



Llywodraeth Cymru
Welsh Government

www.cymru.gov.uk



Asiantaeth
Safonau
Bwyd

food.gov.uk

Food
Standards
Agency

National Diet and Nutrition Survey Rolling Programme (NDNS RP) Results from Years 2-5 (combined) for Wales (2009/10-2012/13)

Executive Summary

A survey carried out on behalf of the Food Standards Agency in Wales,
Welsh Government and Public Health England

Edited by: Beverley Bates, Alison Lennox, Ann Prentice, Chris Bates, Polly Page,
Sonja Nicholson, and Gillian Swan

NatCen
Social Research that works for society

UCL

MRC | Human
Nutrition
Research

Contents

Executive summary	3
Introduction	3
Headline findings	4
Sample and response rates	5
Current UK diet and nutrition recommendations	5
Key findings	7
Methodological issues	20
Future reports	20

Executive summary

Erratum note: Correction to the fruit and vegetable consumption and salt intake data

This Executive Summary has been updated in 2017 since first publication (in December 2015) to take account of corrections to fruit and vegetable consumption estimates due to an error in the calculation and to salt intake values due to bias detected in the original analytical data. Further details are provided in chapters 5 and 7.

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) and is 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).² Recruitment in Wales was boosted to 200 participants per year for four years (2009/10 to 2012/13), in order to achieve representative data specific for Wales. The boost was funded by the Food Standards Agency (FSA) in Wales which previously shared policy responsibility for the diet and nutrition of the population in Wales with the Welsh Government. This policy area is now solely the responsibility of the Welsh Government.

This publication of the Wales NDNS RP Years 2 to 5 report forms part of a series of publications from the NDNS RP, the first of which was the UK combined report covering Years 1 to 4 (2008/9 to 2011/12), released as an Official Statistic by PHE in May 2014.³ This was followed by the Scotland and Northern Ireland reports for the equivalent time period, released as Official Statistics by FSA in Scotland in September 2014⁴ and FSA in Northern Ireland in February 2015⁵ respectively. The combined results from Years 2 to 5 is the first time that representative data for Wales from the NDNS RP has been available. The data will inform nutritional surveillance in Wales; assist in evaluating existing policies; and set future, evidence-based policy direction.

The NDNS RP provides high quality data on the types and quantities of foods consumed by individuals, from which estimates of average nutrient intakes for the population can be derived.⁶ The main report presents combined results from Years 2 to 5 combined of the NDNS RP for the Wales sample, designed to be nationally representative. It follows the same general format as the UK Years 1 to 4 combined report³ including types and quantities of foods consumed, and compares intakes of key foods and nutrients in Wales (Years 2 to 5 combined) with the UK as a whole (Years 1 to 4 combined) and by equivalised household income and deprivation indices. The report also includes findings from blood indices of nutritional status and information on

Body Mass Index (BMI), blood pressure, blood cholesterol levels and the socio-demographic characteristics of the participants. Salt intakes for adults and children in Wales are also presented (these results were excluded from the original report due to the identification of analytical bias in the sodium concentrations which has now been corrected).

This executive summary provides background information on the survey, including sampling and methodology, and presents some of the key findings from the Wales Years 2 to 5 combined report on food consumption, nutrient intake and nutritional status.

Headline findings

- Seventy-eight percent of adults aged 19 to 64 years, 77% of adults aged 65 years and over and 94% of children aged 11 to 18 years in Wales did not meet the “5-A-Day” recommendation for fruit and vegetables. Women aged 19 to 64 years and adults aged 65 years and over in Wales consumed significantly fewer portions of fruit and vegetables than the same age groups in the UK as a whole.
- Mean intakes of non-starch polysaccharide (NSP) were below the recommended level of 18g per day for adults in Wales and were similar to mean intakes in the UK as a whole.
- Mean consumption of oil-rich fish was well below the recommended one portion per week.
- Mean intakes of saturated fat exceeded recommendations in all age groups.
- Mean intakes of non-milk extrinsic sugars (NMES) exceeded recommendations in all age groups except those aged 65 years and over.
- Mean intakes of NMES for the 4 to 10 years and 65 years and over age groups were significantly lower than mean intakes in the UK as a whole.
- As for the UK as a whole, there was evidence of low intakes for some vitamins and minerals, particularly in the 11 to 18 years age group. Mean intakes of calcium, iron, vitamin C and folate were significantly lower in Wales than in the UK as a whole for some age/sex groups.
- The proportion of adults aged 19 to 64 years in Wales who had low blood vitamin D status was 17.7%, a lower proportion than in the UK as a whole (22.8%).
- Adults aged 19 to 64 years in the lowest income tertiles had significantly lower intakes of NSP, fruit and vegetables, and some of the micronutrients and higher intakes of NMES compared to those in the highest income tertiles. Analysis by multiple deprivation index showed a similar pattern but not all the differences reached statistical significance.

Sample and response rates

A random sample of 2,603 addresses from 97 postcode sectors, drawn from the Postcode Address File, was issued in Wales between April 2009 and March 2013. 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.⁷ 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 (stage one). Participants who agreed to a nurse visit (stage two) were asked to provide a blood sample to assess biochemical indices of nutritional status and those who were aged four years and older were asked to provide a 24-hour urine collection to assess salt intake. Physical measurements were also collected.

