

A survey carried out on behalf of the Food Standards Agency



Low income diet and nutrition survey

Summary of key findings

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Foreword

This survey, of a national sample of the most materially deprived households, provides nationally representative baseline data on the dietary habits and nutritional status of the part of the UK population that has a low income. It is the most comprehensive survey of its kind in the UK and provides, for the first time, a wealth of information on the dietary habits and nutritional status in this population subgroup and the factors affecting these.

It is a valuable supplement to the National Diet and Nutrition Survey (NDNS) programme that collects information on the dietary habits and nutritional status of the general UK population.

This report summarises the key findings from the various chapters in the survey, covering foods consumed, nutrient intake and status, physical measurements, physical activity, smoking, drinking and oral health as well as examining the relationship between dietary intake and factors associated with food choice. It also includes comparisons to the general population.

This report highlights areas of concern for the low income population, which are, in many respects, similar to those already identified in the general population, although often to a greater degree. Also identified were higher levels of smoking, increased alcohol intake (amongst consumers) and reduced physical activity, all of which are known risk factors for chronic disease.

Results of this survey will be used to develop nutrition policy by understanding and addressing barriers to the uptake of a healthy balanced diet by those in the population on a low income.

This report, and the work described within, results from a successful collaboration between the Food Standards Agency, which commissioned the survey and a consortium of three organisations led by the Health Research Group at the National Centre for Social Research (NatCen) and including the Nutritional Sciences Research Division at King's College London, and the Department of Epidemiology and Public Health at the Royal Free and University College London Medical School.

We warmly welcome the report and express our thanks to all those who took part.



Dame Deirdre Hutton
Chair
Food Standards Agency

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Michael Nelson, Bob Erens, Beverley Bates, Susan Church and Tracy Boshier

I Introduction

The Low Income Diet and Nutrition Survey (LIDNS) was commissioned by the Food Standards Agency ('the Agency') in order to provide robust, nationally representative, baseline data on the dietary habits and nutritional status of the low income¹ (materially deprived) population in the UK.

This Summary provides background information on LIDNS, including its design and methodology, and presents some of the key findings from the survey on food consumption, nutrient intake, nutritional status, and factors affecting these in the low income population. It particularly focuses on the findings that are most relevant to UK nutrition and health policy.

More extensive details on the survey design and methodology, the sample characteristics, and comprehensive results are available in the Main Report,² with additional tables available on the accompanying CD. Cross references to more detailed information, tables and figures in the Main Report are included where appropriate in this Summary.

I.1 Background and aims

In the UK, the diet and nutritional status of the general population is monitored by the National Diet and Nutrition Survey (NDNS) programme.^{3,4,5,6} Results from these surveys indicate that differences exist in food consumption and nutritional status between lower and higher socio-economic groups. However, while the NDNS provides an overview of diets and nutritional status nationally, the sample size has precluded detailed analyses of individual population subgroups, including low income households, and factors that might affect their diets. A number of smaller studies⁷ in low income households have provided useful qualitative and quantitative data, but their samples were not sufficiently large or representative to fully inform policy priorities.

The Acheson report,⁸ published in 1998, suggested that Government could play a role in reducing nutrition-related health inequalities. It emphasised that the alleviation of food poverty required not only changes in behaviour at the individual and family levels, but also co-ordinated and multi-sectoral action at the national and local levels. The report also emphasised that monitoring changes in diet and nutrition-related outcomes was a key element of the policy process. Initiatives to address nutrition-related health inequalities have been introduced in England, Scotland and Wales.⁹

The main survey was preceded by:

- A scoping study,¹⁰ which considered issues that were specific to a survey of low income households, such as identifying and recruiting the target group, and the most appropriate dietary assessment methodology.
- A methodological study,¹¹ which field tested the methods for sampling and screening for low income households, and for dietary assessment.
- A feasibility study,¹² which was the first full scale test of all aspects of the methodology.

LIDNS was carried out by a consortium of three organisations led by the Health Research Group at the National Centre for Social Research (NatCen) and including the Nutritional Sciences Research Division at King's College London, and the Department of Epidemiology and Public Health at the Royal Free and University College London Medical School. Haematological and biochemical analyses of blood samples were carried out in the Department of Haematology, Royal Victoria Infirmary, Newcastle-upon-Tyne, and the Biotechnology and Biological Sciences Research Council (BBSRC) Institute of Food Research, Norwich. Fieldwork in Northern Ireland was carried out by the Northern Ireland Statistics and Research Agency. Fieldwork was undertaken from November 2003 until January 2005.

The specific aims of LIDNS were to:

- Provide quantitative data on the food and nutrient intakes, sources of nutrients and nutritional status of the low income population.
- Describe the characteristics of individuals with intakes of specific nutrients above or below the national average.
- Assess the diets of the low income population to determine the extent to which they are sufficiently nutritious.
- Evaluate the extent to which the diets of the low income population vary from expert recommendations.
- Provide physical measurements of health-related factors closely associated with diet, namely height, weight and other anthropometric measurements and blood pressure, for a representative sample of low income individuals.
- Measure blood indices that provide evidence of nutritional status or dietary biomarkers.
- Assess physical activity levels of the low income population.
- Provide basic information on smoking and oral health status in relation to diet.
- Examine the relationship between dietary intake and factors associated with food choice in the low income population.
- Examine possible relationships between diet and risk factors in later life.

1.2 Survey design and methodology

1.2.1 Sample selection

Since sample selection based on income alone would not capture all of the aspects of material deprivation likely to influence diets and nutritional status, a measure that reflected deprivation in relation to food access and affordability was desirable. An index of material deprivation that could be assessed via a doorstep screening questionnaire was therefore developed. Questions included receipt of benefits, household composition, car ownership and employment status. The aim was to identify approximately the bottom 15% of the population in terms of material deprivation.

The sample was selected using a five-stage clustered design:

- 528 wards¹³ were selected, with deprived wards over-sampled relative to other wards. Scotland, Wales and Northern Ireland were over-sampled relative to England, but the final dataset was weighted to take this into account.
- A fixed sample of addresses was selected in each ward, according to the level of deprivation. The final issued sample consisted of 25,818 addresses.
- A doorstep screening questionnaire was used to establish eligibility for inclusion in the survey, based on markers of deprivation. It also included questions that were used to assess non-response bias.¹⁴
- At each address, one household¹⁵ was selected.
- In eligible households with two or more residents, two respondents were then randomly selected. If children were present, one adult and one child were selected; otherwise two adults were selected.

As well as over-sampling wards in Scotland, Wales and Northern Ireland and in more deprived areas, there was differential non-response to the survey (e.g. by age, sex, country/region). In order to ensure that the correct population proportions were used in the analysis, the final dataset was weighted. All results are based on these weighted data so that the reported findings reflect the demographic characteristics of the UK low income population as a whole.

Further details of the sample design and weighting scheme are given in Chapter 2, Sections 2.2 and 2.11 of the Main Report.

1.2.2 Survey components

The key stages of the survey, which were administered by trained interviewers and nurses, were as follows:

- A face-to-face interview and self-completion questionnaire.
- Four 24 hour recalls of diet on random days (including at least one weekend day) within a 10 day period.
- Physical measurements. These differed by age group but included, where appropriate, height, weight, waist and hip circumferences, demi-span, mid-upper arm circumference and blood pressure.
- Blood sample collection (in respondents aged 8 years and over) to measure indices of nutritional status.

Further details of the survey components are given in Chapter 2, Section 2.4 of the Main Report.

Information collected in the interview and self-completion questionnaire included, where appropriate:

- Food shopping habits (e.g. main type of shop used, distance to shop)
- Access to food storage and cooking facilities
- Usual food preparation methods
- Cooking skills
- Access to food at school and to free food
- Eating habits, including use of dietary supplements
- General health and dental health, including use of prescribed medicines
- Weight change
- Drinking and smoking
- Physical activity
- Education
- Income
- Attitudes and barriers to healthy eating
- Food security and coping strategies

1.2.3 Limitations of the survey

The LIDNS findings provide a valuable evidence base that can be used to examine income-related nutritional inequalities. In a survey of this scope and complexity, however, it is inevitable that there will be some limitations in the data. These include the following:

- Difficulties in defining and capturing the target population subgroup of low income or materially deprived households.
- Representativeness of the achieved sample, which is affected by sampling procedures and response rates for the different components of the survey (e.g. blood collection among children). Comparisons of socio-demographic characteristics between LIDNS and other nationally representative surveys strongly support the conclusion that the LIDNS sample is

indeed deprived in relation to the general population. However, the sample size within particular subgroups may be insufficient to allow robust analysis, for example, within countries (Scotland, Wales and Northern Ireland) or minority ethnic groups, or for some age groups for some measures.

- Bias in dietary reporting (mis-reporting) is inherent in food consumption surveys and can result in underestimation of the mean energy intake in a survey sample.¹⁶ This has implications for the overall dietary findings, their relation to nutritional status, and comparisons between subgroups. While dietary data in LIDNS were not adjusted for possible misreporting, an attempt was made to estimate the prevalence and extent of misreporting in the survey sample, based on energy requirements and reported physical activity levels. The analyses also tried to identify respondents who may have truthfully reported low energy intake (e.g. those who reported having consumed less than usual). About half (47%) of men and women and over half of children (52% of boys; 55% of girls) were classified as 'fair reporters' of habitual dietary intake.
- For children, the assessment of portion size was carried out using the photographic food atlas based on adult portion sizes,¹⁷ which is likely to result in inaccuracy of portion size reporting. Research in children has indicated that an overestimation of portion size (by 45% on average) is likely using photographs designed for use in adults,¹⁸ but the exact effect of any over-reporting of portion size that has taken place in LIDNS has not been quantified.
- Comparisons between food consumption and nutrient intakes in LIDNS (representing the low income population) and NDNS (representing the general population) are made. However, as well as indicating differences between the low income population and the general population, these comparisons may also reflect population-wide changes in eating habits and food composition over time. In addition, there are methodological differences between the surveys, particularly in terms of the dietary assessment methods used and the number of days of dietary data collected that need to be considered when interpreting these comparisons.

Further details are given in the Main Report (e.g. Chapter 1, Section 1.4 on the limitations of the survey; Chapter 10 on comparisons with the NDNS; and Chapter 11 on dietary reporting).

1.3 Response

Overall, 89% of the 25,818 issued addresses were eligible for screening. Of these, 82% completed the doorstep screening questionnaire and 18% of households (3461) were screened in. Interviews were started at 72% of screened-in households (2477). (Table X1.1)

The overall response rate for fully productive individuals was 55% (59% for Scotland and Northern Ireland, 55% for Wales, and 52% for England), giving a sample size of 3728 fully productive individuals. Of these, 73% were visited by a nurse and a blood sample was obtained from 46% of fully productive individuals. Response rates for blood samples were lower for children, with blood samples obtained from 18% of boys and 22% of girls who were fully productive. (Tables X1.1, X1.2)

Further details of survey response are given in Chapter 2, Sections 2.7 to 2.10 of the Main Report.

1.4 Sample characteristics

Using a doorstep screening questionnaire, LIDNS was successful in sampling low income households within the UK population.

Key characteristics include:

- The low income population sample contained proportionally more women (60%) than men (40%).
- Overall, it also comprised proportionally more children (32%) and people aged 65 years and over (21%) compared with the general population. (Figure X1.1)

Table XI.1

Summary of response rates at key survey stages, by country

Response rates at key survey stages	Country								Total	
	England		Scotland		Wales		Northern Ireland		By stage	Overall
	By stage	Overall	By stage	Overall	By stage	Overall	By stage	Overall adults		
%	%	%	%	%	%	%	%	%	%	
Households										
Eligible for screening ^a	90	100	87	100	89	100	87	100	89	100
Screened	80	80	82	82	82	82	88	88	82	82
Screened-in	19		20		16		16		18	
Productive households	71	58	76	62	72	59	71	63	72	60
Individuals in productive households										
Interviewed ^b	97	56	97	60	97	57	96	61	97	58
Fully productive ^c	91	52	94	59	94	55	93	59	92	55
Visited by nurse	73	38	64	37	69	38	84	49	73	40
Blood sample obtained (aged 8+)	45	24	45	26	38	21	57	34	46	25

Data derived from: Main Report, Chapter 2, Table 2.3.

^a Sampled addresses that are traceable, residential and occupied as a main residence.

^b Respondents who completed the household questionnaire and started an individual interview.

^c Respondents completing three or four 24 hour dietary recalls.

Table XI.2

Number of individual respondents at key survey stages, by sex and country

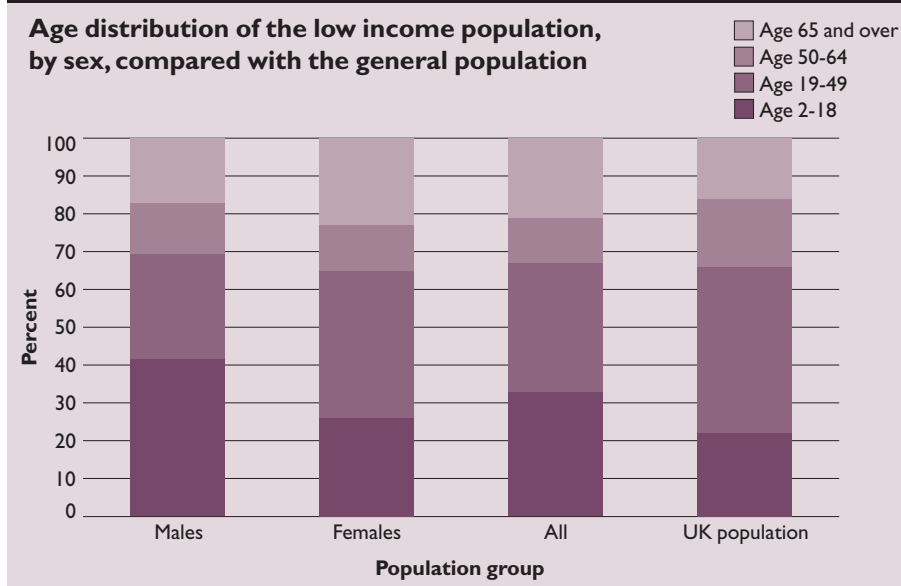
Number of respondents at key survey stages	Country				Total
	England	Scotland	Wales	Northern Ireland	
	N	N	N	N	N
Men					
Fully productive ^a	609	120	109	108	946
Visited by nurse	443	81	76	90	690
Blood sample obtained	300	62	50	72	484
Women					
Fully productive ^a	1222	194	212	222	1850
Visited by nurse	911	134	147	192	1384
Blood sample obtained	622	96	94	139	951
Boys					
Fully productive ^a	289	39	49	62	439
Visited by nurse	199	11	31	50	291
Blood sample obtained ^b	32	1	3	15	51
Girls					
Fully productive ^a	313	39	67	74	493
Visited by nurse	226	23	47	60	356
Blood sample obtained ^b	42	6	3	15	66

Data derived from: Main Report, Chapter 2, Tables 2.2a, 2.2b.

^a Respondents completing three or four 24 hour dietary recalls.

^b Aged 8-18 years.

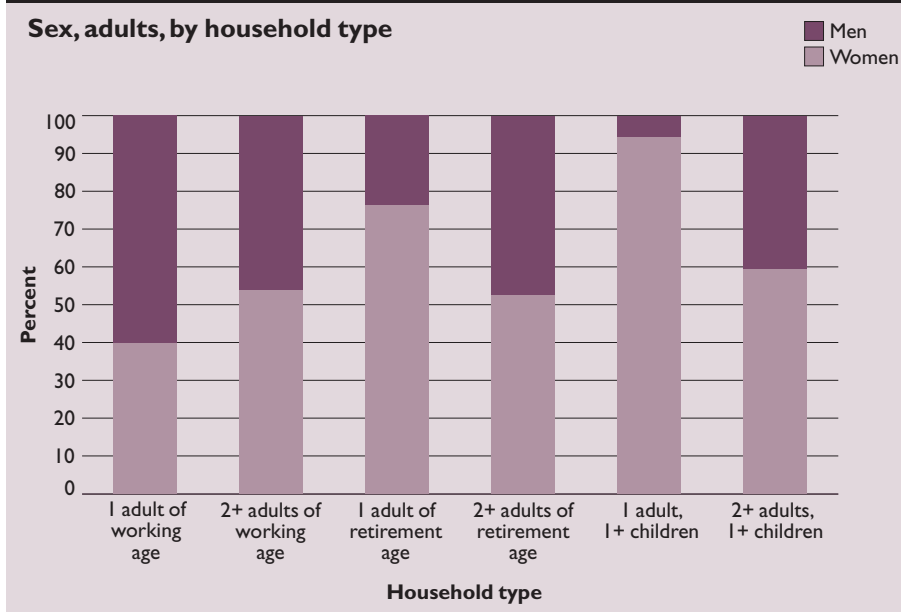
Figure X1.1



Data derived from: Main Report, Chapter 3, Table 3.1; UK population (2003 data) estimated from Population Trends.¹⁹
 Base: Aged 2 years and over.

