster
    - laboratory and analytical personnel: Veronica Bell, Sylvaine Bruggraber, Karen Chamberlain, Marc Fleming, Kate Guberg, Dagmar Koller, Abhilash Krishnankutty, Tabasum Makhdoomi, Amanda Mckillion, Priya Singh, Edyta Telega and Stephen Young
    - other colleagues at HNR: Yvette Edwards, Chris Bates, Anjali Mazumder and David Pell
- team members no longer at HNR:
  Laura Angell, Steve Austin, Falai Baldeh, Karen Binks, Gemma Bramwell, Sue Bryant, Carmen Canas, Mark Chatfield, Christine Clewes, Kate Edgecombe, Emily Fitt, Petros Gousias, Debbie Harman, Lindi Holmes, Katie Lamb, Kerry Lambert, Alison Lennox, Michelle Lewin, Tsz Ning Mak, Adrian Mander, Ian Mather, Adam Messenger, Hanneke Mfuni, Natalie Momen, Melanie Nester, Marilena Papanikolaou, Maria Pinheiro, Gerda Pot, Celia Prynne, Carl Ruffel, Dorothy Singer, Ivonne Solis-Trapala, Deepti Sood, Elizabeth Stickley, Oliver Tunnacliffe, Vijay Vaja, Josie Webber, Clare Whitton, Peter Winship, Rachel Woodward, Antony Wright and Jianhua Wu
- colleagues at University College London: Barbara Carter-Szatynska, Jennifer Mindell, Shaun Scholes and Emmanouil Stamatakis
- Stuart Bennett and colleagues at the Northern Ireland Statistics and Research Agency for organising and carrying out fieldwork in Northern Ireland

- colleagues at Addenbrooke's Hospital for carrying out blood analyses
- Professor Elaine Gunter (Specimen Solutions, LLC) for an independent review of the laboratory procedures and analyses
- Soren Brage and colleagues at the MRC Epidemiology Unit for their physical activity expertise
- members of the National Diet and Nutrition Survey (NDNS) Project Board: in particular Professor Julie Lovegrove and Professor Hilary Powers
- staff at Public Health England, in particular: Mark Bush, Sakhi Dodhia, Melanie Farron-Wilson, Louis Levy, Mark Robinson and Alison Tedstone
- staff at the Food Standards Agency: Clifton Gay, Joseph Shavila and Joanne Casey
- staff at Food Standards Scotland: Anne Milne, Gillian Purdon and Heather Peace
- staff at the Welsh Government: Sarah Rowles and Chris Roberts

Notes to text and tables

1 The data used in the report has been weighted. The weighting is described in Appendix B of this report. Unweighted sample sizes are shown at the foot of each table.

2 The NDNS RP requires weights to adjust for differences in sample selection and response. The weights adjust for:

- differential selection probabilities of addresses, households and individuals
- non-response to the individual questionnaire
- non-response to the nurse visit
- non-response of participants aged 16 years and older to the physical activity self-completion questionnaire (the RPAQ)
- non-response to providing a blood sample

3 The data was analysed using the survey package in the statistical software R (v3.1.3)

4 The following conventions have been used in tables:

- no observations (zero value) or a threshold was not applicable to a particular age group or an analyte was not measured in a particular age group and therefore descriptive statistics for that analyte were not calculated for that age group.

0 non-zero values of less than 0.5% and thus rounded to zero

[ ] unless stated otherwise data and bases for a variable with a cell size between 30-49 are presented in square brackets. In this case it should be noted that the lower or upper 2.5th percentiles represent data from at most two participants. For cell sizes below 30, bases have been presented in square brackets, but data have not been presented.

5 Because of rounding, row or column percentages may not add exactly to 100%.

6 A percentage may be quoted in the text for a single category that aggregates two or more of the percentages shown in a table. The percentage for the single category may, because of rounding, differ by one percentage point from the sum of the percentages in the table.

7 Values for means, medians, percentiles and standard deviations and standard errors are shown to an appropriate number of decimal places. For reasons of space, Standard Error may sometimes be abbreviated to SE and Standard Deviation to sd.

8 ‘Missing values’ occur for several reasons, including refusal or inability to answer a particular question; refusal to co-operate in an entire section of the survey (such as the nurse visit or a self-completion questionnaire); and cases where the question is not applicable to the participant.

9 The group to whom each table refers is stated at the upper left corner of the table.

10 The term ‘significant’ refers to statistical significance (at the 95% level) and is not intended to imply substantive importance.

Contents

1 Introduction

The National Diet and Nutrition Survey Rolling Programme (NDNS RP) is a continuous programme of fieldwork 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 core NDNS RP is jointly funded by Public Health England (PHE)[1] and the UK Food Standards Agency (FSA). The NDNS RP is carried out by a consortium comprising NatCen Social Research (NatCen) and MRC Human Nutrition Research (HNR)[2] with fieldwork in Northern Ireland carried out by Northern Ireland Statistics and Research Agency (NISRA).

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 intake for the population are derived.[3] Results are used by government to develop policy and monitor progress on diet and nutrition objectives of UK health departments, for example, work to tackle obesity and monitor progress towards a healthy, balanced diet as defined by the Eatwell Guide.[4] The food consumption data is 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.

The NDNS programme began in 1992 as a series of cross-sectional surveys designed to be representative of the UK population, each covering a different age group: pre-school children (aged 1.5 to 4.5 years);[5] young people (aged 4 to 18 years);[6] adults (aged 19 to 64 years)[7] and older adults (aged 65 years and over).[8] Since 2008, the NDNS has run continuously covering adults and children aged 1.5 years and over. Methods used in the NDNS are continually reviewed to ensure they remain the best practical methods available.