Table 1.1 Response rates achieved in Wales for Years 2 to 5 combined

Individual response	N	%
Completion of food and drink diary (3 or 4 days) ^a	852 (461 adults, 391 children)	60%
Of those completing a food and drink diary:		
Blood sample obtained ^b	339 (228 adults, 111 children)	49% of adults, 28% of children
24-hour urine collection obtained ^b	461 (276 adults, 185 children)	60% of adults, 57% of children

^a The majority of participants completed four days of the food and drink diary. Only 3% completed three days.

^b All individuals visited by a nurse were asked if they were willing to provide a blood sample and, if aged four years and older (and fully out of nappies), they were asked if they were willing to provide a 24-hour urine collection.

The data were 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.⁸ Details of the sampling and methods of analyses can be found in chapter 2 and appendix B of the main report.

Current UK diet and nutrition recommendations

The NDNS RP Wales findings 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 1.2.

Table 1.2 UK recommendations for consumption of fruit and vegetables, red and processed meat and oily fish

Food	Recommendation
Fruit and vegetables	At least 5 portions per day for those aged 11 years and over ⁹
Red and processed meat ^a	Should not exceed 70g per day for adults ¹⁰
Oily fish ^b	At least 1 portion per week for all ages (140g) ¹¹

^a Red and processed meat referred to in the main report as 'total red 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) for key macronutrients are shown in table 1.3. They indicate the average or the maximum contribution that these nutrients should make to the population average intakes. In addition, biochemical measures of blood lipids are compared with clinical thresholds to provide an indication of the proportion of the population at increased risk of vascular disease.

Table 1.3 UK Dietary Reference Values (DRVs) for key macronutrients

Macronutrient	Dietary Reference Value ¹²
Total fat	Population average no more than 35% of food energy for those aged 5 years and over
Saturated fatty acids	Population average no more than 11% food energy for those aged 5 years and over
<i>Trans</i> fatty acids	Population average no more than 2% food energy for all ages
Non-milk extrinsic sugars (NMES)	Population average no more than 11% food energy for all ages
Non-starch polysaccharides (NSP)	Adult population average at least 18g per day

Population adequacy of micronutrient intake is assessed by comparing intake with the age and sex specific UK DRV for each vitamin and mineral.¹² In addition, 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.

Key findings

Erratum note: correction to fruit and vegetable consumption data

Consumption figures in this section have been corrected for an error in the estimation of fruit, vegetables and fruit juice and the calculation of “5-a-day” portions. Fruit and vegetable components of some food groups (soft drinks, confectionery, biscuits, cakes, sugar, preserves and sweet spreads, savoury snacks and ice cream) were included in the estimates when they should have been excluded. This has now been corrected and the corrected values are slightly lower than the original published values. Further details are provided in chapter 5.

Food consumption¹³ and nutrient intakes (Chapter 5)

Table 1.4 provides a summary of the consumption of selected foods for adults and children in Wales. Six per cent of boys and girls aged 11 to 18 years met the “5-A-Day” recommendation.⁹ Twenty-two per cent of adults aged 19 to 64 years and 23% of adults aged 65 years and over met the recommendation. Mean consumption of oily fish in all age groups was well below the recommended one portion (140g) per week.¹¹ Mean consumption of red and processed meat for adults aged 19 to 64 years and 65 years and over met the recommendation that, for adults, average intakes should not exceed 70g per day.¹⁰ However mean consumption of red and processed meat for men aged 19 to 64 years (82g per day) exceeded the recommendation that, for adults, average intakes should not exceed 70g per day.¹⁰

Table 1.4 Average daily intake of selected foods, for NDNS RP Wales Years 2-5 combined

Food	NDNS age group (years)				
	1.5-3	4-10	11-18	19-64	65+
“5-A-Day” portions (portions/day) ^a	-	-	2.7	3.7	3.6
Fruit g/day ^b	115	97	58	92	105
Vegetables g/day ^c	77	83	117	162	150
Oily fish g/day ^d	2	1	2	7	10
Red and processed meat g/day ^e	31	44	64	66	65
Bases (unweighted)	67	149	175	328	133

^a To calculate “5-A-Day” portions of fruit and vegetables see chapter 5 and appendix A. Children under 11 years have not been included as the 80g portion is only appropriate for older children and adults.

^b Average daily consumption (mean in grams) of fruit including contribution from composite dishes, also includes fruit from smoothies, but excludes fruit juice.

^c Average daily consumption (mean in grams) of vegetables (not including potatoes) including contribution from composite dishes.

^d Oily fish includes anchovies, carp, trout, mackerel, herring, jack fish, pilchards, salmon (including canned), sardines, sprats, swordfish, tuna (fresh only) and whitebait.

^e Red and processed meat referred to in the main report as ‘total red meat’ includes beef, lamb, pork, sausages, burgers and kebabs, offal, processed red meat and other red meat.

Table 1.5 provides a summary of the reported total energy intake for adults and children in Wales. Mean energy intakes were below the Estimated Average Requirement (EAR)¹⁴ for adults and children aged 11 years and over. However it should be borne in mind that the UK doubly labelled water (DLW) sub-study showed evidence of under-reporting of energy intakes in these age groups; see appendix X of the main UK report for more details. ‘Cereals and cereal products’ was the largest contributor to energy intake in all age groups. ‘Meat and meat products’ and ‘milk and milk products’ were the other major contributors with ‘milk and milk products’ making a larger contribution in younger children.