- Nearly three-fifths (58%) of the low income population lived in households with children. About half of these households (30%) comprised only one adult with one or more children, with the adult much more likely to be a woman. **(Figure X1.2)**
- Single person households comprising an adult of working age were more likely to be men, while those comprising an adult of retirement age were more likely to be women. These links between sex, age and household composition make the analyses according to household composition somewhat difficult to interpret. **(Figure X1.2)**

Figure X1.2

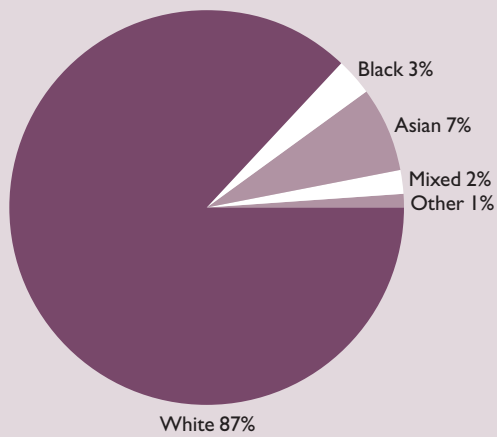


Data derived from: Main Report, Chapter 3, Table 3.6.
 Base: Aged 19 years and over.

- Non-Whites were over-represented in the low income population, comprising 13% compared with 8% in the general population according to the 2001 census.²⁰ The proportion of White respondents was lowest in the South of England (76%) and highest in Northern Ireland (almost 100%). **(Figure X1.3)**
- Over two-thirds (68%) of the low income population lived in social housing, i.e. rented from a local authority or housing association. Compared with the general population, the low income population appeared to live in more crowded accommodation, but their cooking and food storage facilities were comparable.

Figure XI.3

Ethnic group composition of the low income population



Data derived from: Main Report, Chapter 3, Table 3.4.
Base: Aged 2 years and over.

- Overall, 28% of children and 15% of adults lived in households where the household reference person²¹ was currently in work. Where the household reference person currently or had previously worked, in nearly two-thirds of cases, this was in a routine or semi-routine occupation.
- Almost all (98% of children and 95% of adults) of the low income population lived in households where someone was in receipt of at least one state benefit, including means tested benefits such as income support. However, this also included non-means tested benefits such as child benefit and state retirement pension.
- The proportion of the low income population (aged 16 years and over) with no educational qualifications was much higher (55%) than that in the general population (13% in males aged 16-64 years, 15% in females aged 16-59 years).²² In addition, over three-quarters (77%) had left school by the age of 16 years.
- Finally, over half (55%) of adults in the low income population had a self-reported long-term illness. In two-fifths (41%) of adults, the illness limited them in some way (e.g. cutting down on activities).

Further details on the low income population interviewed in LIDNS, with respect to a range of socio-demographic characteristics, can be found in Chapter 3 of the Main Report.

2 Types and quantities of foods consumed

2.1 Foods consumed

Information on the types and amounts of food consumed was collected using four 24 hour dietary recalls, with portion sizes estimated using photographs, descriptions in household measures, or weights derived from packaging. Each item of food or drink was allocated to a unique food code, which was then assigned to one of 88 food groups. The tables in the Main Report, however, show findings for either 82 food groups or 30 aggregated food groups.²³

2.1.1 Food consumption by sex and age

Table X2.1 shows the proportion of the low income population consuming foods within most of the 82 food groups and the mean consumption by those people who did consume foods within these categories.

(Table X2.1)

Table X2.1

Daily consumption of food (g) for all (including non-consumers) and for consumers only, and percentage consuming for all adults and children, by sex

Aged 2 years and over

Food group	Men			Women			Boys			Girls		
	Mean total ^a	Mean con-sumers ^b	% con-sumers	Mean total ^a	Mean con-sumers ^b	% con-sumers	Mean total ^a	Mean con-sumers ^b	% con-sumers	Mean total ^a	Mean con-sumers ^b	% con-sumers
Pasta	18	85	21	19	71	27	31	64	49	28	59	47
Rice	24	109	22	23	90	25	22	76	29	31	79	39
Pizza	11	91	12	9	68	13	21	68	31	14	50	29
Other cereals	5	23	22	5	20	24	5	19	27	6	23	25
White bread	75	88	85	45	55	82	59	65	90	50	55	91
Wholemeal bread	16	70	22	13	45	29	7	43	17	4	32	11
Other breads	15	56	26	11	35	31	8	29	26	8	28	29
Wholegrain and high fibre breakfast cereals	22	66	34	17	46	37	16	34	46	12	29	42
Breakfast cereals, not wholegrain or high fibre	6	24	25	5	18	31	14	23	60	10	17	61
Biscuits	14	24	56	11	18	60	17	24	72	16	21	76
Buns, cakes and pastries	16	39	40	16	33	48	16	31	53	14	25	56
Cereal based milk puddings, sponge and other puddings	17	75	22	16	55	29	15	50	31	14	50	27
Whole milk	87	205	42	62	162	38	141	237	59	105	187	56
Semi-skimmed milk	113	214	53	111	179	62	89	212	42	61	118	51
Skimmed milk	9	138	7	19	180	10	2	[87]	2	1	[82]	2
Other milk and cream	13	78	17	6	32	18	19	96	20	15	82	18
Cheese	15	30	50	10	19	55	10	19	50	9	17	54
Yoghurt and other dairy desserts	10	65	15	19	66	29	23	53	43	29	62	47
Ice cream	5	32	16	4	22	18	11	37	29	10	27	36
Eggs and egg dishes	24	43	55	14	30	48	9	27	32	10	28	36
Butter	5	17	27	5	15	33	2	10	21	2	8	20
Soft margarine, not polyunsaturated	1	6	16	1	4	16	1	6	20	1	3	21
Reduced fat spread, not polyunsaturated	8	20	38	4	12	34	5	12	42	4	9	44
Reduced fat spread, polyunsaturated	3	17	18	2	11	18	2	13	15	1	9	17
Low fat spread, not polyunsaturated	1	19	5	1	12	5	0	[7]	5	0	6	7
Low fat spread, polyunsaturated	2	15	13	1	11	13	1	10	10	1	9	12
Bacon and ham	18	31	59	11	21	55	9	18	50	8	17	46
Beef, veal, lamb and pork and dishes	74	105	71	54	78	68	42	66	62	38	62	62
Coated chicken and turkey	5	41	11	5	35	14	13	34	39	15	36	42
Chicken and turkey dishes	45	81	55	35	57	61	28	46	59	28	45	64
Burgers and kebabs	9	53	16	5	41	13	13	38	34	8	34	23
Sausages	15	39	39	8	28	27	16	34	46	12	28	44
Meat pies and pastries	20	58	34	14	47	30	17	44	40	12	43	28
Other meat and meat products	8	36	22	4	25	17	3	23	12	5	32	15
Liver, liver products and dishes	2	31	6	1	27	5	1	[54]	2	0	[22]	2
White fish coated or fried	12	51	23	9	42	21	10	32	32	7	29	24
White fish dishes and white fish not coated or fried	6	58	11	6	54	11	2	[43]	4	3	48	7
Canned tuna and dishes	3	28	11	3	21	13	4	23	16	3	20	14
Oily fish and dishes	5	37	13	7	42	16	0	[20]	2	1	[32]	4
Carrots, raw	1	14	5	1	15	7	1	[14]	7	1	[11]	8
Salad and other vegetables, raw ^c	11	26	41	15	26	56	4	13	31	9	18	47

Continued...

Table X2.1 continued

Aged 2 years and over

Food group	Men			Women			Boys			Girls		
	Mean total ^a	Mean consumers ^b	% consumers	Mean total ^a	Mean consumers ^b	% consumers	Mean total ^a	Mean consumers ^b	% consumers	Mean total ^a	Mean consumers ^b	% consumers
Tomatoes, raw	10	27	37	11	23	50	2	12	20	4	14	29
Peas and green beans, not raw	16	33	48	14	27	51	9	21	42	8	19	41
Baked beans	18	60	30	11	45	24	20	48	42	19	49	38
Leafy green vegetables, not raw	13	34	38	14	32	44	5	18	25	6	22	27
Carrots, not raw	9	26	34	9	22	42	6	18	35	5	16	30
Tomatoes, not raw	7	45	16	4	30	12	1	[21]	5	1	[28]	5
Other vegetables and vegetable dishes, not raw	38	59	63	34	51	68	15	32	48	18	31	57
Chips, fried and roast potatoes and fried potato products	51	78	65	37	56	67	72	80	90	57	69	82
Other potatoes, potato salads and dishes, potato products cooked without fat	69	108	64	59	84	70	40	64	62	44	66	67
Crisps and savoury snacks	6	17	34	5	14	36	17	21	82	18	22	85
Apples and pears not canned	19	71	26	22	64	34	22	56	39	25	56	44
Citrus fruit not canned	13	84	15	10	54	19	6	37	17	13	52	25
Bananas	18	59	31	18	49	38	14	43	32	14	42	34
Other fruit including canned	12	51	24	19	52	36	7	30	23	11	31	36
Table sugar	24	33	71	12	23	54	7	11	61	5	9	55
Preserves, sweet spreads, fillings and icings	5	17	30	4	15	31	3	14	25	3	12	27
Sugar confectionery	2	13	15	2	13	13	14	27	50	10	20	50
Chocolate confectionery	8	26	29	7	19	35	15	26	59	15	23	68
Fruit juice	33	159	21	37	124	30	47	137	34	59	133	45
Soft drinks, not carbonated, not diet	62	252	25	55	203	27	247	331	75	187	275	68
Carbonated soft drinks, not diet	97	261	37	73	214	34	215	315	68	146	237	61
Soft drinks, not carbonated, diet	24	282	8	28	243	11	96	311	31	114	356	32
Carbonated soft drinks, diet	34	219	15	44	243	18	44	213	21	43	157	27
Wine including fortified, low alcohol and alcohol free	22	203	11	22	145	15	0	[333]	0	0	[28]	0
Beers and lager including low alcohol and alcohol free	290	757	38	44	405	11	22	[525]	4	3	[215]	1
Coffee (made up)	221	452	49	205	402	51	11	[170]	6	15	159	10
Tea (made up)	626	769	81	564	694	81	84	206	41	83	198	42
Beverages (dry weight) e.g. drinking chocolate, cocoa, horlicks	2	21	12	3	19	16	2	14	15	3	16	16
Soups	25	118	21	23	94	24	5	60	8	10	61	16
Savoury sauces, pickles, gravies, condiments	27	35	75	23	30	77	20	25	78	19	25	78
Base (unweighted) ^d	946		946	1850		1850	439		439	493		493

Data derived from: Main Report, Chapter 4, Tables 4.3a, 4.3b, 4.4a, 4.4b.

[] Fewer than 30 observations.

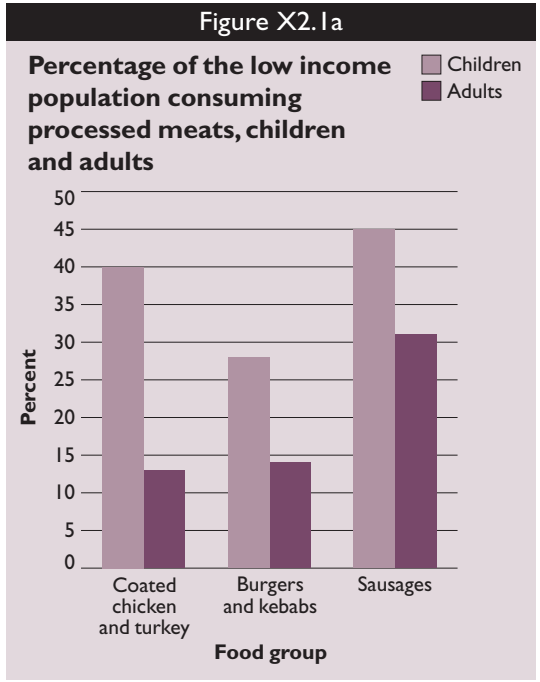
0 = <0.5%.

^a Total low income population, including non-consumers of foods within each group.^b Those who consumed foods within each group on any of the four 24 hour dietary recall days.^c The food group 'salad and other raw vegetables' does not include raw carrots or raw tomatoes, which are listed separately.^d The base shows the number of respondents in each category, but the numbers used in the calculation of the consumers only mean are different for every food group, as these calculations are based on the number of consumers for each food type.

Only 3% of children and 15% of adults reported eating oily fish and dishes (i.e. excluding canned tuna) on any of the four 24 hour dietary recall days. Men consumed 5g and women 7g of oily fish and dishes per day (34g and 48g per week respectively); because of the inclusion of fish dishes, this represents an over estimation of oily fish consumption. Consumption is thus substantially lower than the current recommendation by the Agency to consume at least one portion of oily fish (approximately 140g) per week.

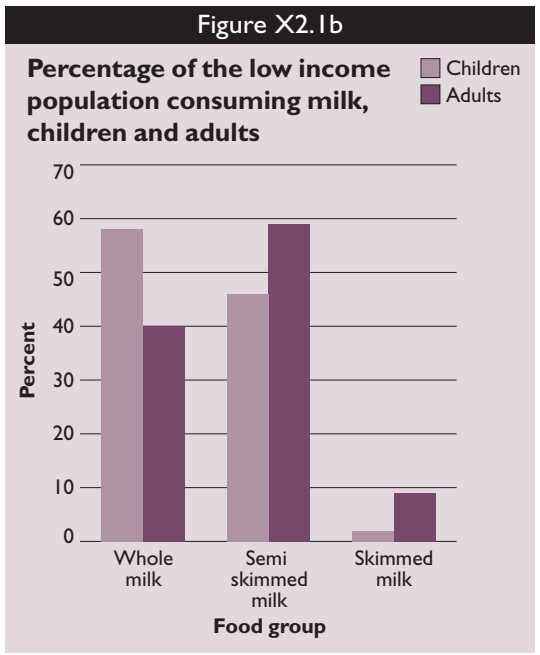
There were a number of differences in consumption patterns by age. For example:

- Children were more likely than adults to consume processed meats such as sausages, coated chicken and turkey, and burgers and kebabs. (Figure X2.1a)



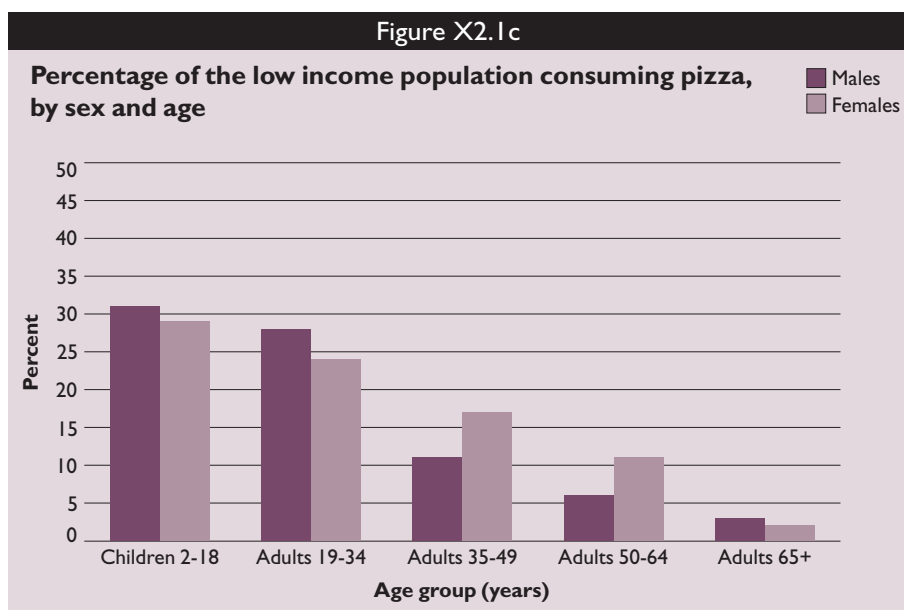
Data derived from: Main Report, Chapter 4, Table 4.3c.
Base: Aged 2 years and over.

- Whole milk was more likely to be consumed by children than adults, while the opposite was the case for semi-skimmed milk. (Figure X2.1b)

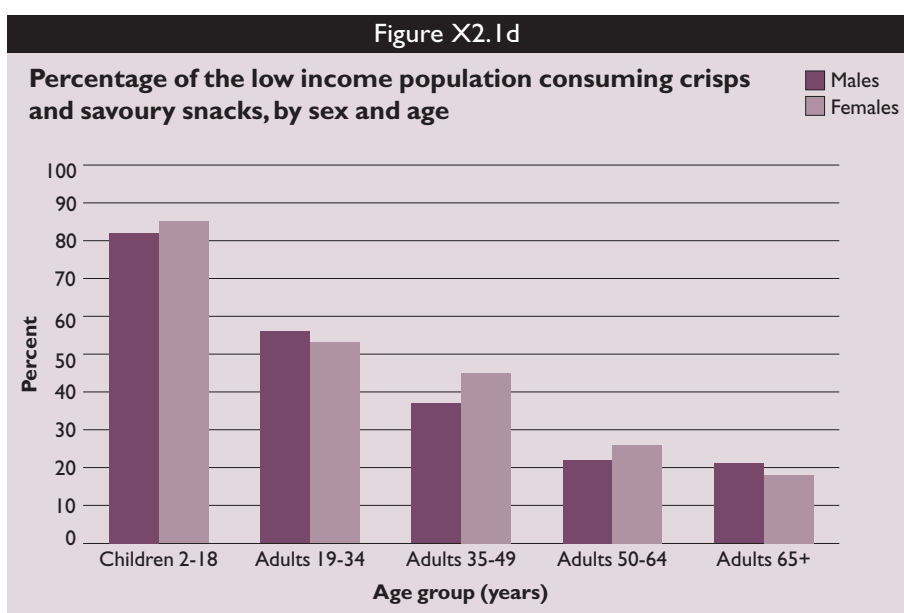


Data derived from: Main Report, Chapter 4, Table 4.3c.
Base: Aged 2 years and over.