This report presents an overview of key findings for food consumption, nutrient intake and nutritional status for the UK in Years 5 and 6 (combined) (2012/13–2013/14) of the NDNS RP.[9] The sample is drawn from all four UK countries, and is designed to be nationally representative. Recruitment in both Wales[10] and Northern Ireland[11] was boosted to 200 participants per year in order to achieve country-specific, representative dietary health data.[12]

The report also provides background information on the survey, including the sample and methodology (Appendix B). Urinary iodine measurement was introduced in Year 6 of the NDNS RP and is therefore presented for the first time in this report.

The commentary in this report mainly discusses the descriptive statistics for Years 5 and 6 (combined). The report is supported by accompanying Excel tables providing data for Years 5 and 6 (combined) and the previous paired years (Years 1 and 2 combined; Years 3 and 4 combined). Statistical comparisons have been performed to analyse differences over time in respect of the latest data (Years 5 and 6 combined) against the first two years of the RP (Years 1 and 2 combined) along with comparisons of the interim paired years against the start of the RP.[13,14,15] No comparisons have been perfomed for Years 5 and 6 (combined) versus Years 3 and 4 (combined); see section 7 of this report and Appendix U for more information on the statistical analysis.

Statistical comparisons were performed for the key foods and nutrients listed below and a commentary of differences has been provided:

- total and food energy intake (MJ/day and kcal/day)
- saturated fatty acids intake (g/day, % total energy and % food energy)
- non-milk extrinsic sugars (NMES) intake (g/day, % total energy and % food energy)
- non-starch polysaccharides (NSP) intake (g/day)
- 5-A-Day fruit and vegetable portions (portions/day)[16] and % achieving 5-A-Day fruit and vegetable portions[16]
- red and processed meat consumption (g/day)
- sugar-sweetened soft drinks consumption (g/day)

2 Headline findings for Years 5 and 6 (2012/13-2013/14)

Fruit and vegetables: Eight per cent of children aged 11 to 18 years met the 5-A-Day recommendation for fruit and vegetable consumption.[16,17] The proportion of adults meeting the 5-A-Day recommendation[16] was 27% of those aged 19 to 64 years and 35% of those aged 65 years and over. There were no significant differences between Years 5 and 6 (combined) and Years 1 and 2 (combined) for any age/sex group either in terms of average number of portions consumed or the percentage meeting the recommendation.

Oily fish: Mean consumption of oily fish in all age groups was well below the recommended one portion per week. There was no evidence of any change in consumption over time.

Red and processed meat: Mean consumption of red and processed meat for women aged 19 to 64 years and 65 years and over met the current maximum recommendation for adults. However, mean consumption by men aged 19 to 64 years and 65 years and over exceeded the recommendation. For adults aged 19 to 64 years, mean consumption of red and processed meat was significantly lower in Years 5 and 6 (combined) and Years 3 and 4 (combined) than in Years 1 and 2 (combined) (65g, 68g and 74g, respectively).

Sugar-sweetened soft drinks: There is evidence that consumption of sugar-sweetened soft drinks has reduced in children. Mean consumption was significantly lower in children aged 4 to 10 years in Years 5 and 6 (combined) compared with Years 1 and 2 (combined) (100g and 130g respectively).

Saturated fatty acids: Mean intakes of saturated fatty acids as a percentage of food energy in Years 5 and 6 (combined) continued to exceed recommendations in all age groups. There was no evidence of a fall in intake over time, except in those aged 65 years and over.

Non-milk extrinsic sugars: Children aged 4 to 10 years had a significantly lower percentage of food energy from non-milk extrinsic sugars (NMES) in Years 5 and 6 (combined) compared with Years 1 and 2 (combined). However, mean intakes of NMES continued to exceed recommendations[18] for all age groups, with the exception of women aged 65 years and over. There were no statistically significant differences over time in other age groups.

Non-starch polysaccharides: Mean intakes of non-starch polysaccharides (NSP) were below the recommendation for adults.[19] There was no evidence of any change in intake over time.

Vitamins and minerals: Evidence continues to indicate low intakes for some vitamins and minerals (such as vitamin A and iron) in a proportion of participants, particularly in those aged 11 to 18 years.

Vitamin D: Around a fifth of adults aged 19 to 64 years had low blood levels of vitamin D.

Iodine: In all age/sex groups, urinary iodine concentrations met the WHO criteria for assessing adequate intake in a population (ie median urinary iodine concentration within the range 100-199µg/L and fewer than 20% of samples below 50µg/L).

3 Current UK diet and nutrition recommendations

The findings for the NDNS RP Years 5 and 6 (combined) are compared with the UK recommendations for food and nutrient intakes. Current UK recommendations for consumption of fruit and vegetables, red and processed meat and oily fish are shown in table A.

Table A: Current UK recommendations

Food	Recommendation
Fruit and vegetables	At least 5 portions per day (equivalent to 400g) for those aged 11 years and over[16]
Red and processed meat[a]	For adults, average intakes of red and processed meat should not exceed 70g per day[20]
Oily fish[b]	At least 1 portion per week for all ages (140g)[21]

[a] Red and processed meat includes beef, lamb, pork, sausages, burgers and kebabs, offal, processed red meat and other red meat.
[b] Oily fish includes anchovies, carp, trout, mackerel, herring, jack fish, pilchards, salmon (including canned), sardines, sprats, swordfish, tuna (fresh only) and whitebait

The Dietary Reference Values (DRVs)[22] for energy and key macronutrients are shown in Table 3.1 of the accompanying Excel tables to this report and are referred to as 'recommendations' in the rest of this report. They indicate the average or the maximum contribution that these nutrients should make to the population average intakes.

Population adequacy of micronutrient intake is assessed by comparing intake with the age and sex specific UK DRV for each vitamin and mineral.[22] Published UK Reference Nutrient Intakes (RNI)[23] and Lower Reference Nutrient Intakes (LRNI)[24] are shown in Tables 5.1 and 5.2 of the accompanying Excel tables to this report.