Table 1.5 Average daily total energy intake for NDNS RP Wales Years 2-5 combined							
Total energy	NDNS age groups (years)						
	1.5-3	4-10	11-18	19-64		65+	
	sex-combined	sex-combined	sex-combined	Men	Women	Men	Women
MJ	4.84	6.30	7.28	8.47	6.52	7.59	6.12
kcal	1146	1494	1730	2015	1550	1807	1455
<i>Bases (unweighted)</i>	67	149	175	130	198	54	79

Table 1.6 provides a summary of the intakes of selected macronutrients for adults and children in Wales.

- Mean intake of total fat met the DRV (no more than 35% food energy) in all age/sex groups except for men aged 65 years and over (36.8%). Mean intake of saturated fatty acids exceeded the DRV (no more than 11% food energy) in all age/sex groups, whilst mean intake of trans fatty acids met the DRV (no more than 2% food energy) in all age/sex groups. ‘Milk and milk products’, ‘cereals and cereal products’ and ‘meat and meat products’ were the main contributors to intake of total fat, saturated and trans fatty acids; ‘milk and milk products’ made a larger contribution for younger children.

- Mean NMES intake exceeded the DRV (no more than 11% food energy) for all age/sex groups except men and women aged 65 years and over. For children, the overall main source of NMES was 'non-alcoholic beverages' (soft drinks and fruit juice). Of these, 'soft' drinks contributed 29% to NMES intake for children aged 11 to 18 years and 13-14% for children aged 10 years and under, while 'fruit juice' contributed 10-13% in children across the age groups. 'Cereals and cereal products' (mainly 'buns, cakes, pastries and fruit pies', biscuits and breakfast cereals) and 'sugar, preserves and confectionery' were the other major contributors in children. For adults aged 19 to 64 years, 'sugar, preserves and confectionery' (including table sugar), 'non-alcoholic beverages' (soft drinks and 'fruit juice') and 'cereals and cereal products' (mainly 'buns, cakes, pastries and fruit pies' and biscuits) made similar contributions to intake (27%, 23% and 20% respectively). For adults aged 65 years and over, 'cereals and cereal products' was the largest contributor (34%), half of which was from 'buns, cakes, pastries and fruit pies'. 'Sugar, preserves and confectionery' was also a major contributor in this age group providing 26%, mainly from table sugar, preserves and spreads.
- Mean intake of non-starch polysaccharides (NSP) for adults aged 19 to 64 years and 65 years and over was below the DRV set for adults of at least 18g per day. 'Cereals and cereal products' and 'vegetables and potatoes' were the main sources of NSP.

Table 1.6 Average daily intake of selected macronutrients, for NDNS RP Wales Years 2-5 combined

Macronutrient	NDNS age group (years)				
	1.5-3	4-10	11-18	19-64	65+
Total fat % food energy	33.6	33.4	33.6	33.6	35.2
Saturated fatty acids % food energy	14.5	13.0	12.2	12.5	13.9
<i>Trans</i> fatty acids % food energy	0.6	0.5	0.5	0.6	0.7
NMES % food energy	11.7	13.3	15.1	11.8	10.3
NSP g	8.8	10.8	12.1	13.5	13.2
<i>Bases (unweighted)</i>	67	149	175	328	133

- For adults, 58% of men and 45% of women aged 19 to 64 years and 48% of those aged 65 years and over reported consuming alcohol over the four-day diary recording period. For adult consumers, alcohol provided on average 9.3% of energy intake for men aged 19 to 64 years and 9.7% of energy intake for women aged 19 to 64 years and 5.4% of energy intake for those aged 65 years and over.

Table 1.7 provides a summary of the intakes of selected micronutrients for adults and children in Wales. Mean intake is compared with the Reference Nutrient Intake (RNI)¹⁵ and an estimate is made of the proportion with intake below the Lower Reference Nutrient Intake (LRNI).¹⁶

- Mean daily intakes of most vitamins from food sources were close to or above the RNI for all age/sex groups. For girls aged 11 to 18 years, 15% and 16% had intakes below the LRNI for vitamin A and riboflavin respectively. Twelve per cent of women aged 19 to 64 years had intakes of riboflavin from food sources below the LRNI.
- For vitamin D, RNIs are set only for those aged up to four years and those aged 65 years and over and there are no LRNIs. Mean intakes from food sources were well below the RNI in both these age groups: 27% of the RNI for children aged 1.5 to 3 years and 32% of the RNI for adults aged 65 years and over.¹⁷
- Mean intakes of most minerals from food sources were below the RNI for some age/sex groups, in particular children aged 11 to 18 years. Mean intakes of all minerals were close to or above the RNI for children aged under 11 years and few children in this age group had intakes below the LRNI. For children aged 11 to 18 years substantial proportions had intakes of minerals (from food sources only) below the LRNI, including 33% and 32% of boys for selenium and magnesium (respectively) and 45% and 54% of girls for selenium and magnesium (respectively). For adults aged 19 to 64 years substantial proportions also had intakes of minerals (from food sources only) below the LRNI, including 27% and 16% of men and 54% and 15% of women for selenium and magnesium (respectively). Iron intakes below the LRNI were found in 25% of women aged 19 to 64 years and 38% of girls aged 11 to 18 years. For adults aged 65 years and over, 37% of men and 49% of women had intakes of selenium from food sources below the LRNI and 29% of men and 18% of women had intakes of magnesium from food sources below the LRNI. It should be noted that the DRVs for some micronutrients such as magnesium, selenium and zinc are based on limited data so caution should be used when assessing adequacy of intake using the LRNI.
- Twenty per cent of adults aged 19 to 64 years (19% of men, 21% of women) and 39% of adults aged 65 years and over (29% of men, 47% of women) reported taking at least one dietary supplement during the four-day diary recording period. Adults aged 19 to 64 years who took supplements generally had higher intakes of vitamins and minerals from food than did non-supplement takers. This pattern was less clear in the 65 years and over age group.