- Amongst adults, consumption of pizza, burgers and kebabs, chips, fried and roast potatoes, crisps and savoury snacks and non-diet carbonated soft drinks decreased with increasing age. (Figures X2.1c, X2.1d, X2.1e)



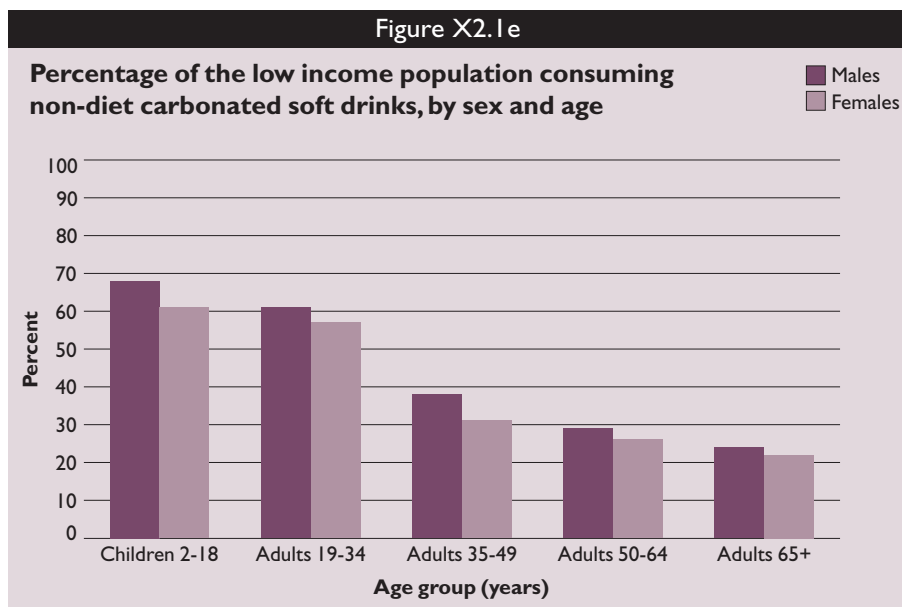
Data derived from: Main Report, Chapter 4 Tables 4.3a, 4.3b.
Base: Aged 2 years and over.



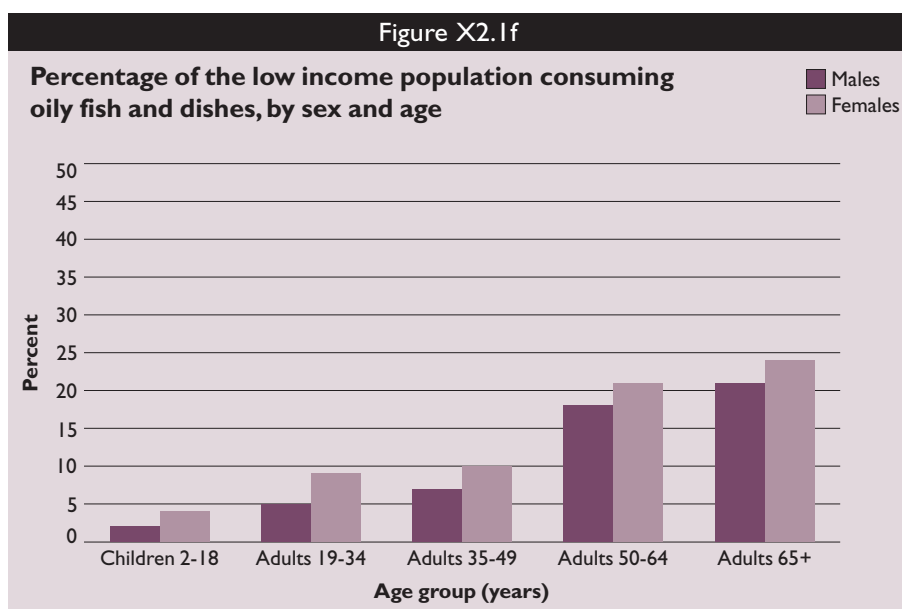
Data derived from: Main Report, Chapter 4 Tables 4.3a, 4.3b.
Base: Aged 2 years and over.

- Consumption of wholegrain and high fibre breakfast cereals, bananas and 'other fruit' tended to increase with increasing age, while consumption of pasta decreased with increasing age.
- Consumption of oily fish and dishes increased with age, from a low base. (Figure X2.1f)
- Amongst children, boys and girls aged 2-10 years tended to consume more whole milk, yoghurt and other dairy desserts, and more fruit, especially bananas, compared with older children (aged 11-18 years).
- Older children had higher consumption of some meat groups (e.g. chicken and turkey dishes, burgers and kebabs, and meat pies and pastries) as well as chips, fried and roast potatoes compared with younger children.

Only a small percentage of children aged 11-18 years reported consuming alcoholic drinks, so findings need to be interpreted with caution, but it appears that a small number of teenagers were consuming large quantities of alcoholic drinks.



Data derived from: Main Report, Chapter 4 Tables 4.3a, 4.3b.
Base: Aged 2 years and over.



Data derived from: Main Report, Chapter 4 Tables 4.3a, 4.3b.
Base: Aged 2 years and over.

2.1.2 Food consumption by country/region and household type

Few of the differences in food consumption patterns by country/region or by household type were statistically significant, but a number of differences were seen, including:

- Consumption of most of the cooked vegetable groups was lowest in Scotland, particularly amongst adults.
- Fruit consumption was typically higher in England, compared with the other countries.
- Men in the North of England consumed more meat pies, chips, fried and roast potatoes, beer and lager compared with men in the South of England.
- Compared with adults living with children, those of working age not living with children tended to consume more wholemeal bread and fruit and less whole milk and non-diet carbonated soft drinks.

Further details of the types and quantities of foods consumed are available in Chapter 4 of the Main Report.

2.1.3 Comparisons with the general population (NDNS)

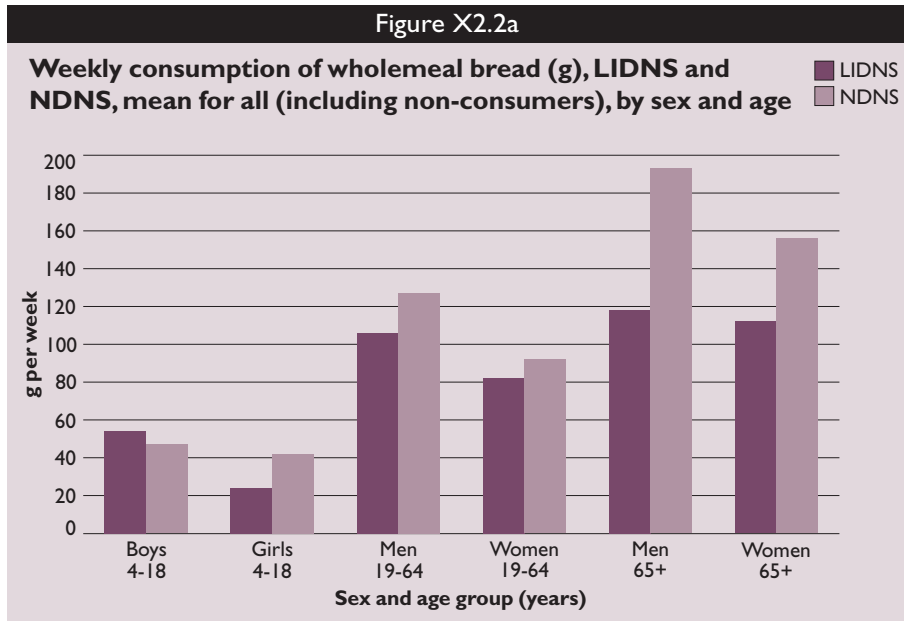
As mentioned in Section 1.2.3 of this Summary, comparisons made between LIDNS and NDNS may reflect population-wide changes in eating habits over time. This is particularly the case for the NDNS of people aged 65 years and over, for which fieldwork was undertaken in 1994-95.⁴

For many foods, the types and quantities consumed by the low income population appeared to be similar to those consumed by the general population, as assessed by the NDNS.^{4,5,6} Where differences were found, they were often consistent across the age groups and between men and women. Some of the key differences found for foods of nutritional significance are listed below.

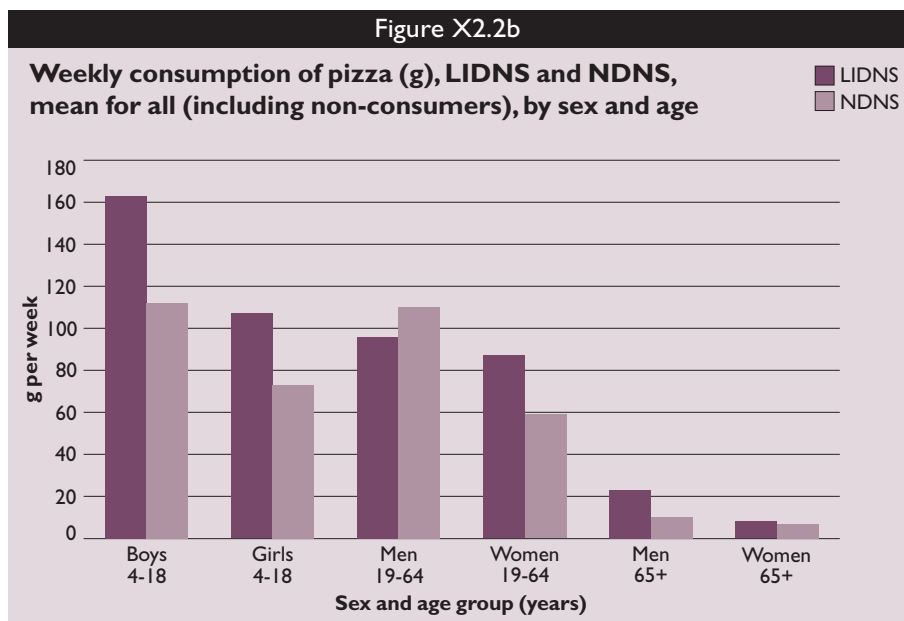
In general terms, the low income population was less likely to consume:

- Wholemeal bread
- Vegetables (see Summary Section 2.2).

(Figure X2.2a)



Data derived from: Main Report, Chapter 10, Table 10.2.
Base: Aged 4 years and over.

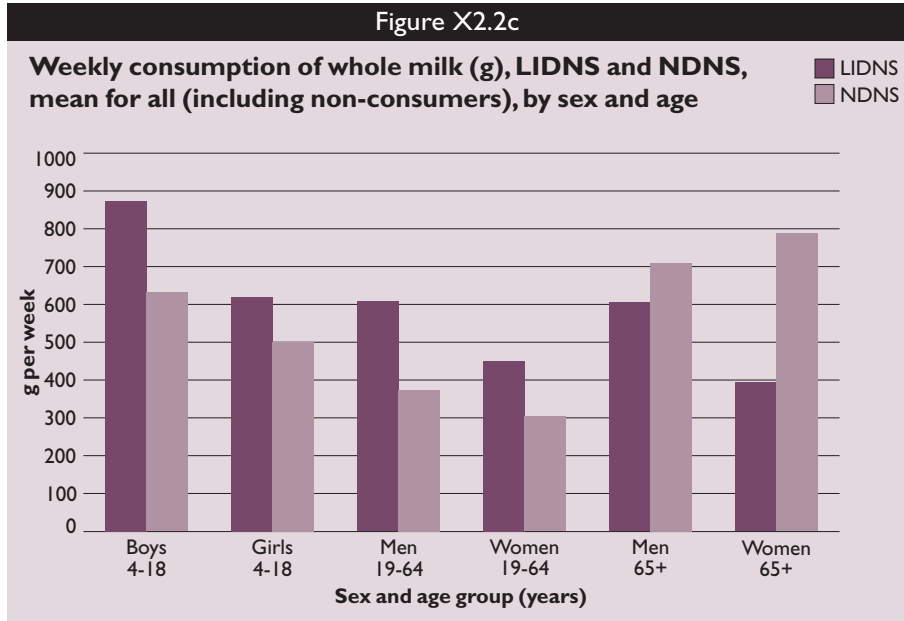


Data derived from: Main Report, Chapter 10, Table 10.2.
Base: Aged 4 years and over.

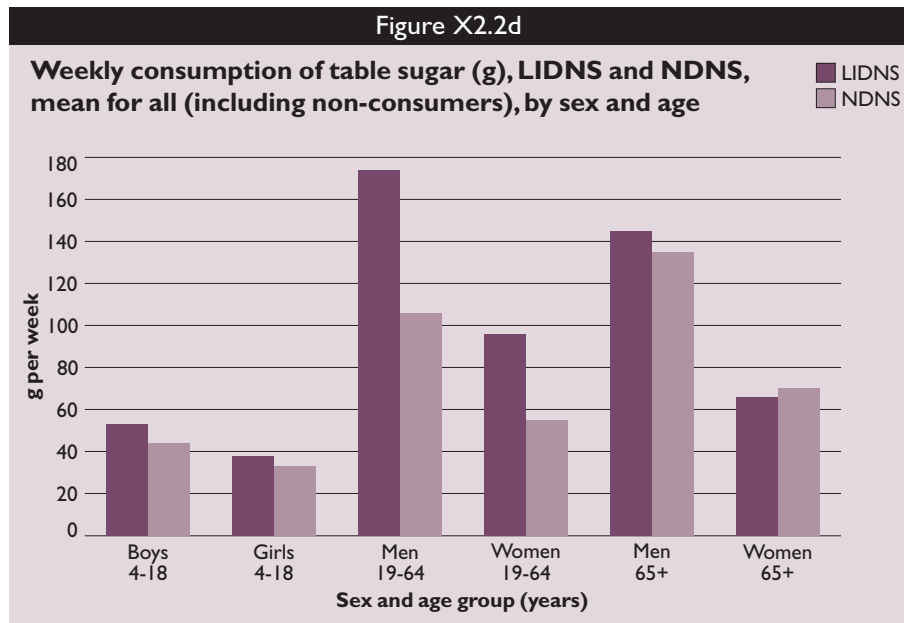
They tended to consume more:

- Fat spreads and oils (including, for example, reduced fat spread, not polyunsaturated)
- Non-diet soft drinks
- Beef, veal, lamb and pork and dishes
- Pizza (except males aged 19-64 years) (Figure X2.2b)
- Processed meats (children and adults aged 19-64 years)
- Whole milk (children and adults aged 19-64 years) (Figure X2.2c)
- Table sugar (all sex and age groups except women aged 65 years and over). (Figure X2.2d)

Further details are available in Chapter 10 of the Main Report.



Data derived from: Main Report, Chapter 10, Table 10.2.
Base: Aged 4 years and over.



Data derived from: Main Report, Chapter 10, Table 10.2.
Base: Aged 4 years and over.

2.2 Fruit and vegetables consumed

2.2.1 Portions of fruit and vegetables consumed

As part of its prevention strategy to reduce early deaths from cancer and heart disease, the Government recommends consumption of at least five portions of fruit and vegetables per day. The number of portions of fruit and vegetables consumed, and total fruit and vegetable consumption, were estimated from the 24 hour dietary recall data.²⁴

On average, men consumed 2.4, and women 2.5, portions of fruit and vegetables per day. This was well below the recommended level of 5 (80 g) portions a day, which was met by only 8% of men and 9% of women. About one-fifth of men and women consumed on average less than one portion in total of fruit and vegetables per day. (Table X2.2)

Table X2.2				
Fruit and vegetable consumption (portions per day), adults and children, by sex				
Aged 2 years and over ^a				
Daily portions of fruit and vegetables	Men	Women	Boys	Girls
Fruit portions^b				
Mean	0.9	1.0	0.8	1.1
Median	0.4	0.7	0.6	0.8
Vegetable portions^c				
Mean	1.5	1.4	0.8	0.9
Median	1.3	1.3	0.7	0.7
Fruit and vegetable portions				
Mean	2.4	2.5	1.6	2.0
Median	2.1	2.0	1.4	1.5

Data derived from: Main Report, Chapter 4, Tables 4.7a, 4.7b.

^a Bases are as shown in Table X2.1.

^b Fruit portions include all fruit (fresh, tinned, frozen and dried), fruit from fruit dishes, and a maximum contribution of one portion of fruit juice (150g) (even if more than 150g was consumed).

^c Vegetable portions include all vegetables (fresh, tinned, frozen and dried), including from composite dishes, and a maximum contribution of one portion of beans and pulses (80g) (even if more than 80g was consumed).

Looking at fruit only, a substantial proportion of the low income population (36% of men, 28% of women, 32% of boys, 18% of girls) consumed no fruit during the four 24 hour recall days.