4 Food consumption[25] and nutrient intakes for Years 5 and 6 (combined)

Statistical comparisons have been performed to analyse differences over time in respect of the latest data (Years 5 and 6 combined) against the first two years of the RP (Years 1 and 2 combined) along with comparisons of the interim paired years against Years 1 and 2 (combined).[13,14,15] No comparisons have been perfomed for Years 5 and 6 (combined) versus Years 3 and 4 (combined); see section 7 of this report for more information on the statistical analysis.

4.1 Food consumption[25] for Years 5 and 6 (combined)

Table B provides a summary of the consumption of selected foods for adults and children in Years 5 and 6 (combined).

Fruit and vegetables: Mean consumption of fruit and vegetables for children aged 11 to 18 years was 2.8 portions per day in Years 5 and 6 (combined) and the proportion meeting the 5-A-Day recommendation[16] was 8%. On average adults aged 19 to 64 years consumed 4.0 portions of fruit and vegetables per day and adults aged 65 years and over consumed 4.2 portions per day. Twenty-five per cent of men aged 19 to 64 years, 28% of women aged 19 to 64 years, 34% of men aged 65 years and over and 35% of women aged 65 years and over met the 5-A-Day recommendation.[16] There were no significant differences in mean consumption of fruit and vegetables or the proportion meeting the 5-A-Day recommendation[16] between Years 5 and 6 (combined) compared with Years 1 and 2 (combined) for any age/sex group. The consumption figures for Years 1 and 2 (combined) and Years 3 and 4 (combined) have been revised to correct an error in the calculation of 5-A-Day portions which caused a slight overestimate in the consumption figures published in the Years 1–4 (combined) report.[17]

(Tables B and 7.3)

Oily fish: Mean consumption of oily fish in all age groups remained well below the recommended one portion (140g) per week in all paired years.[26] Mean consumption was equivalent to 13–29 grams per week in children and 54–87 grams per week in adults. There were no statistically significant differences in consumption of oily fish between Years 5 and 6 (combined) and Years 1 and 2 (combined).

(Tables B and 7.7)

Red and processed meat: Mean consumption of red and processed meat for women aged 19 to 64 years (47g) and 65 years and over (57g) met the current recommendation that adult average intakes should not exceed 70g per day. However, mean consumption for men aged 19 to 64 years (84g) and aged 65 years and over (81g) exceeded the recommendation.[20] Mean consumption of red and processed meat for women aged 19 to 64 years was significantly lower in Years 5 and 6 (combined) (47g) than in Years 1 and 2 (combined) (58g). However, there were no significant differences in consumption between paired years for men.

(Tables B and 7.5)

Sugar-sweetened soft drinks: Reported daily consumption of sugar-sweetened soft drinks in children aged 4 to 10 years was significantly lower in Years 5 and 6 (combined) (100g) compared with Years 1 and 2 (combined) (130g). Whilst the data suggested a similar pattern of change over time in children aged 11 to 18 years and adults aged 65 years and over, these differences did not reach significance.

(Tables B and 7.8)

Table B Average daily intake of selected foods, for NDNS RP UK Years 5 and 6 (combined)

Food	NDNS age group (years)						
	1.5-3	4-10	11-18	19-64		65+	
				Men	Women	Men	Women
5-A-Day portions (portions/day)[a]	-	-	2.8	3.9	4.1	4.2	4.3
% achieving 5-A-Day	-	-	8	25	28	34	35
Oily fish g/day[b]	2	2	4	8	8	13	12
Red and processed meat g/day[c]	28	42	59	84	47	81	57
Sugar-sweetened soft drinks g/day[d]	63	100	212	169	96	39	37
Bases (unweighted)	*215*	*495*	*548*	*373*	*592*	*130*	*193*

[a] To calculate 5-A-Day portions of fruit and vegetables see chapter 5 of the UK Years 1-4 NDNS RP report and appendix A of this report. Children under 11 years have not been included as the 80g portion is only appropriate for older children and adults.
[b] Oily fish includes anchovies, carp, trout, mackerel, herring, jack fish, pilchards, salmon (including canned), sardines, sprats, swordfish, tuna (fresh only) and whitebait.
[c] Red and processed meat includes beef, lamb, pork, sausages, burgers and kebabs, offal, processed red meat and other red meat.
[d] A trend analysis on sugar-sweetened soft drinks has been included in the light of the current policy interest in sugar, the high contribution that soft drinks make to sugar intakes in children and the SACN recommendation that the consumption of sugar-sweetened beverages should be minimised in both children and adults.

4.2 Energy and nutrient intakes for Years 5 and 6 (combined)

Table C provides a summary of the reported mean total energy intake for adults and children in Years 5 and 6 (combined). There were some differences in reported energy intakes between Years 5 and 6 (combined) and Years 1 and 2 (combined), however these differences were only significant for children aged 4 to 10 years where mean total energy intake in Years 5 and 6 (combined) (6.16 MJ) was significantly lower than in Years 1 and 2 (combined) (6.52 MJ). With the exception of children under 10 years, mean daily energy intake was below the estimated average requirement (EAR) for all age/sex groups.

(Tables C and 2.1)

Table C Average daily total energy intake for NDNS RP UK Years 5 and 6 (combined)

Total energy[a]	NDNS age groups (years)								
	1.5-3	4-10		11-18		19-64		65+	
	sex-combined	Boys	Girls	Boys	Girls	Men	Women	Men	Women
MJ	4.68	6.41	5.90	8.14	6.81	8.86	6.71	7.72	6.26
kcal	1108	1520	1400	1933	1617	2107	1595	1835	1488
Bases (unweighted)	*215*	*258*	*237*	*268*	*280*	*373*	*592*	*130*	*193*

[a] Total energy intake includes energy from alcohol.

Table D provides a summary of the intakes of selected macronutrients for adults and children in Years 5 and 6 (combined). The percentage contribution of food groups to energy, macronutrient and micronutrient intake are presented in tables 6.1a-6.20c of the accompanying Excel tables to this report. These tables show that for all age/sex groups the main contributors to energy, macronutrient and micronutrient intake in Years 5 and 6 (combined) are little changed from those in previous paired years.