Table 1.7 Mean daily intake as a percentage of the Reference Nutrient Intake (RNI) from food sources only and proportion of participants with average daily intakes below the Lower Reference Nutrient Intake (LRNI) for selected micronutrients, for NDNS RP Wales Years 2-5 combined

Micronutrients ^a	NDNS age groups (years)									
	Boys		Total	Men		Girls		Total	Women	
	4-10	11-18	boys	19-64	65+	4-10	11-18	girls	19-64	65+
Vitamin A										
Mean % RNI	153	91	118	129	133	108	115	112	150	145
% with intake below the LRNI	3	14	9	9	6	5	15	11	7	3
Riboflavin										
Mean % RNI	182	122	148	134	120	151	108	127	132	140
% with intake below the LRNI	1	5	3	7	5	2	16	10	12	9
Folate										
Mean % RNI	162	112	134	132	130	137	95	113	113	106
% with intake below the LRNI	0	1	1	1	2	0	4	2	5	2
Iron										
Mean % RNI	121	89	103	128	122	101	60	78	79	102
% with intake below the LRNI	0	5	3	7	1	4	38	23	25	6
<i>Bases (unweighted)</i>	83	81	164	130	54	66	94	160	198	79

^a The % of RNI for vitamin D has not been included in this table as RNI's for vitamin D have only been set for those aged 1.5-3 years and 65 years and over.

Table 1.7 (continued) Mean daily intake as a percentage of the Reference Nutrient Intake (RNI) from food sources only and proportion of participants with average daily intakes below the Lower Reference Nutrient Intake (LRNI) for selected micronutrients, for NDNS RP Wales Years 2-5 combined

Micronutrients ^a	NDNS age groups (years)									
	Boys		Total	Men		Girls		Total	Women	
	4-10	11-18	boys	19-64	65+	4-10	11-18	girls	19-64	65+
Calcium										
Mean % RNI	174	83	123	125	116	152	78	110	105	114
% with intake below the LRNI	0	8	4	3	2	2	16	10	7	8
Magnesium										
Mean % RNI	126	74	97	90	81	112	64	85	82	80
% with intake below the LRNI	0	32	18	16	29	1	54	31	15	18
Potassium										
Mean % RNI	152	75	109	83	77	135	62	94	73	73
% with intake below the LRNI	0	17	10	13	19	0	39	22	24	32
Selenium										
Mean % RNI	131	71	97	70	60	122	71	93	68	67
% with intake below the LRNI	0	33	18	27	37	3	45	27	54	49
Zinc										
Mean % RNI	94	81	87	95	88	85	83	84	103	104
% with intake below the LRNI	2	18	11	11	13	10	21	16	8	5
<i>Bases (unweighted)</i>	83	81	164	130	54	66	94	160	198	79

^a The % of RNI for vitamin D has not been included in this table as RNI's for vitamin D have only been set for those aged 1.5-3 years and 65 years and over.

Detailed age breakdown for young people and adults (Chapter 8)

Results for key foods and nutrients are presented for four age groups, subdivided by sex: 11 to 15 years, 16 to 24 years, 25 to 49 years and 50 to 64 years. These age groups differ from the age/sex groups used elsewhere in the report and are referred to as “age subgroups”. Due to small numbers in some of the age/sex subgroups in the Wales sample (males aged 11 to 15 years, 16 to 24 years and 50 to 64 years and females aged 16 to 24 years), caution should be exercised when interpreting findings for these age/sex subgroups.

- Mean daily intake of saturated fatty acids as a percentage of food energy exceeded the DRV for all age subgroups.
- Mean intake of NMES as a percentage of food energy exceeded the DRV in all age subgroups, except females aged 25 to 49 years and adults aged 50 to 64 years.
- Females aged 11 to 15 years had mean intakes below the RNI¹⁵ for iron and calcium, as did females aged 16 to 24 years. Females aged 25 to 49 years had mean intake below the RNI¹⁵ for iron only.
- The number of portions of fruit and vegetables consumed per day and the proportion of participants in Wales meeting the “5-A-Day” recommendation⁹ was higher in those aged 25 to 64 years than in those aged 11 to 24 years. The proportion achieving “5-A-Day” was similar or lower in Wales compared with the UK as a whole for all sex-combined age subgroups.

Intake by equivalised income or by Wales Index of Multiple Deprivation (Chapter 9)

Households were grouped into tertiles, ranked by equivalised income¹⁸ and separately by the Wales Index of Multiple Deprivation (WIMD).¹⁹ Statistical comparisons were undertaken for intakes of key foods and nutrients by tertiles of equivalised income or WIMD for adults aged 19 to 64 years. Tertile 3 (the highest income or lowest deprivation) was used as the reference category. Numbers in the 4 to 10 years and 11 to 18 years age groups were too small to allow statistical comparisons between tertiles and data has not been presented for the 65 years and over age group.

- There were some observed differences in food consumption, energy and nutrient intakes by equivalised household income tertiles and WIMD tertiles. Differences tended to be clearest between the lowest and highest tertiles and analysis by equivalised income and WIMD generally showed consistent results. However, differences between tertiles were not consistently seen for all age groups.