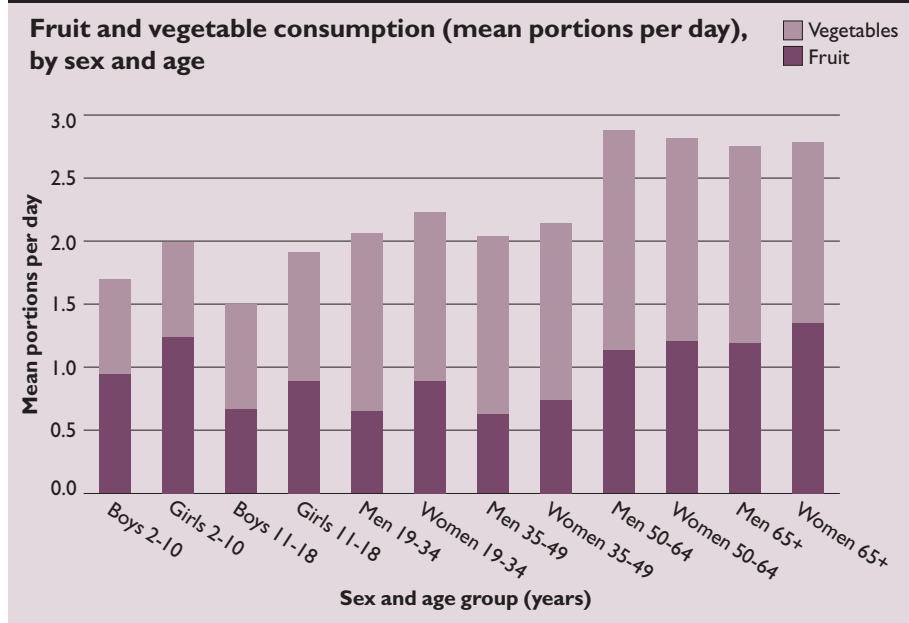
The number of portions of fruit and vegetables consumed varied by age, with older adults (aged 50 years and over) consuming more than younger adults (aged 19-49 years). There were also some differences by country/region and household type, although these differences were not always statistically significant. Consumption of fruit and vegetables tended to be highest in England and, amongst adults, lowest in Scotland. Adults living with children consumed more fruit and vegetables compared with adults who did not live with children. (Figure X2.3)

2.2.2 Comparisons with the general population (NDNS)

A comparison of data from LIDNS with that from the NDNS 19-64 years⁶ suggests that the low income population consumes fewer portions of both fruit and vegetables than does the general population. The mean number of portions of fruit and vegetables consumed by the general adult population was below the target of five per day, ranging from 1.9 portions in NDNS women in receipt of benefits to 2.9 portions amongst all NDNS women. Consumption of fruit and vegetables by adults in LIDNS was similar to that by NDNS adults in receipt of benefits.

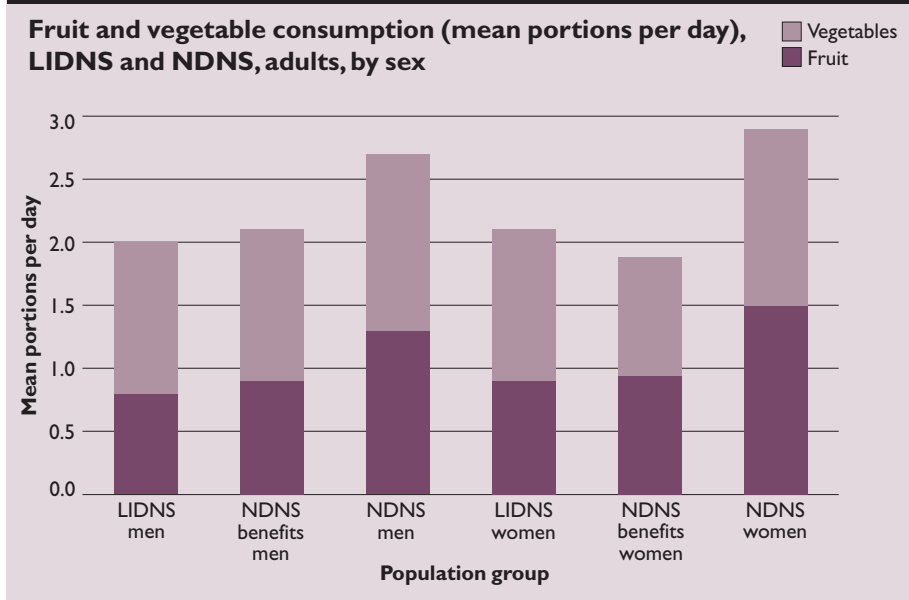
(Figure X2.4)

Figure X2.3



Data derived from: Main Report, Chapter 4, Tables 4.7a, 4.7b.
Base: Aged 2 years and over.

Figure X2.4



Data derived from: Main Report, Chapter 10, Table 10.9.
Base: Aged 19 years and over.

Portions for LIDNS men and women were re-calculated by the method used in the NDNS (e.g. fruit from fruit crumbs excluded, juice and syrup from canned fruit included, fruit juice portion taken as 80g, and vegetables from meat dishes excluded) to allow direct comparison; the values therefore differ from those presented in Table X2.2.
NDNS benefits = NDNS households in receipt of benefits.

2.3 Special diets and dietary supplements

According to information collected in the interview, 12% of men and 14% of women were on a special diet, most commonly a low-fat or diabetic diet or, in women, a weight-reducing diet.

Overall, 20% of adults and 6% of children reported taking dietary supplements, with use more common amongst women and with increasing age. Cod liver oil and other fish oil based supplements were the types most commonly taken.

3 Energy, macronutrient and alcohol intakes

3.1 Introduction

Information from the 24 hour dietary recalls on the types and amounts of food consumed was linked to a nutrient databank in order to calculate nutrient intakes.²⁵ No attempt was made to adjust the nutrient intakes presented here to take account of under-reporting (see Section 1.2.3 of this Summary and Chapter 11 of the Main Report). Information on selected macronutrients is presented here.

Recommendations, in the form of Dietary Reference Values (DRVs),²⁶ have been published for macronutrients. These include:

- Estimated Average Requirements (EAR) for energy, which are the amount estimated to meet the average requirements of the population group.
- DRVs for carbohydrates and fats, based on population average intakes as a percentage of energy. For fat, saturated and *trans* fatty acids, and non-milk extrinsic sugars (NMES), the DRVs refer to recommended maximum intakes.
- Recommended population average daily intake (18g), together with a daily range (12-24g) for individuals, for non-starch polysaccharides (NSP).
- Reference Nutrient Intake (RNI) for protein, which is the amount that is sufficient to meet the needs of most (about 97%) of the population group.

Intakes of energy, macronutrients and (for adults only) alcohol by sex and age are presented in Table X3.1a for adults, and Table X3.1b for children. Data are expressed as mean intakes and also compared with recommendations or as a proportion of energy, as appropriate.

3.2 Energy

As would be expected, males had higher mean daily total energy intakes compared with females in all age groups. Average energy intake tended to increase with age for children, but decrease with age for adults. Mean energy intakes were below the EAR in all sex and age groups except for girls aged 2-10 years. There were few country/region differences in energy intake, although intakes expressed as a percentage of the EAR were higher in women in Northern Ireland compared with those in Wales. (Tables X3.1a, X3.1b)

The four food types contributing most to energy intakes in the low income population were cereals and cereal products, meat and meat products, milk and milk products, and potatoes and savoury snacks. The percentage contributions from the different food types were generally similar across the age and sex groups, but the contribution from potatoes and savoury snacks was lower in adults (10%) than in children (15%). (Figure X3.1a)

Further information on energy intakes, including by country/region, household type and ethnic group, and on the main food sources, can be found in Chapter 5 of the Main Report.

3.3 Protein

Mean daily intake of protein exceeded the RNI in all sex and age groups. Minor differences found by country/region, household type and ethnic group were unlikely to be of nutritional significance. (Tables X3.1a, X3.1b)

The main contributors to protein intake in adults and children were meat and meat products (37% and 34% respectively), followed by cereals and cereal products (22% and 25% respectively) and milk and milk products (17% and 19% respectively).

Further information on protein intakes, including by country/region, household type and ethnic group, and on main food sources, can be found in Chapter 6 of the Main Report.

3.4 Carbohydrate

Mean total carbohydrate intake contributed 47.8% of food energy for men and 48.6% for women, just below the recommended minimum DRV of 50%. Total carbohydrate intake in children contributed roughly half of food energy (around 51%). However, the contribution of NMES to energy intake was in excess of the maximum DRV of 11% in all sex and age groups (men 14.6%, women 13.1%, boys 17.1%, girls 16.5%).

(Tables X3.1a, X3.1b)

Table X3.1a										
Average daily intake of energy (MJ), macronutrients (g), and alcohol (g), and intakes expressed as a percentage of Dietary Reference Values, adults, by sex and age										
<i>Aged 19 years and over</i>										
Energy and macronutrients	Men					Women				
	Age group					Age group				
	19-34	35-49	50-64	65+	Total	19-34	35-49	50-64	65+	Total
Total energy intake										
Mean (MJ)	9.84	8.91	8.44	7.60	8.64	6.94	6.53	6.29	6.01	6.43
% of Estimated Average Requirement	93	84	81	83	85	86	81	79	77	81
Protein										
Mean (g)	82.9	79.4	78.5	69.9	77.2	58.9	60.1	60.3	57.3	58.9
% of Reference Nutrient Intake	149	143	147	131	142	131	134	130	123	129
Total carbohydrate										
Mean (g)	279.8	248.5	243.7	216.5	245.5	212.6	192.7	185.4	179.5	192.6
% of food energy	48.5	47.3	48.0	47.5	47.8	50.1	48.1	48.0	48.1	48.6
Non-milk extrinsic sugars (NMES)										
Mean (g)	92.3	79.3	74.7	61.5	76.1	68.7	52.2	46.7	46.8	53.9
% of food energy	16.2	14.8	14.5	13.1	14.6	15.6	12.6	11.6	12.1	13.1
Non-starch polysaccharides (NSP)										
Mean (g)	13.4	12.2	12.9	12.3	12.7	10.6	10.4	11.2	10.9	10.7
% with intakes below 12 g/day	42	54	53	56	51	72	72	62	67	69
Total fat										
Mean (g)	91.9	81.5	74.9	70.2	79.1	62.8	60.5	58.5	56.1	59.4
% of food energy	36.2	36.4	35.0	36.0	35.9	34.8	35.5	35.0	35.2	35.2
Saturated fatty acids										
Mean (g)	34.4	30.6	28.6	28.3	30.4	23.7	23.2	23.1	23.3	23.4
% of food energy	13.4	13.4	13.3	14.4	13.7	13.0	13.6	13.6	14.5	13.7
Cis-monounsaturated fatty acids										
Mean (g)	32.4	28.2	25.2	22.6	26.9	21.4	20.2	19.1	17.6	19.5
% of food energy	12.7	12.7	11.8	11.6	12.2	11.9	11.9	11.5	11.1	11.6
Cis n-3 polyunsaturated fatty acids										
Mean (g)	2.3	1.9	1.9	1.6	1.9	1.7	1.5	1.4	1.3	1.5
% of food energy	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.8	0.9
Cis n-6 polyunsaturated fatty acids										
Mean (g)	12.7	11.4	10.3	9.5	10.9	9.1	8.7	8.0	7.0	8.1
% of food energy	5.1	5.3	4.8	4.9	5.0	5.1	5.1	5.0	4.5	4.9
Trans fatty acids										
Mean (g)	3.1	3.1	2.7	2.5	2.8	2.1	2.1	2.1	2.2	2.1
% of food energy	1.2	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.4	1.3
Alcohol										
Mean (g)	18.8	19.5	15.0	12.1	16.2	7.3	6.2	4.6	2.9	5.2
% of total energy	5.9	5.8	4.7	4.1	5.1	2.9	2.6	2.0	1.3	2.2
Consumers only, % of total energy	9.9	12.5	10.7	8.6	10.3	8.0	7.4	6.3	4.3	6.5
Base (unweighted)										
	194	226	258	268	946	483	494	336	537	1850

Data derived from: Main Report Tables 5.2, 6.2, 6.7a, 6.7b, 6.15, 6.20, 7.2a, 7.2b.

Table X3.1b

Average daily intake of energy (MJ) and macronutrients (g), and intakes expressed as a percentage of Dietary Reference Values, children, by sex and age

Aged 2-18 years

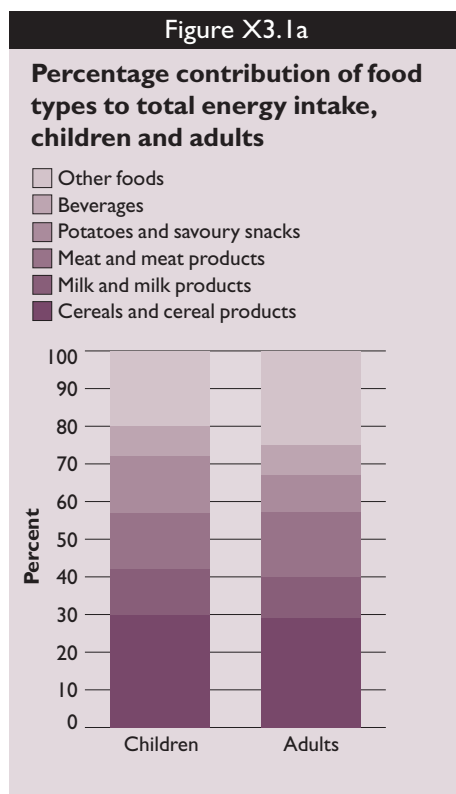
Energy and macronutrients	Boys			Girls		
	Age group		Total	Age group		Total
	2-10	11-18		2-10	11-18	
Total energy intake						
Mean (MJ)	7.07	9.36	8.03	6.40	7.85	7.02
% Estimated Average Requirement	98	93	96	100	97	99
Protein						
Mean (g)	55.0	71.6	62.0	49.9	60.6	54.5
% of Reference Nutrient Intake	251	152	209	236	142	196
Total carbohydrate						
Mean (g)	226.6	296.5	256.1	207.6	247.1	224.5
% of food energy	51.0	50.5	50.8	51.5	50.4	51.0
Non-milk extrinsic sugars (NMES)						
Mean (g)	76.6	102.9	87.7	67.9	80.7	73.4
% of food energy	17.0	17.2	17.1	16.7	16.3	16.5
Non-starch polysaccharides (NSP)						
Mean (g)	10.1	12.6	11.1	9.2	11.5	10.2
% with intakes below 12 g/day	73	52	64	80	61	72
Total fat						
Mean (g)	67.4	89.5	76.7	60.1	76.2	67.0
% of food energy	35.9	36.4	36.1	35.3	36.3	35.7
Saturated fatty acids						
Mean (g)	27.5	33.8	30.1	24.7	28.4	26.3
% of food energy	14.6	13.7	14.2	14.4	13.5	14.0
Cis-monounsaturated fatty acids						
Mean (g)	22.7	31.5	26.4	20.2	26.7	23.0
% of food energy	12.0	12.8	12.4	11.9	12.7	12.2
Cis-n-3 polyunsaturated fatty acids						
Mean (g)	1.5	2.2	1.8	1.4	1.8	1.6
% of food energy	0.8	0.9	0.8	0.8	0.9	0.8
Cis-n-6 polyunsaturated fatty acids						
Mean (g)	8.5	12.7	10.3	7.5	11.5	9.2
% of food energy	4.5	5.2	4.8	4.4	5.4	4.8
Trans fatty acids						
Mean (g)	2.2	3.0	2.6	1.9	2.4	2.1
% of food energy	1.2	1.2	1.2	1.1	1.2	1.2
<i>Base (unweighted)</i>	239	200	439	278	215	493

Data derived from: Main Report Tables 5.2, 6.2, 6.7a, 6.7b, 6.15, 6.20, 7.2a, 7.2b.

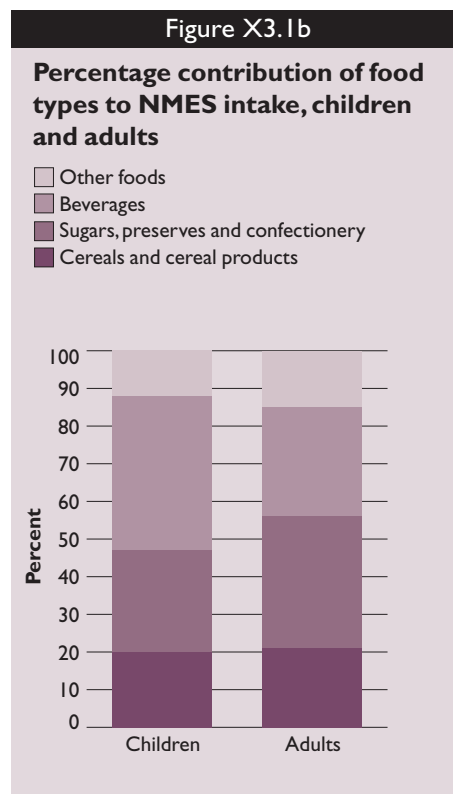
There was some variation in mean NMES intakes by country/region in children but these differences were not statistically significant when expressed as a percentage of energy. Among adults, those in single adult households with children obtained a larger proportion of their energy from NMES compared with other groups, possibly owing to the influence of children's eating habits.

Cereals and cereal products were the main source of carbohydrate intake (adults 42%, children 40%). In adults, the main source of NMES was table sugar, preserves and confectionery (35%, of which table sugar contributed 22%). In children, the main source of NMES was beverages, and, in particular, non-diet soft drinks. (Figure X3.1b)

Further information on intakes of total carbohydrate, NMES, intrinsic and milk sugars and starch, including by country/region, household type and ethnic group, and on the main food sources, can be found in Chapter 6 of the Main Report.