Total fat: Mean intake of total fat met the recommendation (no more than 35% food energy) in all age/sex groups.

(Tables D and 3.3)

Saturated fatty acids: Mean intake of saturated fatty acids exceeded the recommendation (no more than 11% of food energy) in all age/sex groups; for example, mean intake of saturated fatty acids for adults aged 19 to 64 years was 12.7% of food energy. Mean intakes of saturated fatty acids as a percentage of food energy for adults aged 65 years and over were significantly lower in Years 5 and 6 (combined) (13.4%) and Years 3 and 4 (combined) (13.2%) compared with Years 1 and 2 (combined)

(14.3%). For all other age/sex groups mean intakes were similar in Years 5 and 6 (combined) to other paired years and there were no significant differences.

(Tables D, 3.4 and 6.4a-c)

***Trans* fatty acids:** Mean intake of *trans* fatty acids provided 0.5–0.6% of food energy for all age/sex groups, and thus continued to meet the recommendation (no more than 2% food energy).

(Tables D and 3.5)

Non-milk extrinsic sugars: Mean NMES[27] intake exceeded the recommendation (no more than 11% of food energy) for all age/sex groups except women aged 65 years and over (10.4%). NMES intake was highest for children aged 4 to 10 years (13.4% of food energy) and 11 to 18 years (15.2% of food energy). NMES intake as a percentage of food energy was significantly lower in Years 5 and 6 (combined) than in Years 1 and 2 (combined) for children aged 4 to 10 years (13.4% and 14.4%, respectively). A new recommendation for sugar intake was set by SACN in 2015. The new recommendation is that intake of free sugars should provide no more than 5% of total energy intake for adults and children aged over two years.[18] The main sources of NMES in children aged 18 years and under were 'cereal and cereal products' (mainly cakes and biscuits), 'non-alcoholic beverages' (soft drinks and fruit juice), 'sugar, preserves and confectionery' and (in younger children) 'milk and milk products' (sweetened yogurt, fromage frais and other dairy desserts). The main sources of NMES in adults aged 19 years and over were 'sugar, preserves and confectionery', 'non-alcoholic beverages' (soft drinks and fruit juice) and 'cereal and cereal products' (mainly cakes and biscuits) with 'alcoholic beverages' providing a further 7-9% of intake.

The contribution of sugar-sweetened soft drinks to NMES intake indicates a similar pattern with the contribution being similar or slightly decreasing across the paired years.

(Tables D, 3.7 and 6.7a-c)

Non-starch polysaccharides: Mean intakes of NSP[28] remained well below the DRV set at a population average intake of 18g per day for adults aged 19 years and over (13-14 g/day). Intakes were similar in Years 5 and 6 (combined) to those in Years 1 and 2 (combined) for adults aged 19 to 64 years and 65 years and over; there were no statistically significant differences in NSP intake between paired years. A new recommendation was set by SACN for fibre intake in 2015 based on a different definition of fibre. [19]

(Tables D and 3.8)

Table D Average daily intake of selected macronutrients, for NDNS RP UK Years 5 and 6 (combined)

Macronutrient	NDNS age group (years)				
	1.5-3	4-10	11-18	19-64	65+
Total fat (% food energy)	33.9	33.4	33.6	34.2	34.7
Saturated fatty acids (% food energy)	14.6	13.3	12.6	12.7	13.4
Trans fatty acids (% food energy)	0.5	0.5	0.5	0.5	0.6
NMES[18,27] (% food energy)	12.2	13.4	15.2	12.3	11.1
NSP[19,28] (g)	7.8	10.7	12.2	14.0	13.4
Bases (unweighted)	*215*	*495*	*548*	*965*	*323*

Fifty-three per cent of adults aged 19 to 64 years and 53% of adults aged 65 years and over reported consuming alcohol during the four-day recording period. On average, adults aged 19 to 64 years who consumed alcohol during the four-day recording period obtained 8.4% of total energy intake from alcohol and adults aged 65 years and over obtained 7.1%.

(Table 4.1)

Table E provides a summary of the intakes of selected micronutrients for adults and children in Years 5 and 6 (combined). Mean intake is compared with the RNI[23] and estimates of the proportion with intake below the LRNI are made.[24] Published UK RNIs and LRNIs are shown in tables 5.1 and 5.2 of the accompanying Excel tables to this report.

Vitamins: Mean daily intakes of most vitamins from food sources were close to or above the RNI for the majority of age/sex groups. A substantial proportion (16%) of children aged 11 to 18 years had intakes below the LRNI for vitamin A. In addition, girls aged 11 to 18 years and women aged 19 to 64 years had intakes below the LRNI for riboflavin (20% and 13%, respectively).

(Tables E and 5.3-5.6)

Vitamin D: For vitamin D, RNIs are set only for those aged up to 4 years and those aged 65 years and over and there are no LRNIs set. Mean intakes from food sources only were well below the RNI in both these age groups: 29% of the RNI for children aged 1.5 to 3 years and 33% of the RNI for adults aged 65 years and over.[29]

(Tables E and 5.6)

Minerals: For children aged 4 to 10 years, mean intakes of all minerals were close to or above the RNI with the exception of zinc intake in girls (87% of the RNI) and few children had intakes below the LRNI. However, a substantial proportion of children aged

11 to 18 years had intakes below the LRNI for all minerals, including for iron (48% of girls 11 to 18 years below the LRNI). Twenty seven percent of women aged 19 to 64 years also had iron intakes below the LRNI. A substantial proportion of adults aged 19 years and over had intakes below the LRNI for magnesium, potassium and selenium. The health implications of this are unclear.