- Overall there were few clear differences in energy or macronutrient intake by equivalised household income or WIMD for adults aged 19 to 64 years. Mean protein intake (as a percentage of food energy) and mean NSP intake were significantly lower in the lowest income tertile compared with the highest while mean NMES intake (as a percentage of food energy) showed the opposite trend, significantly higher in the lowest income tertile compared with the highest tertile. Analysis by WIMD showed the same difference for NSP but the difference for NMES did not reach statistical significance and there was no pattern for protein.
- Mean intake of micronutrients tended to be lower in the equivalised income tertiles 1 and 2 compared with the highest income tertile (tertile 3) for adults aged 19 to 64 years. However the pattern was less clear when split by WIMD tertiles. Where mean intakes fell below recommendations this was generally the case for all tertiles.

Mean fruit and vegetable consumption expressed in grams and as “5-A-Day” portions showed clear differences between lowest and highest tertile when split by income and by WIMD. However, mean consumption in all tertiles was below the recommendation of “5-A-Day”. No clear pattern for total meat or red meat²⁰ was observed. Mean oily fish consumption was below the recommended one portion per week²¹ in all tertiles.

24-hour urine analyses: Sodium excretion and estimated Salt intake (Chapter 7)²²

Erratum note: The results in this section were excluded from the original report published in December 2015. The results published here have been corrected to take account of analytical bias in sodium concentrations and are in line with data republished in the UK year 1-4 report in February 2017 and the urinary sodium surveys of adults in England and Scotland (2014)^{23,24} and Northern Ireland (2015).²⁵

Salt intake has been estimated from urinary sodium excretion. Table 1.8 presents the recommended maximum salt intake per day for adults, which was set by COMA²⁶ and endorsed by the Scientific Advisory Committee on Nutrition (SACN) in its report on Salt and Health (2003) and the recommended maximum intakes set by SACN (2003) for children.²⁷

In Wales, mean estimated salt intake for those aged 11 years and over, was higher than the maximum recommended intake.

Mean estimated salt intake was 7.8g/day for children aged 11 to 18 years, this was 29% greater than the SACN recommendation of a population average of no more than 6g/day. Mean estimated salt intake was 8.4g/day for adults aged 19 to 64 years, this was 41% greater than the SACN recommendation of a population average of no more than 6g/day; 9.7g/day for men aged 19 to 64 years and 7.3g/day for women aged 19 to 64 years. Mean estimated salt intake was 7.1g/day for adults aged 65 years and over, this was 18% greater than the SACN recommendation of a population average of no more than 6g/day.

Table 1.8 Average estimated salt intake (g/day), for NDNS RP Wales Years 2-5 combined compared with NDNS RP UK Years 1-4 combined, by age^a			
NDNS age/sex group^b	Recommended maximum salt intake (g/day)^{26,27,c,d}	Wales Years 2-5 combined^e (g/day)	UK Years 1-4 combined^{e,f} and England 2011 survey^{e,g} (g/day)
11 to 18 years	6	[7.8] (n=44)	7.0 ⁱ (n=377)
19 to 64 years	6	8.4 (n=123)	8.5 ^g (n=547)
19 to 64 years males	6	9.7 (n=56)	9.8 ^g (n=250)
19 to 64 years females	6	7.3 (n=67)	7.2 ^g (n=297)
65 years and over	6	[7.1] (n=41)	7.6 ⁱ (n=270)

^a complete by standard criteria only.

^b Results are not presented for children aged 4 to 6 years as base numbers are below 30.

^c 1g salt contains 17.1mmol sodium.

^d These are the maximum daily dietary targets.

^e Counts are provided in brackets.

^f The UK report for years 1 to 4 of the NDNS RP³ reported urinary sodium results from participants aged 4 to 18 years and 65 years and over only.

^g The most recent published data for adults in England comes from a 24-hour urinary sodium survey carried out in 2011.²⁸

Biochemical indices of nutritional status (Chapter 6)

This section reports on the results of blood samples taken from participants in Wales, which provide an assessment of the availability of nutrients to the body (after absorption) for use in metabolic processes.

- There is evidence of anaemia (as indicated by low haemoglobin levels) or low iron stores (plasma ferritin) in all age/sex groups in the population, with a higher proportion in females. The proportion of participants who had both haemoglobin and plasma ferritin concentrations below the thresholds which indicate iron deficiency was 3.0% of those aged 11 to 18 years, 3.9% of women aged 19 to 64 years and 4.3% of adults aged 65 years and over.
- There is evidence of low vitamin D status (vitamin D concentration below the threshold of 25nmol/L) at the time of venepuncture in all reported age/sex groups. For children aged 11 to 18 years 23.0% had a vitamin D concentration below the threshold of 25nmol/L. For adults, 19.8% of men and 15.8% of women aged 19 to 64 years and 16.5% of adults aged 65 years and over had a vitamin D concentration below the threshold of 25nmol/L; this has implications for bone health (increasing the risk of rickets and osteomalacia).
- A substantial proportion of participants in all reported age/sex groups had riboflavin status values based on raised erythrocyte glutathione reductase activation coefficient (EGRAC) indicating biochemical depletion. In Wales the proportion ranged from 51.2% for those aged 65 years and over and 59.9% for men aged 19 to 64 years up to 88.2% for children aged 11 to 18 years. However, there is uncertainty about the functional consequences of a raised EGRAC and it has been recommended that the EGRAC threshold should be raised to a level above 1.30 to better reflect riboflavin inadequacy; this requires further consideration.²⁹ Therefore, in addition to using this threshold, changes in the riboflavin status of the UK population (including those in Wales) will also be monitored by reviewing the EGRAC values at the 75th and 90th percentiles in successive years.
- There is little evidence of low status for other micronutrients where normal ranges or thresholds for low status have been set, e.g. vitamin C, thiamin as indicated by erythrocyte transketolase activation coefficient (ETKAC), retinol and vitamin E.
- The proportion of adults aged 19 to 64 years and aged 65 years and over who had a serum total cholesterol concentration between 5.2 and 6.4mmol/L, indicating a marginally increased risk of cardiovascular disease was 34.4% and 27.6% respectively. A further 12.1% and 17.2% of adults aged 19 to 64 years and 65 years and over respectively had serum cholesterol in the range 6.5 to 7.8mmol/L indicating a moderately elevated cardiovascular risk. Another 1.2% of adults aged