Data derived from: Main Report, Chapter 5, Tables 5.9a, 5.9b. Base: Aged 2 years and over.



Data derived from: Main Report, Chapter 6, Tables 6.12a, 6.12b. Base: Aged 2 years and over.

3.5 Non-starch polysaccharides

Amongst adults, 51% of men and 69% of women fell short of the minimum recommended intake of non-starch polysaccharides (NSP) of 12g per day. The proportion with intakes below the recommended minimum was significantly higher amongst women in Scotland compared with those in England, and in Black women compared with White and Asian women.

(Tables X3.1a, X3.1b)

Cereal and cereal products were the largest source of NSP for adults and children, providing 37% and 38% of intake respectively.

Further information on NSP intakes, including by country/region, household type and ethnic group, and on the main food sources, can be found in Chapter 6 of the Main Report.

3.6 Fat and fatty acids

The proportion of food energy derived from total fat was 35.9% for men, 35.2% for women, 36.1% for boys and 35.7% for girls. These values were generally higher than the UK dietary recommendation of a maximum of 35% of food energy from total fat, although average intakes for men and women aged 50-64 years and women aged 19-34 years did meet the recommendation.

(Tables X3.1a, X3.1b)

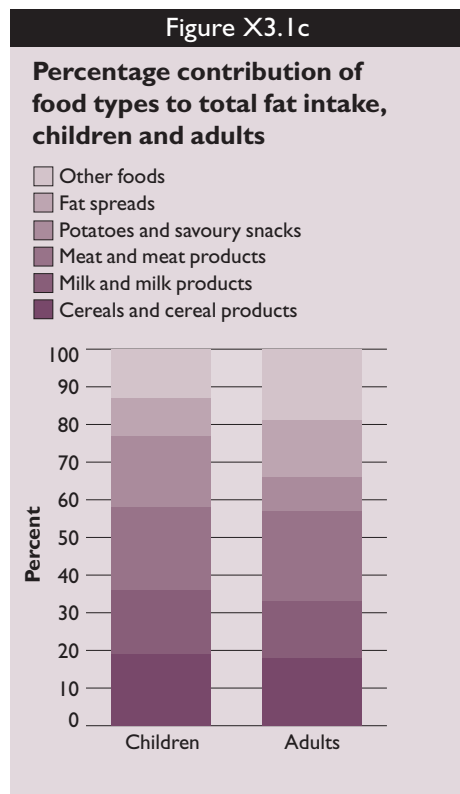
The proportion of food energy derived from fat tended to be highest in Northern Ireland and lowest in England, and, within England, highest in the North region and lowest in the South.

The main contributors to total fat intake in adults' diets were meat and meat products, cereals and cereal products, milk and milk products, fat spreads, potatoes and savoury snacks. In contrast to adults, children obtained a higher proportion of fat intake from potatoes and savoury snacks (adults 9%, children 19%) and confectionery (adults 3%, children 6%; not shown in Figure) but a lower proportion from fat spreads.

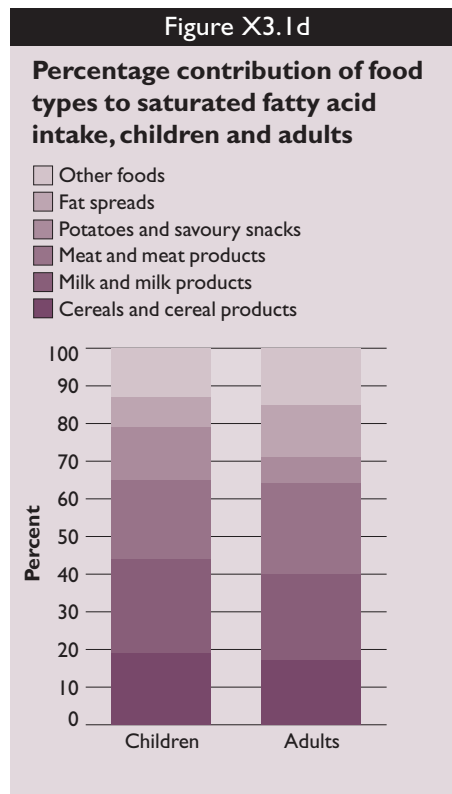
(Figure X3.1c)

Mean intake of saturated fatty acids exceeded the UK dietary recommendation (a maximum of 11% of food energy) in all age groups, but most noticeably in adults aged 65 years and over (men 14.4%, women 14.5%) and children aged 2-10 years (boys 14.6%, girls 14.4%).

(Tables X3.1a, X3.1b)



Data derived from: Main Report, Chapter 7, Tables 7.6a, 7.6b. Base: Aged 2 years and over.



Data derived from: Main Report, Chapter 7, Tables 7.7a, 7.7b. Base: Aged 2 years and over.

Meat products were the main contributor to saturated fatty acid intake in adults (particularly younger adults), closely followed by milk and milk products, while the order was reversed for children, and especially younger children. **(Figure X3.1d)**

Intakes of *cis*-monounsaturated and *cis*-polyunsaturated fatty acids were below recommended levels of 13% and 6.5%, respectively.

However, average intakes of *trans* fatty acids as a percentage of food energy fell below the UK recommendation of not more than 2% in adults and children (e.g. 1.3% of food energy in adults and 1.2% in children). The main sources of *trans* fatty acids were meat and meat products, fat spreads, cereals and cereal products (specifically biscuits, buns, cakes and pastries) and milk and milk products. **(Tables X3.1a, X3.1b, Figure X3.1e)**

Further information on the intakes of fat, fatty acids (saturated, *cis*-monounsaturated, *cis* n-3 polyunsaturated, *cis* n-6 polyunsaturated, *trans*) and cholesterol, including by country/region, household type and ethnic group, and on the main food sources, can be found in Chapter 7 of the Main Report.

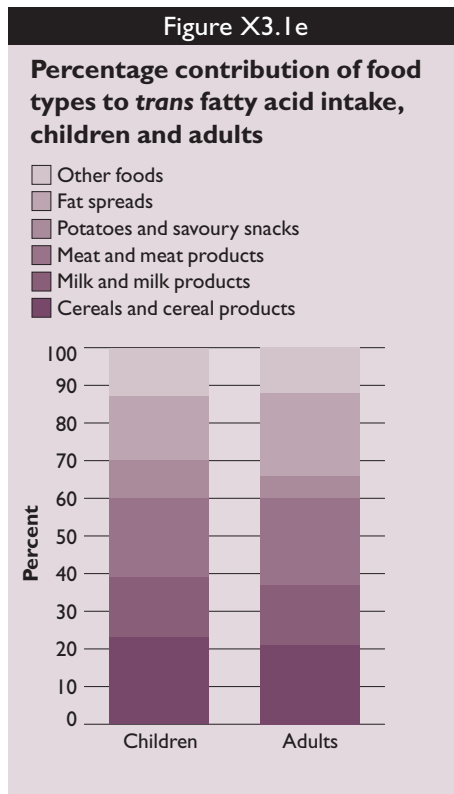
3.7 Alcohol

Overall, men obtained 5.1% and women 2.2% of their total energy from alcohol. For those who consumed alcohol, the values were 10.3% of energy for men and 6.5% for women. High consumers of alcohol (upper 2.5 percentile) derived a much larger proportion of their total energy from alcohol (e.g. 32.1% for men and 19.1% for women). **(Tables X3.1a, X3.1b)**

Further information on alcohol intake for adults, including by country/region and household type, can be found in Chapter 6 of the Main Report. In addition, self-reported information on the consumption of alcoholic drinks by adults was collected as part of the main interview and is reported in Chapter 16 of the Main Report.

3.8 Comparisons with the general population (NDNS)

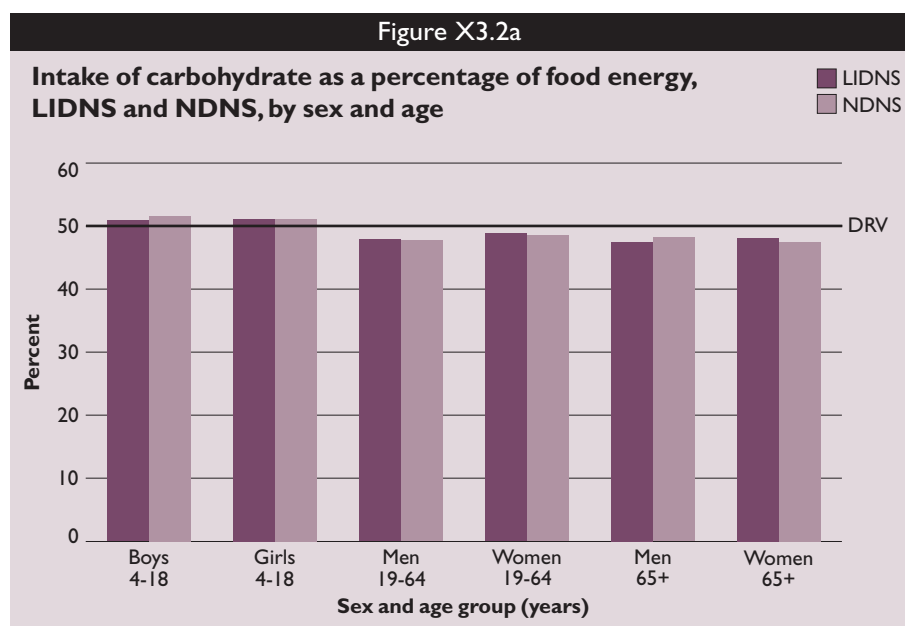
The age and sex differences in energy intake found in LIDNS largely mirror those seen in the general population, as assessed by the NDNS.⁴⁵⁶ For boys and women, mean daily total energy intakes in LIDNS were similar to those in the NDNS, while for girls intakes were slightly higher in LIDNS and for men intakes were higher in NDNS.



Data derived from: Main Report, Chapter 7, Tables 7.8a, 7.8b.
Base: Aged 2 years and over.

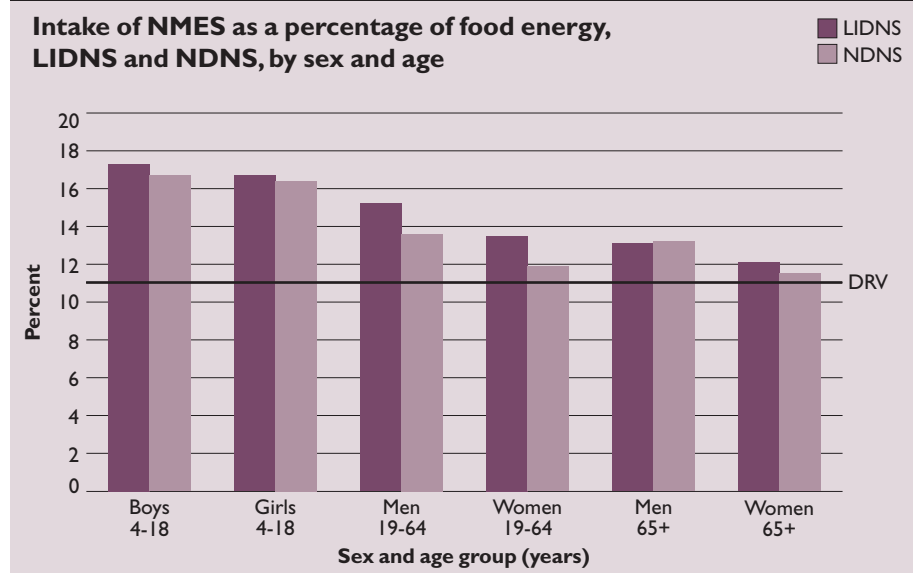
Mean carbohydrate intake and its contribution to food energy were similar in the low income and the general populations. However, there was a notable difference in the mean intake and percentage of food energy from NMEs which was higher in all age groups in LIDNS, with the exception of men aged 65 years and over. Non-diet soft drinks contributed more to NMEs intakes in LIDNS compared with the NDNS, particularly in children. (Figures X3.2a, X3.2b)

Comparing the LIDNS findings on NSP with those in the general population, a greater percentage of men and women aged 19-64 years had mean intakes of NSP below 12g in LIDNS than in NDNS. This is consistent with the finding that generally the low income population consumed lower amounts of wholemeal bread, wholegrain and high fibre breakfast cereals and vegetables.



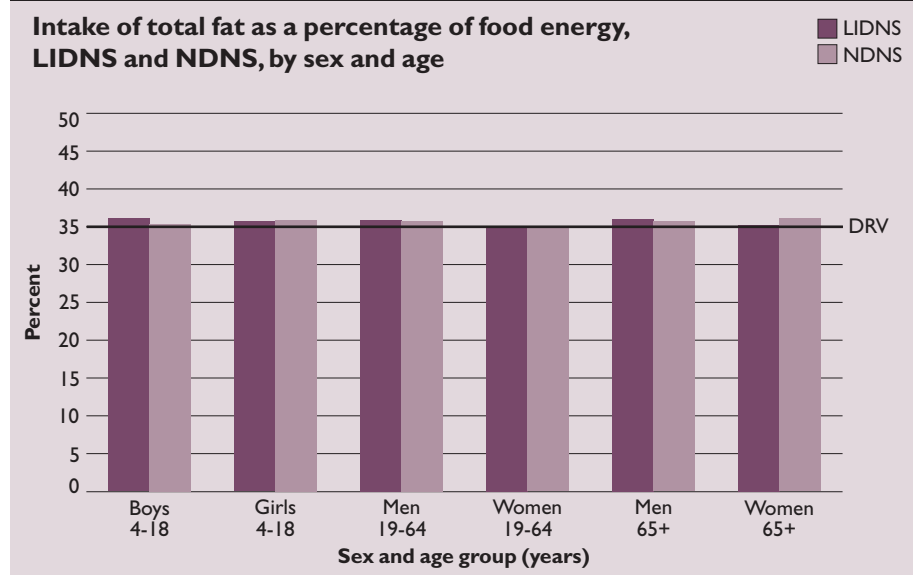
Data derived from: Main Report, Chapter 10, Tables 10.3a, 10.3b.
Base: Aged 4 years and over.

Figure X3.2b



Data derived from: Main Report, Chapter 10, Tables 10.3a, 10.3b.
Base: Aged 4 years and over.

Figure X3.2c

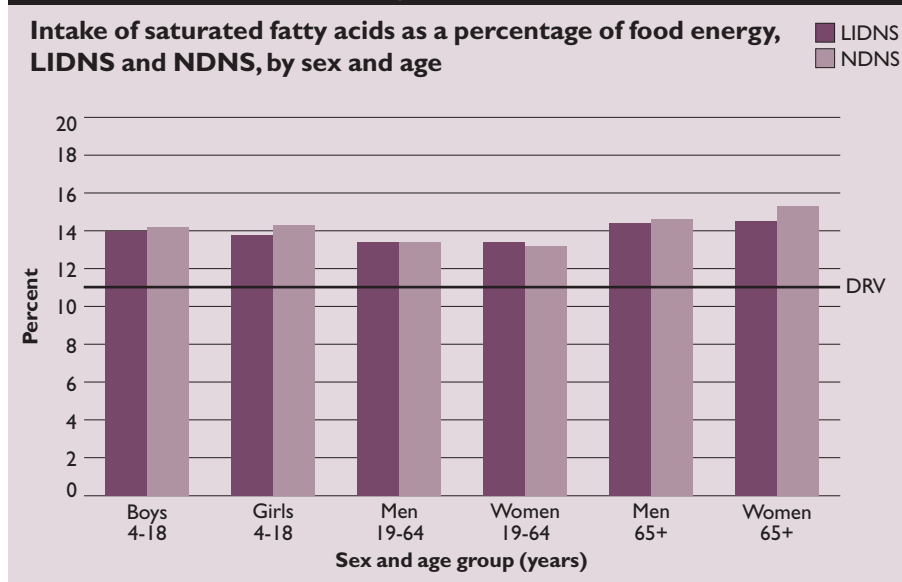


Data derived from: Main Report, Chapter 10, Tables 10.3a, 10.3b.
Base: Aged 4 years and over.

Fat intakes as a proportion of food energy were broadly similar to those in the general population. The proportion of food energy derived from saturated fatty acids was lower in LIDNS children and adults aged 65 years and over compared with the general population. Potatoes and savoury snacks contributed more total fat and saturated fatty acids in children in LIDNS. The contribution of *trans* fatty acids to energy intake was similar between LIDNS and NDNS for adults aged 19-64 years. However, it was slightly lower in LIDNS compared with NDNS in children and in adults aged 65 years and over. **(Figure X3.2c, X3.2d)**

Amongst adults aged 19-64 years, the mean daily intake of alcohol was lower in LIDNS than in the general population. However, amongst consumers only, mean daily intakes were greater in LIDNS than in NDNS.

Figure X3.2d



Data derived from: Main Report, Chapter 10, Tables 10.3a, 10.3b.
Base: Aged 4 years and over.

4 Vitamin and mineral intakes

4.1 Introduction

Information from the four 24 hour dietary recalls on the types and amounts of food consumed was linked to a nutrient databank in order to calculate nutrient intakes.²⁵ No attempt was made to adjust the nutrient intakes presented here to take account of misreporting (see Section 1.2.3 of this Summary and Chapter 11 of the Main Report). Information on selected micronutrients is presented here.