(Tables E and 5.7-5.13)

Table E Average daily intake as a percentage of the Reference Nutrient Intake (RNI)[23] from food sources only and proportion of participants with average daily intakes below the Lower Reference Nutrient Intake (LRNI)[24] for selected micronutrients, for NDNS RP UK Years 5 and 6 (combined)

Micronutrients	NDNS age groups (years)								
	Children	Boys		Men		Girls		Women	
	1.5-3	4-10	11-18	19-64	65+	4-10	11-18	19-64	65+
Vitamin A									
Mean % RNI	123	145	103	128	225	109	96	142	162
% with intake below the LRNI	6	7	14	11	4	12	18	8	4
Riboflavin									
Mean % RNI	235	166	134	140	141	156	114	128	141
% with intake below the LRNI	0	0	8	3	5	1	20	13	5
Folate									
Mean % RNI	207	156	113	136	133	140	95	108	109
% with intake below the LRNI	0	0	5	2	2	0	8	4	4
Vitamin D[a]									
Mean % RNI	29	-	-	-	36	-	-	-	31
Iron									
Mean % RNI	90	120	93	133	126	103	58	76	106
% with intake below the LRNI	9	1	9	1	2	3	48	27	3
Calcium									
Mean % RNI	217	161	89	130	119	151	88	106	108
% with intake below the LRNI	0	1	12	4	3	1	19	8	8
Bases (unweighted)	*215*	*258*	*268*	*373*	*130*	*237*	*280*	*592*	*193*

[a] The % of RNI for vitamin D has not been included in this table as RNIs for vitamin D have only been set for those aged 1.5-3 years and 65 years and over. SACN published a new report on vitamin D in July 2016 which has set an RNI for all age/sex groups. This change will be reflected in future reports.[29]

Table E (continued) Average daily intake as a percentage of the Reference Nutrient Intake (RNI)[23] from food sources only and proportion of participants with average daily intakes below the Lower Reference Nutrient Intake (LRNI)[24] for selected micronutrients, for NDNS RP UK Years 5 and 6 (combined)

Micronutrients	NDNS age groups (years)								
	Children	Boys		Men		Girls		Women	
	1.5-3	4-10	11-18	19-64	65+	4-10	11-18	19-64	65+
Magnesium									
Mean % RNI	180	128	81	98	88	116	67	87	84
% with intake below the LRNI	0	0	27	12	16	3	48	11	15
Potassium									
Mean % RNI	222	149	77	88	84	140	65	73	74
% with intake below the LRNI	0	0	15	11	9	0	33	26	24
Iodine									
Mean % RNI	202	124	104	130	132	121	82	99	118
% with intake below the LRNI	1	5	16	5	5	7	26	11	8
Selenium									
Mean % RNI	164	133	81	72	68	125	71	72	70
% with intake below the LRNI	0	1	23	26	34	2	44	46	52
Zinc									
Mean % RNI	101	94	90	101	93	87	84	106	108
% with intake below the LRNI	5	4	17	6	6	13	22	6	3
Bases (unweighted)	*215*	*258*	*268*	*373*	*130*	*237*	*280*	*592*	*193*

5 Biochemical indices of nutritional status

This section reports on the analysis of blood samples taken from participants, providing an assessment of the availability of nutrients to the body (after absorption) for use in metabolic processes. Biochemical indices of micronutrient status are compared with threshold values, where they have been set, to give an estimate of the proportion of the population at greater risk of deficiency due to depleted body stores or tissue concentrations. In addition, biochemical measures of blood lipids are compared with clinical thresholds (presented in Table F) to provide an indication of the proportion of the population at increased risk of cardiovascular disease.

Table F Biochemical Indices of micronutrient status for Years 5 and 6 (combined); mean concentrations and percentages above or below established thresholds

Blood analyte	NDNS age groups (years)[a]						
	Children	Boys	Men		Girls	Women	
	4-10	11-18	19-64	65+	11-18	19-64	65+
Haemoglobin (g/L) and Ferritin (μg/L)							
% with concentration below the threshold for haemoglobin and ferritin[30]	0	0	1	4	5	3	3
Vitamin B_{12} (pmol/L)							
Mean concentration	429	305	264	242	317	275	261
% with concentration below 150pmol/L[31]	0	0	6	5	3	6	8
Holotranscobalamin (pmol/L)[b]							
Mean concentration	94	67	71	[61]	[67]	72	70
% with concentration below 32pmol/L[32,33]	1	3	3	[8]	[1]	4	6
Bases (unweighted)							
Haemoglobin (g/L) and Ferritin (μg/L)	*90*	*88*	*201*	*65*	*82*	*303*	*95*
Vitamin B_{12} (pmol/L)	*95*	*90*	*206*	*71*	*84*	*319*	*101*
Holotranscobalamin (pmol/L)	*50*	*56*	*98*	*[33]*	*[48]*	*162*	*52*

[a] Due to small cell sizes for those aged 1.5 to 3 years and 4 to 10 years, descriptive statistics and percentages above/below an established threshold have not been presented in this table for those aged 1.5 to 3 years and descriptive statistics and percentages above/below an established threshold have only been not been presented for the sex-combined 4 to 10 years age group.

[b] HoloTC was introduced in Year 6 and therefore descriptive statistics are for Year 6 only.

Table F (continued) Biochemical Indices of micronutrient status for Years 5 and 6 (combined); mean concentrations and percentages above or below established thresholds

Blood analyte	NDNS age groups (years)[a]						
	Children	Boys	Men		Girls	Women	
	4-10	11-18	19-64	65+	11-18	19-64	65+
25-hydroxyvitamin D (nmol/L)[c]							
Mean concentration	50.9	45.0	42.4	43.4	47.8	45.3	47.9
% with concentration below 25nmol/L[34]	6	17	22	21	15	15	9
Erythrocyte glutathione reductase activation coefficient (EGRAC) for riboflavin status (ratio)							
Mean	1.30	1.41	1.35	1.30	1.42	1.38	1.31
% with EGRAC above 1.30[35,36]	39	72	52	39	67	58	43
75th percentile	1.38	1.48	1.41	1.36	1.47	1.46	1.35
90th percentile	1.49	1.65	1.60	1.47	1.73	1.62	1.50
Total cholesterol (mmol/L)							
Mean concentration	4.2	3.7	4.9	4.6	4.1	5.0	5.3
% between 5.2mmol/L and 6.4mmol/L[37]	-	-	38	16	-	31	37
% between 6.5mmol/L and 7.8mmol/L[37]	-	-	6	8	-	9	17
% above 7.8mmol/L[37]	-	-	0	2	-	1	1
Bases (unweighted)							
25-hydroxyvitamin D (nmol/L)	*92*	*90*	*202*	*70*	*86*	*314*	*100*
EGRAC (ratio)	*97*	*96*	*207*	*67*	*86*	*319*	*99*
Total cholesterol (mmol/L)	*103*	*96*	*210*	*71*	*86*	*327*	*102*