19 to 64 years had a serum total cholesterol concentration greater than 7.8mmol/L, indicating severe risk, whilst there were no such cases for those aged 65 years and over.

- The UK, Scotland, Northern Ireland and Wales results for blood folate status were originally published in March 2015, but the thresholds published by the WHO which were used in that report were set using blood folate data based on different laboratory assays from those used to analyse NDNS samples. Measurements of blood folate are specific to the assay method and the laboratory used; therefore thresholds need to be appropriate to the assay method or to have been adjusted for the assay method used. Consequently, the report on folate status in the UK, Scotland and Northern Ireland as determined in Years 1 to 4 and in Wales in Years 2 to 5 of the NDNS RP will be republished in 2017.

Differences between Wales Years 2 to 5 combined and the UK Years 1 to 4 combined for intakes of key foods and nutrients (Chapter 10)

Erratum note: correction to fruit and vegetable consumption data

Consumption figures in this section have been corrected for an error in the estimation of fruit, vegetables and fruit juice and the calculation of “5-A-Day” portions. Fruit and vegetable components of some food groups (soft drinks, confectionery, biscuits, cakes, sugar, preserves and sweet spreads, savoury snacks and ice cream) were included in the estimates when they should have been excluded. This has now been corrected and the corrected values are slightly lower than the original published values. Further details are provided in chapter 5.

Statistical comparisons were undertaken for intakes of key foods and nutrients between the Wales sample of the NDNS RP Years 2 to 5 combined and the whole of the UK sample of the NDNS RP Years 1 to 4 combined.³⁰ Results are presented by standard age groups; 1.5 to 3 years, 4 to 10 years, 11 to 18 years, 19 to 64 years and 65 years and over and are also subdivided by sex (except for children aged 1.5 to 3 years and adults aged 65 years and over, where numbers are insufficient to subdivide by sex).

- Overall there were few differences between Wales and the UK as a whole for mean intakes of energy and macronutrients.
- Mean daily total energy intake was significantly lower in girls aged 4 to 10 years in Wales compared with the UK as a whole (1404 kcal compared with 1489 kcal) and for adults aged 19 to 64 years (1780 kcal compared with 1861 kcal).

- In women aged 19 to 64 years mean intake of total fat as a percentage of food energy was significantly lower in Wales compared with the UK as a whole.
- For all age groups, with the exception of children aged 1.5 to 3 years, mean intakes of *trans* fatty acids were significantly lower in Wales compared with the UK as a whole. In both Wales and the UK as a whole mean intakes met the recommendation of remaining below 2% of food energy. This apparent difference in intake between Wales and the UK is mainly due to lower *trans* fatty acid composition values for many processed foods in the dataset from Year 3 onwards.³¹
- Mean intake of non-milk extrinsic sugars (NMES) tended to be slightly lower in most age/sex groups in Wales compared with the same groups in the UK as a whole although the differences were not significant in all age/sex groups. Mean NMES intake as a percentage of food energy was significantly lower in Wales than in the UK as a whole for children aged 4 to 10 years (13.3% and 14.7% respectively) and adults aged 65 years and over (10.3% and 11.5% respectively).
- Mean intakes of NSP were similar in Wales and the UK as a whole.
- Mean alcohol intake expressed as a percentage of total energy for female consumers aged 19 to 64 years was significantly higher in Wales (9.7%) compared with the UK as a whole (7.8%).
- Mean iron intake in Wales generally showed a similar pattern to the UK as a whole across the age groups (except for girls aged 4 to 10 years in Wales who had a lower mean intake than in the UK as a whole).
- Mean calcium intake was significantly lower in girls aged 11 to 18 years in Wales (622mg) compared with the UK as a whole (670mg) and fell below the RNI in both Wales and the UK as a whole. For girls aged 11 to 18 years, 16% in Wales and 19% in the UK as a whole had intakes below the LRNI, however this difference did not reach significance.
- Women aged 19 to 64 years in Wales had a significantly lower mean consumption of portions of fruit and vegetables compared with the same group in the UK as a whole (3.6 and 4.0 respectively). Adults aged 65 years and over in Wales also had a significantly lower mean consumption of portions of fruit and vegetables compared with the same age group in the UK as a whole (3.6 portions and 4.5 portions respectively). The percentage achieving “5-A-Day” was significantly lower in Wales compared with the UK as a whole for women aged 19 to 64 years (21%

compared with 28%) and adults aged 65 years and over (23% compared with 36%).