Recommendations, in the form of DRVs,²⁶ have been published for micronutrients. These include:

- Reference Nutrient Intake (RNI), which is the amount that is sufficient to meet the needs of most (about 97%) of the population group.
- Lower Reference Nutrient Intake (LRNI), which is the amount that is sufficient to meet the needs of only the few people in a population group who have very low requirements.

If the average (mean) intake of a population group is equal to the RNI, then the risk of deficiency in the group is considered to be very small. The further below the RNI the population average intake falls, however, the greater the likelihood that some individuals within the group will have an intake below their requirements. This becomes even more likely if more than 3% of the group has an intake below the LRNI. However, low intakes during the dietary recording period do not necessarily indicate deficiency. For example, some nutrients, such as vitamins A and D and iron are stored by the body. Assessment of nutritional status by measurement of blood analytes (see Section 5 of this Summary and Chapter 14 of the Main Report) is used in conjunction with dietary data.

Intakes of selected vitamins and minerals from food sources only by sex and age are presented in Table X4.1a for adults, and Table X4.1b for children. Data are expressed as mean intakes and as a percentage of the RNIs, where these have been set. Tables X4.2a (adults) and X4.2b (children) show the proportions of adults and children with intakes below the LRNI for specific nutrients. (Tables X4.1a, X4.1b, X4.2a, X4.2b)

For some adults,²⁷ dietary supplements provided an additional source of micronutrients. However, intake data suggested that vitamin supplement users typically obtained sufficient vitamins from food sources alone to meet their requirements. Dietary supplements containing minerals had little effect on the proportion of adults with intakes below the LRNI, suggesting that those individuals with sub-optimal intakes were unlikely to be taking dietary supplements.

Table X4.1a

Daily intake of vitamins and minerals (mg or µg), and intake expressed as a percentage of the Reference Nutrient Intake, adults, by sex and age
Aged 19 years and over^a

Vitamins and minerals	Men					Women				
	Age group					Age group				
	19-34	35-49	50-64	65+	Total	19-34	35-49	50-64	65+	Total
Vitamin A										
Mean (µg)	795	824	1342	1144	1029	677	809	982	1096	892
% of RNI	114	118	192	163	147	113	135	164	183	149
Thiamin										
Mean (mg)	1.68	1.50	1.65	1.53	1.59	1.27	1.27	1.34	1.34	1.30
% of RNI	168	150	183	170	167	159	158	167	167	163
Riboflavin										
Mean (mg)	1.79	1.74	1.87	1.73	1.78	1.33	1.42	1.49	1.54	1.44
% of RNI	137	134	144	133	137	120	129	135	140	131
Niacin equivalent										
Mean (mg)	40.9	37.7	37.3	33.3	37.1	29.4	28.6	28.9	26.9	28.3
% of RNI	241	222	232	208	225	226	220	240	224	226
Vitamin B₆										
Mean (mg)	2.5	2.3	2.4	2.1	2.3	1.8	1.8	1.7	1.7	1.8
% of RNI	175	163	168	151	163	154	147	145	143	147
Vitamin B₁₂										
Mean (µg)	5.5	5.6	7.6	6.1	6.2	4.0	4.8	5.0	5.0	4.6
% of RNI	366	374	509	409	413	263	317	330	332	310
Folate										
Mean (µg)	288	270	288	258	275	207	208	223	220	214
% of RNI	144	135	144	129	137	104	104	112	110	107
Vitamin C										
Mean (mg)	74.0	57.9	76.4	63.0	67.5	70.7	63.0	74.2	67.2	68.1
% of RNI	185	145	191	157	169	177	158	186	168	170
Vitamin D										
Mean (µg)	3.01	3.03	3.67	3.41	3.28	2.16	2.52	2.83	2.64	2.51
Iron										
Mean (mg)	11.6	10.8	11.5	10.2	11.0	8.5	8.7	8.8	9.0	8.7
% of RNI	134	124	133	117	126	58	59	99	103	79
Calcium										
Mean (mg)	936	901	889	834	887	675	718	751	725	714
% of RNI	134	129	127	119	127	96	103	107	104	102
Magnesium										
Mean (mg)	272	262	254	229	253	195	194	201	188	194
% of RNI	91	87	85	76	84	72	72	74	70	72
Sodium										
Mean (mg)	3221	2935	2850	2681	2910	2199	2109	2117	1996	2099
% of RNI	201	183	178	168	182	137	132	132	125	131
Potassium										
Mean (mg)	3012	2944	2980	2619	2873	2340	2334	2419	2288	2334
% of RNI	86	84	85	75	82	67	67	69	65	67
Zinc										
Mean (mg)	9.6	9.3	9.5	8.3	9.1	6.7	7.0	6.9	6.8	6.9
% of RNI	101	98	100	87	96	96	101	99	98	98
Iodine										
Mean (µg)	197	198	197	185	194	137	151	158	158	151
% of RNI	141	142	141	132	138	98	108	113	113	108
Copper										
Mean (µg)	1.26	1.15	1.25	1.11	1.19	0.87	0.88	0.95	0.89	0.89
% of RNI	105	96	104	92	99	72	74	80	74	74

Data derived from: Main Report Tables 8.3a, 8.3b, 9.3a, 9.3b.

^a Bases are as shown in Table X3.1a.

Table X4.1b

Daily intake of vitamins and minerals (mg or µg), and intake expressed as a percentage of the Reference Nutrient Intake, children, by sex and age

Aged 2-18 years^a

Vitamins and minerals	Boys			Girls		
	Age group		Total	Age group		Total
	2-10	11-18		2-10	11-18	
Vitamin A						
Mean (µg)	733	625	687	527	568	545
% of RNI	165	98	137	120	95	109
Thiamin						
Mean (mg)	1.47	1.82	1.62	1.29	1.47	1.37
% of RNI	223	187	208	199	201	200
Riboflavin						
Mean (mg)	1.64	1.70	1.66	1.38	1.30	1.35
% of RNI	198	137	172	171	118	149
Niacin equivalent						
Mean (mg)	28.0	35.7	31.2	24.8	29.1	26.6
% of RNI	260	220	243	233	229	232
Vitamin B₆						
Mean (mg)	1.9	2.3	2.1	1.8	1.9	1.8
% of RNI	215	176	198	198	181	191
Vitamin B₁₂						
Mean (mg)	4.4	4.6	4.5	3.8	3.7	3.7
% of RNI	566	346	473	495	286	406
Folate						
Mean (µg)	194	232	210	176	201	187
% of RNI	173	116	149	167	101	138
Vitamin C						
Mean (mg)	76.7	74.5	75.8	89.6	78.0	84.6
% of RNI	256	201	233	299	213	262
Vitamin D						
Mean (µg)	2.00	2.43	2.18	1.74	2.07	1.88
Iron						
Mean (mg)	9.0	11.4	10.0	7.9	9.3	8.5
% of RNI	120	101	112	107	63	88
Calcium						
Mean (mg)	819	913	859	710	723	715
% of RNI	176	91	140	156	90	128
Magnesium						
Mean (mg)	186	228	204	168	198	181
% of RNI	133	79	110	125	69	101
Sodium						
Mean (mg)	2133	2977	2489	2008	2481	2211
% of RNI	258	186	228	253	155	211
Potassium						
Mean (mg)	2198	2650	2389	2042	2355	2176
% of RNI	166	81	130	161	73	123
Zinc						
Mean (mg)	6.4	8.1	7.1	5.6	6.9	6.2
% of RNI	100	88	95	89	85	87
Iodine						
Mean (µg)	152	152	152	132	129	131
% of RNI	160	114	140	141	97	122
Copper						
Mean (µg)	0.73	1.02	0.86	0.69	0.87	0.76
% of RNI	123	117	120	117	100	110

Data derived from: Main Report Tables 8.3a, 8.3b, 9.3a, 9.3b.

^a Bases are as shown in Table X3.1b.

4.2 Vitamins

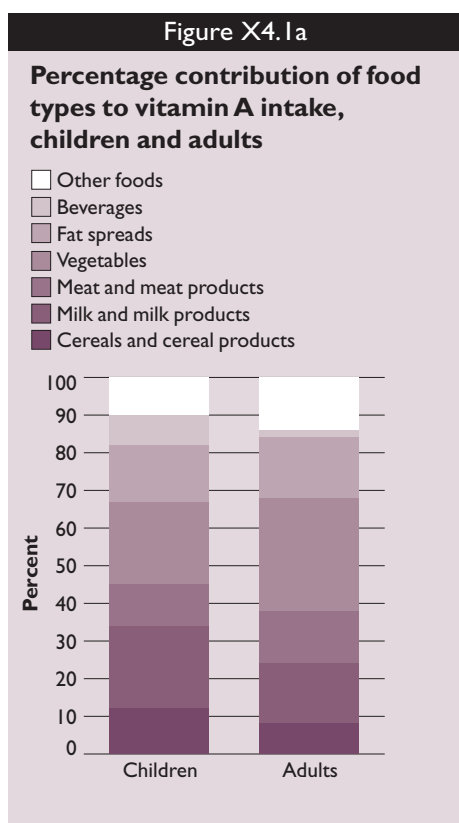
Average (mean and median) daily intakes of all vitamins from food sources, with the exception of vitamins A²⁸ and D, were above or close to the RNI for males and females in all age groups.

There was a wide distribution of vitamin A intakes; younger adults tended to have lower intakes compared with those aged 50 years and over. A proportion of adults and children in all age groups had intakes of vitamin A below the LRNI (ranging from 7-18%), particularly older children and younger adults. However, a proportion of adults exceeded the maximum intake of pre-formed retinol recommended by the Scientific Advisory Committee on Nutrition (SACN).²⁹ There was some variation in mean vitamin A intake and proportions with low intakes by country/region and by household type.

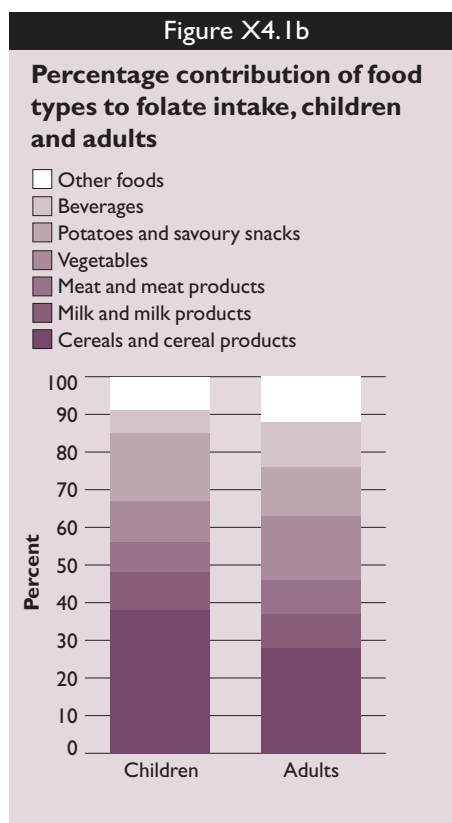
The main sources of vitamin A were vegetables, milk and milk products, fat spreads and meat and meat products. **(Figure X4.1a)**

There was evidence of low intakes of riboflavin, particularly among older children aged 11-18 years, men aged 19-34 years and women aged 19-49 years. The main source of riboflavin, particularly amongst children, was milk and milk products.

While all male and female age groups had mean daily intakes of folates from food sources above the RNI, a proportion of the low income population had intakes below the LRNI, with this proportion higher amongst women than men. Cereals and cereal products, mainly fortified breakfast cereals but also white bread, were the main sources of folate. Beverages (mainly beer and lager) provided more folate in men compared with women and children. **(Figure X4.1b)**



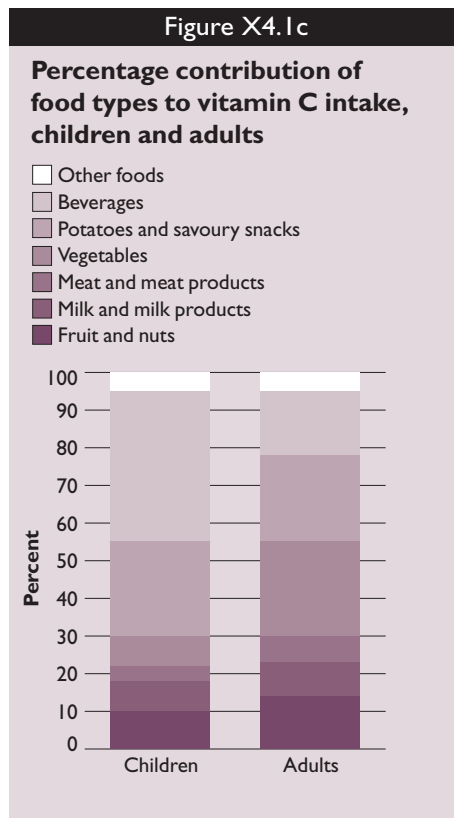
Data derived from: Main Report, Chapter 8, Tables 8.6a, 8.6b. Base: Aged 2 years and over.



Data derived from: Main Report, Chapter 8, Tables 8.8a, 8.8b. Base: Aged 2 years and over.

The range of vitamin C intakes was wide, but average daily intakes were well above the RNIs for males and females in all age groups. The main sources of vitamin C in adults were vegetables and potatoes and savoury snacks, while beverages (including soft drinks and fruit juice) and potatoes and savoury snacks were the main sources in children. **(Figure X4.1c)**

Exposure to ultraviolet light is known to be the main source of vitamin D for most people. Therefore, no DRVs are set for children and adults aged 4-64 years. However, for the two age groups in this survey with RNIs set for vitamin D, mean daily intakes were well below the RNI



Data derived from: Main Report, Chapter 8, Tables 8.9a, 8.9b.
Base: Aged 2 years and over.

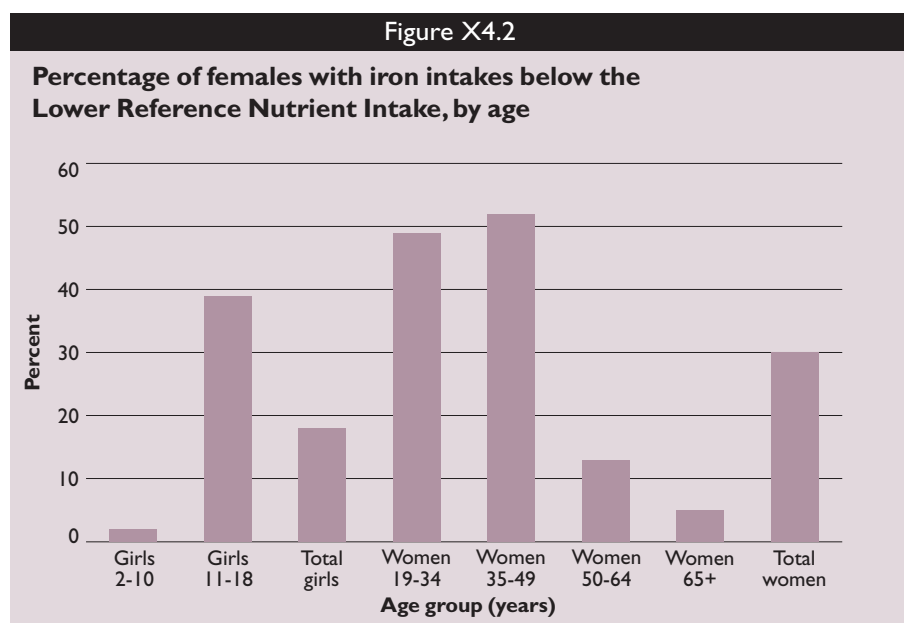
(22% of the RNI for children aged 2-3 years, and 34% and 26% of the RNI for men and women aged 65 years and over).

More detailed information on intakes, DRVs (where set) and food sources of these and other vitamins (e.g. retinol, carotene, pantothenic acid, biotin, vitamin E) can be found in Chapter 8 of the Main Report.

4.3 Minerals

Average intakes of total iron fell below the RNI for women aged 19-49 years and girls aged 11-18 years. Overall, 30% of women had intakes of total iron below the LRNI; this included half of women aged 19-49 years and almost 40% of girls aged 11-18 years. A much higher proportion (about one-half) of women living in households with children had intakes below the LRNI compared with other household types.

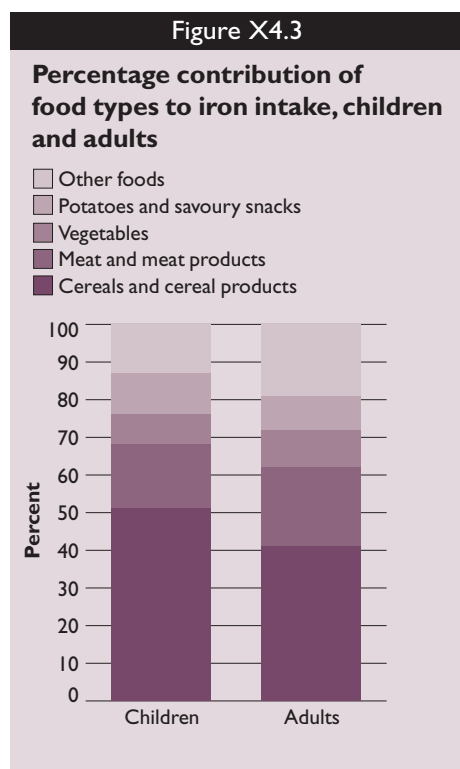
(Figure X4.2)



Data derived from: Main Report, Chapter 9, Table 9.3b.
Base: Females aged 2 years and over.