[a] Due to small cell sizes for those aged 1.5 to 3 years and 4 to 10 years, descriptive statistics and percentages above/below an established threshold have not been presented in this table for those aged 1.5 to 3 years and descriptive statistics and percentages above/below an established threshold have only been not been presented for the sex-combined 4 to 10 years age group.

[c] The 25-OHD data presented here was obtained using the Diasorin Liaison analyser and have been standardised using the procedures of the Vitamin D Standardisation Program to isotope dilution-LCMS/MS international reference methods:
VDSP - Sempos CT, Vesper HW, Phinney KW, Thienpont LM, Coates PM. Vitamin D status as an international issue: national surveys and the problem of standardization. Scand J Clin Lab Invest Suppl 2012;243:32–40.
ODIN - Cashman KD, Dowling KG, Škrabáková Z., et al., Vitamin D deficiency in Europe – pandemic? AJCN (2016); 103(4): 1033-44.

Haemoglobin and Ferritin: There is continued evidence of anaemia (as indicated by low haemoglobin levels)[30] and of low iron stores (as indicated by low plasma ferritin),[30] especially among females aged 11 to 18 years and women aged 19 to 64 years.

(Tables F and 8.1)

Vitamin B_{12}: There is evidence of low vitamin B_{12} status from serum vitamin B_{12} in girls aged 11 to 18 years and in adults aged 19 years and over.[31] There is also evidence of low vitamin B_{12} status from low holotranscobalamin (HoloTC) concentration in all age groups.[32] Percentages below the threshold are not the same for the two measures. Holotranscobalamin (the active form of vitamin B_{12} which is available for uptake into cells) is a relatively new measure and is believed to be a better indicator of functional vitamin B_{12} deficiency, as well as an indicator of the early stages of B_{12} deficiency (recent low B_{12} ingestion), as it changes faster than total B_{12} with altered dietary intake of B_{12}.[33] Chronic untreated vitamin B_{12} deficiency can cause macrocytic anaemia and is associated with lasting neurological damage.

(Tables F, 8.2 and 8.3)

Vitamin D: There is evidence of low vitamin D status (vitamin D concentration below the threshold of 25nmol/L)[34] in all reported age/sex groups; this has implications for bone health, increasing the risk of rickets and osteomalacia. Around a fifth of adults aged 19 to 64 years and a sixth of children aged 11 to 18 years and adults aged 65 years and over had levels below the threshold.

(Tables F and 8.6)

Riboflavin: A substantial proportion of participants in all age/sex groups had raised erythrocyte glutathione reductase activation coefficient (EGRAC) indicating biochemical riboflavin depletion.[35] However, there is uncertainty about the functional consequences of a raised EGRAC.

(Tables F and 8.4)

Results are not presented in this report for vitamin C, retinol, vitamin E or thiamin (ETKAC) where there has previously been little evidence of low status.[38]

Cholesterol: The proportion of adults who had a serum total cholesterol concentration between 6.5 to 7.8mmol/L, indicating a moderately elevated cardiovascular risk[37] was 6% of men and 9% of women aged 19 to 64 years and 8% of men and 17% of women aged 65 years and over. Serum total cholesterol concentrations greater than 7.8mmol/L, indicating severe risk,[37] were almost exclusively limited to those aged 65 years and over (2%).

(Tables F and 8.7)

6 Urinary iodine concentration

Lack of dietary iodine can lead to goitre (enlargement of the thyroid), hypothyroidism and impairment of mental heath including retardation in infants and children. Indicators to assess and monitor the iodine status of a population have been defined by the World Health Organization (WHO).[39] A population urinary iodine concentration median above 100µg/L (with less than 20% of the population below 50 µg/L) is recognised as an indicator of a low prevalence of iodine deficiency within that group.

A spot urine sample was introduced in Year 6 of the NDNS RP for measurement of urinary iodine concentration. The median and other descriptive statistics for urinary iodine concentration are presented for children aged 4 to 18 years (sex-combined), adults aged 19 years and over (sex-combined) and women of childbearing age (16 to 49 years) for Year 6 only in table 9.1 and figure 9.2 of the accompanying Excel tables and figures to this report.[40]

In all age/sex groups, results met the WHO criteria for adequate iodine intake (i.e. median urinary iodine concentration within the range 100-199µg/L and fewer than 20% of samples below 50µg/L). The population median urinary iodine for women of childbearing age (16 to 49 years) was 117µg/L. For other age groups the median urinary iodine concentration was 119µg/L for adults aged 19 years and over and 138µg/L for children aged 4 to 18 years.

(Table 9.1 and figure 9.2)

7 Methodological issues and response rates

An overview of the purpose, documents, methodologies, procedures for data collection and quality control are provided in the supporting technical appendices to this report. Further, Appendix X of the UK Years 1 to 4 (combined) report[41] includes a consideration of the methodological issues and limitations of self-reported measures of food intake such as time between diet and nutritional status assessment and days of the week recorded in the food diary, as well as mis-reporting, which is a limitation of all methods of measuring food intake currently used in dietary surveys. These should be borne in mind while interpreting these findings.