- No clear pattern was observed in either direction in any of the age/sex groups for mean consumption of red meat. Mean oily fish consumption was similar in Wales and the UK as a whole across all age/sex groups, with the exception of women aged 19 to 64 years where mean oily fish intake was significantly lower in Wales (35g per week) compared with the UK as a whole (54g per week).²¹

Differences between Wales (Years 2 to 5 combined) and the UK as a whole (Years 1 to 4 combined) for blood analytes^{32,33}

No statistical comparisons were undertaken for blood analytes between the Wales sample of the NDNS RP Years 2 to 5 combined and the whole of the UK sample of the NDNS RP Years 1 to 4 combined. Therefore this section includes observed differences only.³⁰

- For men aged 19 to 64 years, mean vitamin C concentration was lower in Wales (37.7 μ mol/L) than in the UK as a whole (48.9 μ mol/L).
- In Wales, there was a higher proportion of women aged 19 to 64 years (15.7%) and adults aged 65 years and over (17.2%) with a serum total cholesterol between 6.5 and 7.8mmol/L (a level associated with moderate risk) than in the UK as a whole (11.5% for women aged 19 to 64 years and 13.2% for adults aged 65 years and over in the UK as a whole).
- In all adult age/sex groups, a lower proportion of participants in Wales than in the UK as a whole had a 25-OHD concentration below 25nmol/L (the current threshold indicating vitamin D adequacy) at the time of venepuncture. Results are summarised in table 1.9.

Table 1.9 The percentage of NDNS RP Wales (Years 2 to 5 combined) and NDNS RP UK (Years 1 to 4 combined) participants with 25-OHD concentration below 25nmol/L at the time of venepuncture^a

	% of respective dataset with 25-OHD concentration <25nmol/litre ^a			
	<i>Cell size for each age group is shown in brackets</i>			
	11-18y (sex-combined)	19-64y men	19-64y women	65y (sex-combined)
Wales (Years 2-5 combined)	23.0% (53)	19.8% (62)	15.8% (105)	16.5% (50)
UK as a whole (Years 1-4 combined)	22.0% (523)	24.0% (551)	21.7% (770)	21.0% (338)

^a It should be noted that no statistical analysis of the differences has been performed.

Methodological issues

An overview of the purpose, documents, methodologies, procedures for data collection and quality control are provided in the main report along with supporting technical appendices. These include a consideration of the methodological issues and limitations which include self-reported measures of food intake, time between diet and nutritional status assessment and days of the week in the food diary. This should be borne in mind while interpreting these findings (see chapter 5 and appendix X of the main report for more detail).

Future reports

A Years 5 and 6 report with key foods, nutrients and indices of nutritional status for the UK as a whole was published in September 2016.

The UK, Scotland, Northern Ireland and Wales results for blood folate status were originally published in March 2015, but the thresholds published by the WHO which were used in that report were set using blood folate data based on different laboratory assays from those used to analyse NDNS samples. Measurements of blood folate are specific to the assay method and the laboratory used; therefore thresholds need to be appropriate to the assay method or to have been adjusted for the assay method used. Consequently, the report on folate status in the UK, Scotland and Northern Ireland as determined in Years 1 to 4 and in Wales in Years 2 to 5 of the NDNS RP will be republished in 2017.

Additional recruitment has taken place in Wales since 2013/14 and is planned to be completed by 2016/17, allowing an analysis of changes over time in diet and nutrition in Wales.

¹ Responsibility for nutrition policy in England and Wales transferred from the Food Standards Agency (FSA) to Health Departments in 2010. Management of NDNS also transferred to the Department of Health in England at that time. From 1 April 2013, responsibility for the survey transferred to the Department of Health's Executive Agency, Public Health England (PHE).

² From Year 6 onwards, the consortium comprises NatCen and HNR.

³ National Diet and Nutrition Survey: results from Years 1 to 4 (combined) of the rolling programme for 2008 and 2009 to 2011 and 2012 <https://www.gov.uk/government/publications/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 21/05/15).

⁴ National Diet and Nutrition Survey Rolling Programme (NDNS RP): results from Years 1- 4 (combined) for Scotland (2008/09-2011/12) <http://www.food.gov.uk/sites/default/files/ndns-scotland-full-report.pdf> (accessed 21/05/15).

⁵ National Diet and Nutrition Survey Rolling Programme (NDNS RP): results from Years 1- 4 (combined) for Northern Ireland (2008/09-2011/12) <http://www.food.gov.uk/sites/default/files/ndns-ni-full-report.pdf> (accessed 21/05/15).

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 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.

⁸ 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.

⁹ Department of Health 5 A DAY programme [online] <http://www.nhs.uk/Livewell/5ADAY/Pages/5ADAYhome.aspx> (accessed 21/05/15).

¹⁰ Scientific Advisory Committee on Nutrition. Iron and Health. London: TSO, 2010. This recommendation applies to adults only. The recommendation is that adults with relatively high intakes of red and processed meat (of 90g or more per day) should consider reducing their intakes.

¹¹ Scientific Advisory Committee on Nutrition. Advice on fish consumption: benefits and risks. London: TSO, 2004.

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 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).

¹⁴ Scientific Advisory Committee on Nutrition. Dietary Reference Values for Energy: [Online]. Available http://www.sacn.gov.uk/pdfs/sacn_dietary_reference_values_for_energy.pdf (2011) (accessed 21/06/15).

¹⁵ 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.

¹⁶ 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.