Cereals and cereal products were the main source of iron for both adults and children, with meat and meat products, vegetables, and potatoes and savoury snacks also important contributors.

(Figure X4.3)



Data derived from: Main Report, Chapter 9, Tables 9.4a, 9.4b.
Base: Aged 2 years and over.

Substantial proportions of adults and children aged 11-18 years had intakes of magnesium and potassium below the LRNI. There was also evidence of low intakes of calcium and iodine in men aged 19-34 years, women in all age groups and children aged 11-18 years. Substantial proportions of adults and children in all age groups had intakes of zinc below the LRNI (ranging from 8-21%).

Estimates of sodium intake exclude salt added at the table or in cooking and are therefore an underestimate, in most cases, of true sodium intake. Nonetheless, for men and boys aged 11-18 years, even these intakes exceeded the SACN target to reduce average total salt intake in adults (aged 15 years and over) to 6g per day (2400 mg sodium).³⁰

Sixty-six percent of adults lived in households where it was reported that salt was added during cooking. Thirty percent of men, 22% of women, 13% of boys and 12% of girls reported that they always added salt at the table.

More detailed information on intakes, DRVs (where set) and food sources of these and other minerals (e.g. phosphorus, chloride, iodine) can be found in Chapter 9 of the Main Report.

4.4 Comparisons with the general population (NDNS)

Mean daily intakes of most vitamins and many minerals were above or close to the RNI in the different sex and age groups in both LIDNS and NDNS.^{4 5 6} For those where mean intakes fell below the RNI in specific age groups, this was usually the case for the same groups in both surveys. For example, women aged 19-64 years in both surveys had mean daily intakes of total iron, magnesium, potassium and copper below the RNI. However, low income women had lower mean intakes of these minerals, especially for iron (68% of RNI in LIDNS, 82% of RNI in NDNS). For total iron, magnesium and zinc, girls in LIDNS had higher intakes expressed as a percentage of RNI compared with girls in NDNS, possibly owing to their higher meat consumption.

Table X4.2a

Percentage of adults with average daily intakes of vitamins and minerals below the Lower Reference Nutrient Intake, by sex and age

Aged 19 years and over^a

Vitamins and minerals	Men					Women				
	Age group				Total	Age group				Total
	19-34	35-49	50-64	65+		19-34	35-49	50-64	65+	
Vitamins										
Vitamin A	18	14	10	7	12	11	15	9	7	10
Riboflavin	15	8	2	9	9	20	19	13	8	15
Folate	5	4	3	5	4	6	8	8	5	7
Minerals										
Iron	5	5	4	3	4	49	52	13	5	30
Calcium	14	7	4	4	7	15	12	11	8	11
Magnesium	24	24	27	36	28	23	30	24	26	26
Potassium	18	13	12	28	18	32	37	33	35	34
Zinc	16	13	10	18	14	11	9	13	8	10
Iodine	9	3	3	3	5	13	12	8	6	10

Data derived from: Main Report Tables 8.3a, 8.3b, 9.3a, 9.3b.

^a Bases are as shown in Table X3.1a.

Nutrients included are those for which the percentage with intakes below the LRNI exceeded 5% in one or more age groups.

Table X4.2b

Percentage of children with average daily intakes of vitamins and minerals below the Lower Reference Nutrient Intake, by sex and age

Aged 2-18 years^a

Vitamins and minerals	Boys			Girls		
	Age group		Total	Age group		Total
	2-10	11-18		2-10	11-18	
Vitamins						
Vitamin A	11	12	11	14	17	15
Riboflavin	1	15	7	-	21	9
Folate	-	7	3	-	5	2
Minerals						
Iron	2	14	7	2	39	18
Calcium	1	10	5	1	13	6
Magnesium	2	33	15	2	46	21
Potassium	1	22	10	-	23	10
Zinc	10	21	15	18	18	18
Iodine	1	9	5	2	13	7

- No observations

Data derived from: Main Report Tables 8.3a, 8.3b, 9.3a, 9.3b.

^a Bases are as shown in Table X3.1b.

Nutrients included are those for which the percentage with intakes below the LRNI exceeded 5% in one or more age groups.

There were some differences in the percentage contributions of main food types to micronutrient intake between the low income and general populations. For example, adults and children in LIDNS obtained more of their vitamin C intake from potatoes and savoury snacks and adults obtained less from fruit and fruit juice compared with those in NDNS. In addition, fish and fish dishes contributed less to vitamin D intake in LIDNS adults and children.

5 Blood markers of nutritional status

5.1 Introduction

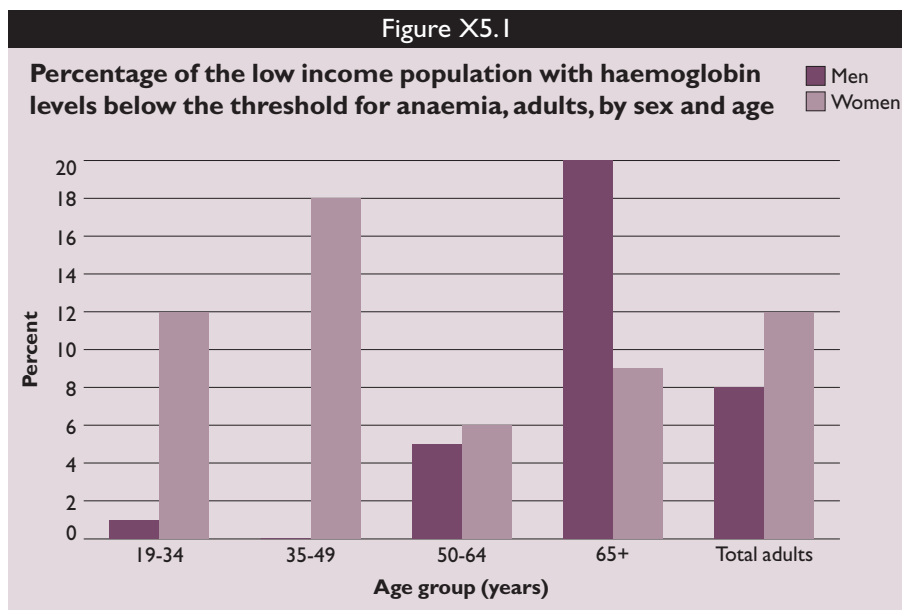
Assessment of nutritional status includes measures of the concentrations and functional adequacy of nutrients absorbed by the body, including amounts held in body stores. Blood samples (non-fasting) obtained from LIDNS respondents were analysed for a range of components used as markers of nutritional status. Information on selected nutrients discussed in earlier sections is presented here. Owing to the low response rates for blood sampling and hence the small sample size, results for children should be interpreted with caution. In addition, it was difficult to make comparisons with the general population for most blood analytes owing to methodological differences between LIDNS and NDNS (see Main Report, Chapter 14).

5.2 Micronutrients

In many respects, the results of blood analyses suggested adequate micronutrient status. This section highlights the nutrients for which blood analyte concentrations suggested sub-optimal status in one or more age/sex groups. For most micronutrients, there were few significant differences in status by country/region.

5.2.1 Iron status

The prevalence of anaemia was 8% in men and 12% in women, based on haemoglobin concentration. The estimated prevalence of iron deficiency (low iron stores) was 1% to 4% in all men and 6% to 11% in all women, based on serum ferritin (which is an indicator of long-term iron intake) and serum transferrin receptor concentration, but within this there were age group differences. For example, serum ferritin concentrations below the threshold indicating low iron stores were found in 16% of girls aged 11-18 years, 21% of women aged 19-34 years and 14% of women aged 35-49 years. **(Figure X5.1)**



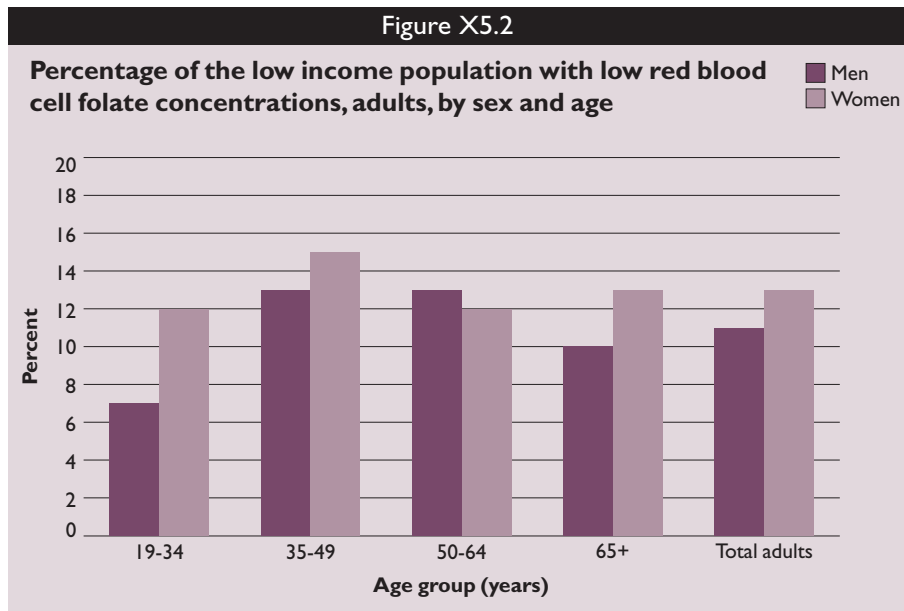
Data derived from: Main Report, Chapter 14, Table 14.3a.
Base: Aged 19 years and over.
Thresholds were <13g/dl for men and <12g/dl for women.

Overall, indices of poor iron status were most common in men aged 65 years and over, in women aged 19-49 years, and in children aged 11-18 years. For females, the same age groups tended to have low iron intakes (see Tables X4.1a and X4.1b).

5.2.2 Water-soluble vitamins and homocysteine

Thirteen percent of women and 11% of men had low concentrations of red blood cell folate, indicating sub-optimal status. Since red blood cell folate is a marker of long-term dietary intakes, correlation with recent dietary intake data is not appropriate. Similar proportions (12%

of men and 13% of women) had low concentrations of plasma folate, which reflects more recent intake. This compares with dietary intakes below the LRNI in 4% of men and 7% of women (see Table X4.2a). (Figure X5.2)



Data derived from: Main Report, Chapter 14, Table 14.5a.
Base: Aged 19 years and over.
Threshold was <350nmol/l red blood cells.

Only one-fifth of men and one-third of women had plasma homocysteine concentrations in the range associated with lower risk of coronary heart disease. The prevalence of unfavourable plasma homocysteine concentrations was higher amongst the older age groups, and particularly those aged 65 years and over, in both men and women. However, there are many confounding factors, including smoking and drinking and the use of non-fasting blood samples. There was no obvious association between the high prevalence of raised homocysteine concentrations in adults and low intakes of dietary folate, which is one of a number of modulators of homocysteine levels.

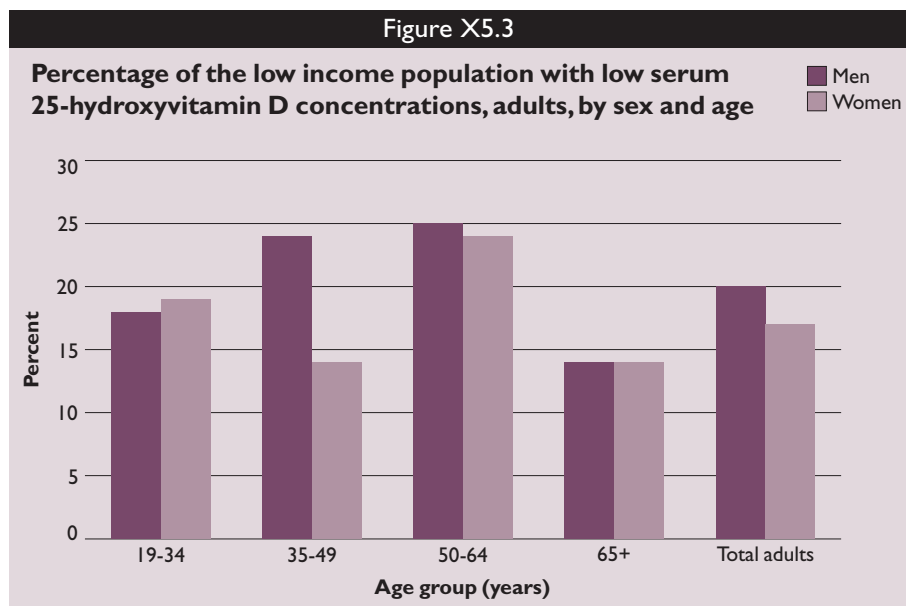
Concentrations of vitamin B₁₂ were above the cut-off point for normal status for adults in most sex and age groups. The exceptions were men aged 65 years and over, where 10% had low serum concentrations, and women aged 19-34 years, where 7% had low serum concentrations; there was no clear dietary evidence of vitamin B₁₂ inadequacy to explain the prevalence of low vitamin B₁₂ status in these two age groups.

Overall 47% of men and 35% of women had plasma vitamin C concentrations in the depleted or deficient range. Concentrations suggesting depletion or deficiency were found in a proportion of men and women across all age groups. This is in contrast with dietary intake data, which suggested that average intakes were well above the RNI and that very few adults had intakes below the LRNI. Non-dietary factors such as smoking and infection can contribute to reduced circulating concentrations of vitamin C.

5.2.3 Fat-soluble vitamins

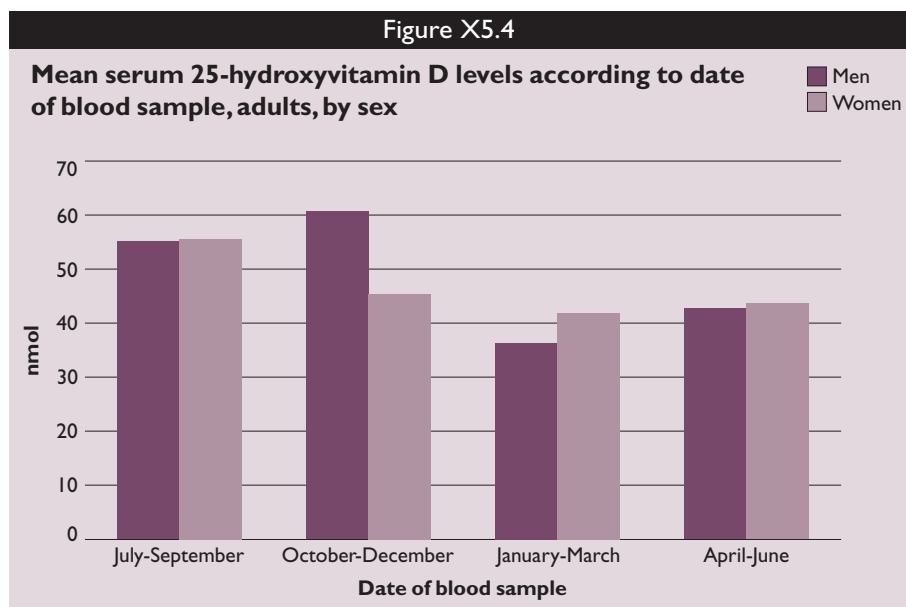
Plasma retinol concentrations were generally above the cut-off points for low status, with less than 1% of men and women overall having mean plasma retinol concentrations suggesting marginal deficiency. Dietary intake data showed that a proportion of all age/sex groups had intakes below the LRNI. However, plasma retinol reflects retinol stores in the liver and thus is related to long-term dietary intake of vitamin A.

One-fifth of adults had plasma 25-hydroxyvitamin D concentrations below the cut-off point for low vitamin D status. (Figure X5.3)



Data derived from: Main Report, Chapter 14, Table 14.7a.
 Base: Aged 19 years and over.
 Threshold was <25nmol/l.

As would be expected, the proportion was higher in blood samples taken in the winter, owing to lower exposure to ultra-violet light, which is the main source of vitamin D in most people. Low vitamin D status was more common among women in Scotland than women in the other countries, but no difference was seen for men. (Figure X5.4)



Data source: Main Report, Chapter 14, Figure 14.1.
 Base: Aged 19 years and over.

There were no apparent associations between biochemical measures of vitamin D status and dietary intake, mainly owing to the action of sunlight but also due to the limited distribution of vitamin D in foods.

Only a very small proportion of adults had plasma α -tocopherol concentrations below the threshold suggesting dietary insufficiency, a finding consistent with the apparently adequate dietary vitamin E intake.