A random sample of 8,879 addresses from 323 postcode sectors, drawn from the Postcode Address File, was issued between April 2012 and March 2014.[42] Where there were multiple households at an address, a single household was selected at random. For each household, either one adult (aged 19 years and over) and one child (aged 1.5 to 18 years), or one child only were randomly selected to take part.[43]

Selected individuals were asked to complete a diary of food and drink consumption over four consecutive days (with the start date randomly allocated) and an interview was conducted to collect background information on dietary habits, socio-demographic status, lifestyle and physical activity. Participants also had their height and weight measured and those aged four years and over asked to provide a spot urine sample (in Year 6 only). Participants who agreed to a nurse visit were asked to provide a blood sample to assess biochemical indices of nutritional status. Physical measurements including blood pressure and waist and hip circumferences were also taken by the nurse.

Response rates achieved for key components of the NDNS RP are shown in Table G.

Table G: Response rates achieved for Years 5 and 6 (combined)

Individual response	**N**	**%**
Completion of food and drink diary (3 or 4 days)	2,546 (1,288 adults, 1,258 children)	53%
Of those completing a food and drink diary:		
Blood sample obtained[a]	730 adults, 352 children	57% of adults, 28% of children

[a] All individuals visited by a nurse were asked if they were willing to provide a blood sample.

The data was 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.[44]

Statistical analysis (linear regression) of differences between Years 5 and 6 (combined) (2012/13–2013/14) and Years 3 and 4 (combined) (2010/11–2011/12) compared with Years 1 and 2 (combined) (2008/09–2009/10) have been undertaken for the key foods and nutrients listed in the Introduction of this report and a commentary of differences has been provided.

Statistical comparisons were performed for Years 5 and 6 (combined) versus Years 1 and 2 (combined) and for Years 3 and 4 (combined) versus Years 1 and 2 (combined) where * indicates $p<0.05$ and ** indicates $p<0.01$. No comparisons have been perfomed for Years 5 and 6 (combined) versus Years 3 and 4 (combined). Comparisons were only performed where the goodness-of-fit statistic R-squared was above 5% (see appendix U of this report for more details). Due to the skewed nature of the data, data for 5-A-Day fruit and vegetable portions[16] has been transformed to the natural logarithmic scale before statistical analysis was performed. For the following foods, data was dichotomised about the median before statistical analysis was performed using logistic regression:

- % achieving 5-A-Day[16]
- red and processed meat
- sugar-sweetened soft drinks

8 Future reports

A set of tables for Year 7 (only) (2014/15) will be published in 2016/17 followed later in 2017 by a summary report for Years 7 and 8 (combined) (2014/15 and 2015/16). In the Years 7 and 8 (combined) report, descriptive statistics will be provided for free sugars intake and fibre intake using the AOAC method covering all paired years of the RP (NMES and NSP will not be reported after Year 7).

A full report covering Years 5 to 9 (combined) (2012/13 to 2016/17) will be published in 2018/19 and will include an analysis of changes in the UK diet and nutrient intake and nutritional status over time.

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[1] From 1 April 2013, responsibility for the NDNS contract transferred from the Department of Health in England to the Department of Health's Executive Agency, Public Health England (PHE).

[2] In Years 1 to 5 the consortium also included the University College London Medical School (UCL).

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

[4] https://www.gov.uk/government/publications/the-eatwell-guide (accessed 02/08/16).

[5] 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.

[6] Gregory JR, Lowe S, Bates CJ, Prentice A, Jackson LV, Smithers G, Wenlock R, Farron M. 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.

[7] 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.

[8] 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.

[9] Additional recruitment was undertaken in Wales (Years 5 to 9) and in Northern Ireland (Years 6 to 9) in order to achieve representative data for each country and to enable comparisons to be made with UK results.

[10] The Wales boost was funded by the Food Standards Agency (FSA) in Wales which previously shared policy responsibility for diet and nutrition of the population in Wales. This policy area is now solely the responsibility of the Welsh Government.

[11] The Northern Ireland boost has been co-funded by three funding partners: the Department of Health, Social Services and Public Safety (DHSSPS); the Food Safety Promotion Board (*safefood*) and FSA in NI. FSA in NI has responsibility for monitoring the diet of the population in Northern Ireland.

[12] The country boost in Wales covered both Year 5 and Year 6, whereas the country boost in Northern Ireland was for Year 6 only,

[13] Commentary regarding Years 1 and 2 (combined) and Years 3 and 4 (combined) descriptive statistics for UK dietary matters is provided in chapter 10 of the UK Years 1-4 (combined) report.

[14] Participants with dietary data for at least three days were included in the analyses. The majority of participants completed four days of the food and drink diary. Only 2% (n=46) completed three days.

[15] Number of diary days by day of week for UK sample Years 5 and 6 (combined):

	UK :Years 5 and 6 (combined)	
Day of the week	Number of diary days	% of total days
Monday	1,436	14.2
Tuesday	1,439	14.2
Wednesday	1,425	14.1
Thursday	1,434	14.1
Friday	1,472	14.5
Saturday	1,438	14.2
Sunday	1,494	14.7
Total	10,138	100.0

[16] Department of Health 5-A-Day programme http://www.nhs.uk/Livewell/5ADAY/Pages/5ADAYhome.aspx (accessed 02/08/16).

[17] In the Years 1 to 4 (combined) report, 5-A-Day portions were calculated including food groups that should have been excluded, as stated in appendix A of the report, ie the fruit component of biscuits, cakes and confectionery items and the fruit juice compoment of soft drinks. These food groups have now been excluded in this Years 5 and 6 (combined) report and therefore the values for Years 1 and 2 (combined) and Years 3 and 4 (combined) will be lower than those presented in the Years 1 to 4 (combined) report.

[18] Population average of no more than 11% food energy for all ages. The SACN Carbohydrates and Health report published in 2015 (https://www.gov.uk/government/publications/sacn-carbohydrates-and-health-report; accessed 02/08/16) recommended that the definition for “free sugars” be adopted in the UK and the population average intake of free sugars should not exceed 5% of total dietary energy for those aged 2 years and over. In the Years 7 and 8 (combined) report, descriptive statistics will be provided for free sugars (NMES will no longer be reported).