¹⁷ For vitamin D, RNIs are only set for those aged up to four years and those aged 65 years and over.

¹⁸ Equivalisation is a standard methodology that adjusts household income to account for different demands on resources, by considering the household size and composition.

¹⁹ The Welsh Index of Multiple Deprivation (WIMD) is the official measure of relative deprivation for small areas in Wales. It is designed to identify those small areas where there are the highest concentrations of several different types of deprivation. The WIMD comprises seven domains of deprivation, each developed to measure a distinct form or type of deprivation; income, employment, health, education, proximity to services, living environment and crime. Although the term deprivation is often synonymous with monetary poverty it is important to note that only the Income Deprivation Domain is intended to measure poverty in this sense. The remaining six domains focus on other types of deprivation, such as the lack of adequate education or poor health. The domains can be interpreted individually or combined to assess deprivation in more than one domain <http://wales.gov.uk/statistics-and-research/welsh-index-multiple-deprivation/?lang=en>.

²⁰ Total red meat (also referred to in this executive summary as 'Red and processed meat') includes beef, lamb, pork, sausages, burgers and kebabs, offal, processed red meat and other red meat.

²¹ Weekly equivalent oily fish consumption has been calculated using unrounded data rather than the rounded figures in tables 9.6a-c, 9.12a-c and 10.6a-c.

²² Dietary salt intake can only be accurately assessed by measuring sodium excretion in urine. The predominant source of sodium in the diet is "common salt" (sodium chloride). It is not possible to obtain accurate estimates of dietary intake of sodium from food intake information, mainly because of the difficulty with accurately assessing the amount of salt added to food in cooking or at the table. Estimates of sodium intake can be obtained by measuring urinary sodium excretion, assuming the body is in balance for sodium.

²³ National Diet and Nutrition Survey (NDNS): Assessment of dietary sodium for adults (19 to 64 years) in England, 2014 report; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/509399/Sodium_study_2014_England_Text_final.pdf Published 2016 (accessed 27/06/16).

²⁴ National Diet and Nutrition Survey (NDNS): Assessment of dietary sodium for adults (19 to 64 years) in Scotland, 2014 report; http://www.foodstandards.gov.scot/sites/default/files/Monitoring%20the%20Scottish%20Diet-%20Sodium%20Survey%202014%20SCOTLAND_FINAL%20PDF.pdf Published 2016 (accessed 27/06/16).

²⁵ National Diet and Nutrition Survey: Assessment of dietary sodium - Adults (19 to 64 years) in Northern Ireland 2015; <https://www.food.gov.uk/northern-ireland/nutrition/national-diet-and-nutrition-survey-assessment-of-dietary-sodium>. Published 2016 (accessed 06/10/16).

²⁶ Department of Health. Report on Health and Social Subjects: 46. Nutritional Aspects of Cardiovascular disease. HMSO (London, 1994).

²⁷ Scientific Advisory Committee on Nutrition (2003). Salt and Health. The Stationery Office. http://www.sacn.gov.uk/pdfs/sacn_salt_final.pdf (accessed 15/09/14).

²⁸ National Diet and Nutrition Survey - Assessment of dietary sodium in adults (aged 19 to 64 years) in England, 2011 report. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/127916/Sodium-Survey-England-2011_Text_to-DH_FINAL1.pdf.pdf (accessed 15/09/14).

²⁹ It should be noted that there is uncertainty about the functional consequences of a raised EGRAC. Therefore, in addition to using this threshold, changes in the riboflavin status of the UK population (including those in Wales) will also be monitored by reviewing the EGRAC values at the 75th and 90th percentiles in successive years.

³⁰ The Wales Years 2 to 5 sample includes core and boost participants. The UK Years 1 to 4 sample also includes the core and boost participants from Wales. In the UK Years 1 to 4 data, the Wales cases were weighted down to

represent the proportion of participants that the Wales core participants represent in the UK Years 1 to 4 NDNS RP survey population.

³¹ New, lower analytical values for *trans* fatty acids in a range of processed foods were added to the nutrient databank in Years 3 and 4 onwards. Therefore there is a higher proportion of the new, lower composition values in the Wales dataset, based on years 2-5 than in the UK dataset, based on Years 1-4. This is likely to be the main explanation for the apparently lower *trans* fatty acid intakes in Wales compared with the UK.

³² In section 6.8.1 comparisons are made between blood analyte results for NDNS RP participants in the Wales (Years 2 to 5 combined) and the UK (Years 1 to 4 combined) samples. The following points should be taken into consideration when making any comparisons between these datasets:

- the number of blood samples obtained in Wales for those aged 11 years and over was 288. The sample size for blood samples obtained from those aged 11 years and over was 2,344 for the UK. It should be noted that this number for the UK also includes blood samples obtained from participants in Wales.
- the Wales blood samples were collected between April 2009 and July 2013; (Years 2 to 5 of the NDNS RP) whilst the UK blood samples were collected between February 2008 and July 2012 (Years 1 to 4 of the NDNS RP).
- plasma 25-hydroxyvitamin D (25-OHD) data are only presented as annual averages in Table 6.3, because if split by season the cell sizes would be too small. All of the noted differences are observed differences only and no statistical analysis of the differences has been undertaken as the cell sizes in some age/sex groups in Wales are small. Therefore caution should be taken when comparing findings between Wales Years 2-5 and UK Years 1 to 4 where cell sizes are small.

³³ It should be noted that this number for the UK also includes blood samples obtained from participants in Wales.