[19] Adult population average of at least 18g per day. The SACN Carbohydrates and Health report published in 2015 (https://www.gov.uk/government/publications/sacn-carbohydrates-and-health-report; accessed 02/08/16) included recommendations for fibre intake for those aged two years and over. The DRV for the average adult population intake of fibre is 30g per day defined using the AOAC method of analysis which equates to 23.1g per day NSP, an increase from the previous 18g per day recommendation. The fibre intake using the AOAC method will be presented in the NDNS RP Years 7 and 8 report (NSP will no longer be reported).

[20] The Department of Health has advised that people who eat a lot of red and processed meat a day (more than 90g cooked weight) cut down to 70g. http://www.nhs.uk/Livewell/Goodfood/Pages/meat.aspx (accessed 02/08/16).

[21] Scientific Advisory Committee on Nutrition. Advice on fish consumption: benefits and risks. London: TSO, 2004.

[22] 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.

[23] The RNI for a vitamin or mineral is the amount of the nutrient that is sufficient for 97.5% 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 more likely that some of the group will have an intake below their requirement.

[24] 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. An intake below the LRNI is only considered a problem if sustained over a period of time. As diet is recorded for only four days in the NDNS RP, estimated intake values may not represent intakes over the longer term for micronutrients that are not widely distributed in foods such as vitamin A. It should also be noted that DRVs for some micronutrients such as magnesium, potassium, selenium and zinc are based on very limited data so caution should be used when assessing adequacy of intake using the LRNI.

[25] Results for food consumption include vegetables, fruit, meat and fish after disaggregation (i.e. including the contribution from composite dishes, both homemade dishes and manufactured products, containing these ingredients but excluding other components of these dishes).

[26] Weekly equivalent oily fish consumption has been calculated using unrounded data rather than the rounded figures in table B and sex-combined averages have been calculated using unrounded sex-combined data in table B.

[27] The definition of NMES provided in the 1991 COMA report is “Sugars not contained within the cellular structure of a food except lactose in milk and milk products”.

[28] Non-starch polysaccharides are plant cell wall constituents and comprise all other polysaccharides in the diet. They are not digested or absorbed in the small intestine.

[29] For vitamin D, RNIs are only set for those aged up to four years and those aged 65 years and over. In July 2016 SACN published a new report on vitamin D and health which set an RNI for vitamin D in all age groups. https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report (accessed 02/08/16).

[30] Scientific Advisory Committee on Nutrition (SACN). Iron and Health [Online]. London: TSO, 2010. www.sacn.gov.uk/pdfs/sacn_iron_and_health_report_web.pdf (accessed 02/08/16).
Haemoglobin: 1.5-4y males <110g/L, 1.5-4y females <110g/L, 5-11y males <115g/L, 5-11y females <115g/L, 12-14y males <120g/L, 12-14y females <120g/L, 15y+ males <130g/L, 15y+ females (non-pregnant) <120g/L.
Ferritin: 1.5-4y males <12mg/L, 1.5-4y females <12mg/L, 5y+ males <15mg/L, 5y+ females <15mg/L.

[31] WHO. Conclusions of a WHO technical consultation on folate and vitamin B12 deficiencies. Food and Nutrition Bulletin. 2008; 29. S238–S244.

[32] Holotranscobalamin is a relatively recently established marker and thresholds indicating deficiency are under debate. 32pmol/L is suggested as a marker of biochemical holotranscobalamin deficiency, the concentration below which urinary methylmalonic acid is likely to be raised. Annals of Clinical Biochemistry. 2012. (49) 184-189.

[33] Ebba Nexo and Elke Hoffmann-Lücke. (2011). Holotranscobalamin, a marker of vitamin B12 status: analytical aspects and clinical utility. Am J Clin Nutr. 94(1): 359S–365S.

[34] Department of Health (1998) Nutrition and Bone Health with Particular Reference to Calcium and Vitamin D. Report on Health and Social Subjects no. 49. London: The Stationery office.

[35] Hill MH, Bradley A, Mustaq S, Williams EA, Powers HJ. Effects of methodological variation on assessment of riboflavin status using the erythrocyte glutathione reductase activation coefficient assay. British Journal of Nutrition, 2009; 102 (2): 273-8.

[36] The threshold for EGRAC is under review, therefore, in addition to using this threshold, changes in the riboflavin status of the UK population will also be monitored by reviewing the EGRAC values at the 75th and 90th percentiles in future years.

[37] The British Cardiac Society, British Hyperlipidaemia Association, British Hypertension Society, endorsed by the British Diabetic Association, have issued guidance published in the article 'Joint British recommendations on prevention of coronary heart disease in clinical practice'. Heart, 1998; 80: 1–29.

[38] Results for these analytes were presented in the Years 1 to 4 report and data for Years 5 and 6 will be included in the dataset on the UK Data Archive.

[39] World Health Organization (WHO), Assessment of iodine deficiency disorders and monitoring their elimination: http://whqlibdoc.who.int/publications/2007/9789241595827_eng.pdf (accessed 02/08/16).

[40] The population urinary iodine median have been determined from spot urine samples. The proportion of the population with insufficient iodine intake cannot be determined from these data.

[41] https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-results-from-years-1-to-4-combined-of-the-rolling-programme-for-2008-and-2009-to-2011-and-2012 (accessed 02/08/16).

[42] This includes additional recruitment in Wales (Years 5 and 6) and Northern Ireland (Year 6 only) to boost to 200 participants per year in order to achieve country-specific, representative dietary health data. In previous years, country-specific boosts were as follows: Wales (Year 2 to 4); Northern Ireland (Years 1 to 4) and Scotland (Years 1 to 4).

[43] 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.

[44] Non-response bias occurs if those who respond to the survey (or elements of the survey) differ from those who do not respond. Data was weighted to reduce such bias.