5.2.4 Comparisons with the general population (NDNS)

Compared with the general population (NDNS),⁴⁶ a higher proportion of women aged 19-64 years (LIDNS 13%, NDNS 8%) and men aged 65 years and over (LIDNS 20%, NDNS 11%) had haemoglobin concentrations below the threshold for anaemia.³¹ Mean serum ferritin

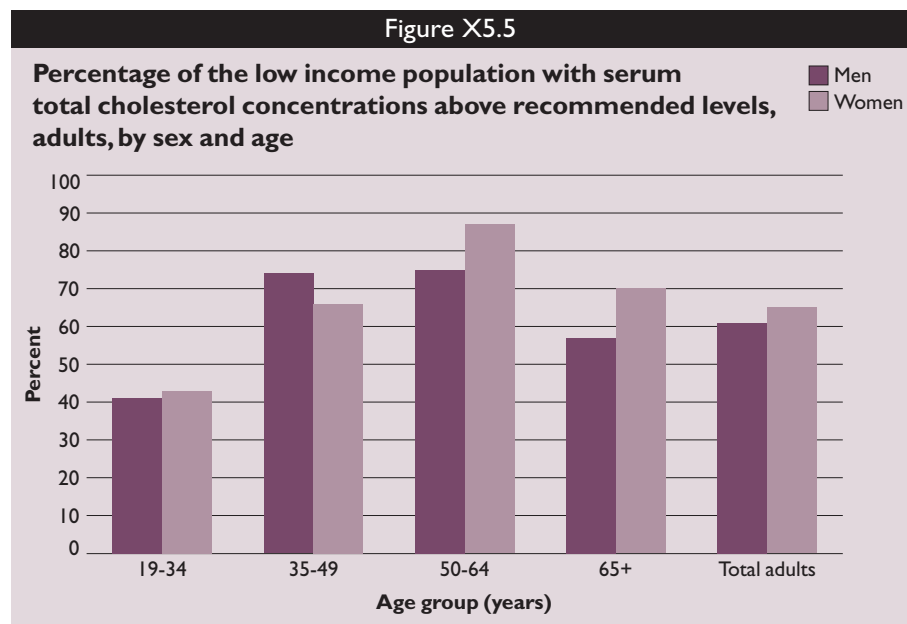
concentrations were higher in LIDNS, but this may in part be a consequence of infection (ferritin is an acute phase protein elevated during infection).

Comparisons of folate status with the NDNS need to be interpreted with caution owing to the use of different analytical methodology, but a greater proportion of LIDNS adults aged 19-64 years and a lower proportion of LIDNS adults aged 65 years and over had red blood cell folate concentrations below the threshold.

The proportions of adults with plasma 25-hydroxyvitamin D concentrations below the cut-off point for low vitamin D status tended to be higher, in most cases, in LIDNS (e.g. 14% of both men and women aged 65 years and over) than those found in NDNS (e.g. 6% of men and 10% of women aged 65 years and over).

5.3 Blood lipids

A total cholesterol concentration above 5.0 mmol/l is associated with higher risks of cardiovascular disease. Overall, 61% of men and 65% of women had concentrations of serum total cholesterol of 5.0 mmol/l or above. **(Figure X5.5)**



Data derived from: Main Report, Chapter 14, Table 14.11a.
Base: Aged 19 years and over.
Threshold was ≥ 5.0 mmol/l.

Overall, 13% of men and 3% of women had serum high-density lipoprotein (HDL) cholesterol concentrations indicative of a higher risk of cardiovascular disease. However, over 80% of adults had high serum concentrations of non-HDL cholesterol, which was used as an estimate of serum low-density lipoprotein (LDL) cholesterol, a risk factor for cardiovascular disease. (The non-HDL values tend to over-estimate the prevalence of high concentrations of LDL cholesterol.)

There were no obvious or simple associations between dietary fat intake and concentrations of blood lipids, which are affected by a range of factors (e.g. smoking, drinking and exercise) as well as diet.

Comparisons with the general population

The prevalence of raised total cholesterol concentrations is similar to that found in the 2003 Health Survey for England (HSE),^{32,33} where 66% of both men and women had serum total cholesterol concentrations at or above 5.0 mmol/l.

Further details of the full range of blood analytes (including haematocrit, transferrin receptor, mean corpuscular haemoglobin, red cell distribution width, plasma folate, plasma carotenoids, and C-reactive protein) are presented in Chapter 14 of the Main Report.

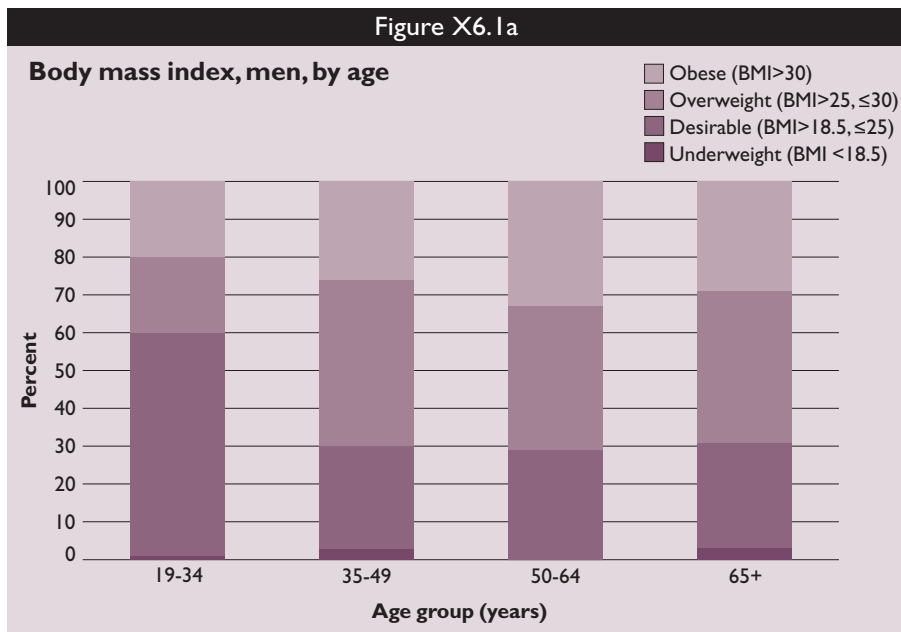
6 Physical measurements, blood pressure and physical activity

6.1 Physical measurements

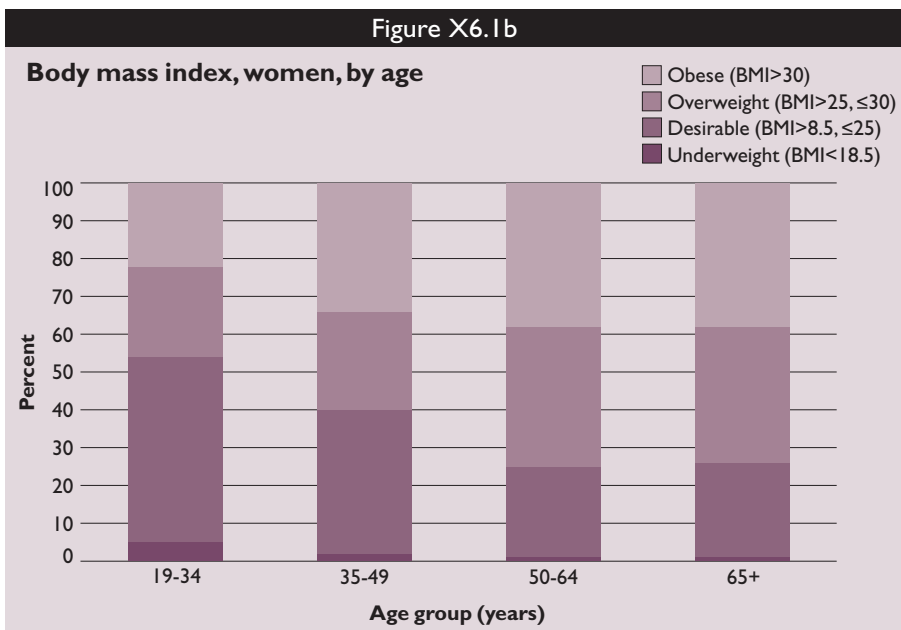
Physical measurements undertaken in LIDNS included height, weight and body mass index (BMI: kg/m²) for those aged 2 years and over; mid-upper arm circumference (MUAC) for those aged 2-15 years; and waist and hip circumferences for those aged 11 years and over.

The prevalence of underweight (BMI <18.5) in adults in this population was low (2% of both men and women). Conversely, 62% of men and 63% of women were overweight (BMI >25) or obese (BMI >30); the proportion was higher in the older age groups compared with adults aged 19-34 years. However, mean energy intakes in these groups were on average below the EAR, suggesting that either energy requirements have been overestimated or that reported energy intakes have been underestimated or varied from normal during the study period.

(Figures X6.1a, X6.1b)



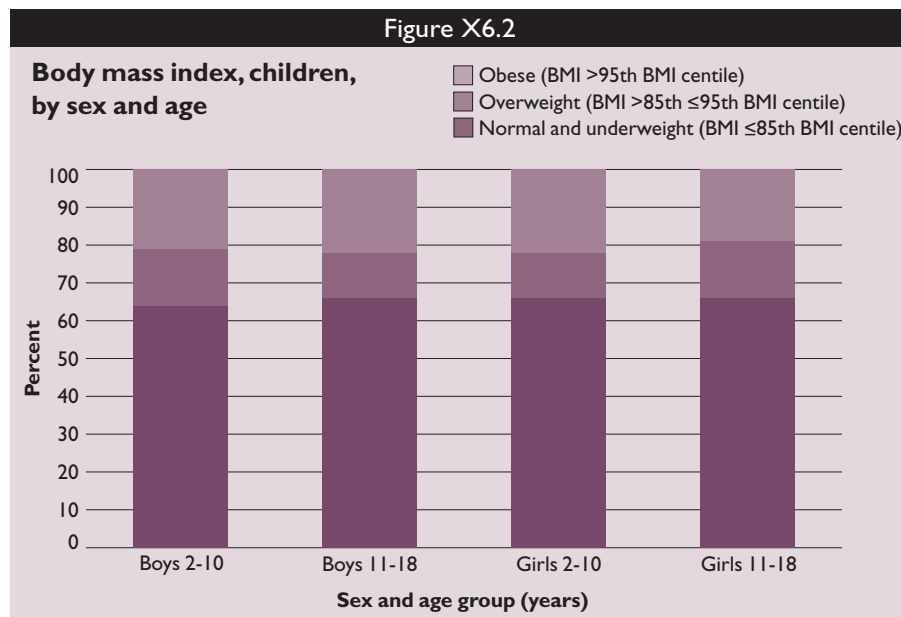
Data derived from: Main Report, Chapter 12, Table 12.4a.
Base: Men aged 19 years and over.



Data derived from: Main Report, Chapter 12, Table 12.4a.
Base: Women aged 19 years and over.

Amongst children, the only physical incidence of undernutrition was in young girls, of whom 2% aged 2-5 years had a mid-upper arm circumference (MUAC) that fell below the normal range. By contrast, about one-fifth (21%) of children were obese (defined as >95th BMI centile for age), and a further 14% were overweight (>85th BMI centile, ≤95th BMI centile for age).

(Figure X6.2)



Data derived from: Main Report, Chapter 12, Table 12.4b.
Base: Children aged 2-18 years.

Waist and hip circumferences and waist-hip ratio (WHR) provide measures of central obesity, which is linked to increased risk of chronic diseases. Overall, 38% of men and 49% of women had a raised waist circumference, while 45% of men and 42% of women had a raised WHR (defined as ≥ 0.95 for men and ≥ 0.85 for women). The mean WHR increased with increasing age in adults, with fewer men (19%) and women (24%) aged 19-34 years having a raised WHR compared with men and women aged 50-64 years and 65 years and over (55-62%).

A larger proportion of men in Wales and women in Scotland were overweight including obese compared with England and Northern Ireland. Similarly, a greater proportion of boys in Wales and girls in Northern Ireland were classified as overweight including obese. However none of these differences were statistically significant. There were no significant variations in mean BMI by country/region.

Differences in physical measurements in adults by household type were largely accounted for by variation in the age distribution between household types. However, the prevalence of overweight and obesity was higher among girls living in single adult households (17% and 22% respectively) than among girls living in households with two or more adults (9% and 19% respectively).

Comparisons with the general population

Compared with the general population (NDNS,⁴⁶ HSE,³² Scottish Health Survey (SHS)³⁴), women in LIDNS were heavier, had a higher mean BMI and, compared with the NDNS, a higher proportion of obesity.

The percentage of men and women in LIDNS with raised measures of central obesity was higher than in NDNS. This was also the case for females aged 16 years and over in LIDNS compared with females aged 16 years and over in HSE and SHS.

However, due to small base sizes, there were no apparent differences in overweight and obesity that could be interpreted with confidence in children's measurements between LIDNS and HSE or SHS.

Further details on physical measurements are presented in Chapter 12 of the Main Report.

6.2 Blood pressure

Raised blood pressure is a risk factor for chronic disease; blood pressure can be affected by a number of lifestyle factors including diet. Mean systolic blood pressure (SBP; peak pressure) was 133mmHg in men and 126mmHg in women and varied markedly by age. Mean diastolic blood pressure (DBP; minimum pressure) was 74mmHg in men and 73mmHg in women. These values include blood pressure in respondents taking anti-hypertensive medication.

Forty-two percent of men and 35% of women had hypertension (defined as SBP \geq 140mmHg and/or DBP \geq 90mmHg and/or on medication for hypertension). This was higher in men and women aged 65 years and over (62% and 63%, respectively) compared with those aged 19-34 years (18% and 7%, respectively). Overall, 45% of men and 60% of women with hypertension were on drug treatment; however, of those on drug treatment, adequate control of blood pressure was obtained in only 53% of men and 48% of women.

Age-standardised mean SBP and DBP were significantly higher in men in Northern Ireland than in England or Scotland. Mean DBP was lower in women in Wales than in women from the other three countries. In women but not men, the age-standardised prevalence of hypertension was substantially higher in Scotland (56%) than in the other three countries (Northern Ireland 41%, Wales 35%, England 34%).

Comparisons with the general population

Mean SBP and DBP in LIDNS were very similar to findings from the most recent national health surveys of the general population in England (2003 HSE)³² and Scotland (2003 SHS).³⁴ However, prevalence of hypertension appeared to be higher in LIDNS than in HSE for men and than in SHS for men and women. It is possible that this may partly reflect the different age profiles of the surveys. The same methods and blood pressure devices were used in the three surveys.

Further details on blood pressure are presented in Chapter 13 of the Main Report.

6.3 Physical activity

LIDNS respondents were asked a number of questions about their work, home and leisure activities in order to assess self-reported physical activity. Over three-quarters of men (76%) and women (81%) undertook less than one 30 minute session of moderate or vigorous activity a week. Only 11% of men and 8% of women undertook 30 minutes continuous activity of a moderate or vigorous intensity at least five days a week.³⁵

Fifty-two percent of boys and 49% of girls aged 2-10 years compared with 28% of boys and 41% of girls aged 11-15 years³⁶ were active for less than 30 minutes every day on average. Twenty-six percent of boys and 31% of girls aged 2-10 years and 34% of boys and 38% of girls aged 11-15 years were in the high activity level for children (defined as at least 60 minutes of moderate or vigorous activity each day).

Self-reported low activity levels were more prevalent among overweight or obese adults and those with a high waist circumference. However, self-reported activity levels were not associated with whether boys or girls were overweight, obese, or a normal weight for their age and height.

Physical activity scores³⁷ decreased as BMI increased for adults. These scores were highest in men and women without hypertension; they were lowest for men with controlled, and for women with uncontrolled, hypertension.

6.3.1 Comparisons with the general population

Both adults and children in LIDNS were less likely to be categorised in the high activity level compared with the general population, as assessed by the 2003 HSE and 2003 SHS.^{32,34} Among adults, this may be linked to both low income and lack of employment.

Further details on physical activity are presented in Chapter 15 of the Main Report.

7 Other health-related factors

7.1 Smoking

Smoking, which is highly correlated with socio-economic group, can affect nutritional status. Questions on smoking behaviour were therefore included in LIDNS.

Overall, 45% of men and 40% of women aged 19 years and over were current smokers. Older adults were much less likely than younger adults to smoke cigarettes. Among men aged 65 years and over, the prevalence of current smokers was 22% compared with 54%, 58% and 52% of men aged 19-34 years, 35-49 years and 50-64 years, respectively. Among women, the corresponding figures were 15%, 53%, 54%, and 42%, respectively. Men and women in Scotland and Northern Ireland were more likely to be current smokers than those in Wales and England.

The results from LIDNS are consistent with those from other surveys, which indicate that adults on a low income are much more likely than average to smoke. For example, the 2003 General Household Survey³⁸ reported that 28% of men and 24% of women aged 20 years and over in the general population were current smokers.

Further information, including the number of cigarettes smoked, is presented in Chapter 16 of the Main Report.

7.2 Drinking

Alcohol consumption can have implications for nutrient intakes, nutritional status and health (e.g. providing energy and displacing nutrients).

Overall, 61% of men and 42% of women reported they had had an alcoholic drink in the week before the interview; 22% of men and 11% of women drank on three or more days in the past week. Conversely, 20% of men and 24% of women said they did not drink at all nowadays.

Based on all adults, 16% of men drank more than 21 units (the recommended limit for safe drinking for men) in the past week, and 5% drank more than 50 units. Mean consumption for men was 10.5 units per week. Among women, 6% drank more than 14 units (the recommended limit for safe drinking for women) in the past week, and 2% more than 35 units. Mean consumption for women was 3.6 units per week.

Looking at smoking and drinking combined, 48% of men and 59% of women were categorised as non-smokers/moderate drinkers (i.e. non-smokers who drank up to 21/14 units per week), while 9% percent of men and 4% of women were categorised as smokers/heavy drinkers (i.e. smokers who drank more than 21/14 units per week).

Comparisons with the 2003 HSE and the 2003 SHS suggest that adults in LIDNS drank alcohol less frequently than adults in the general population.³⁹

Further information on self-reported drinking behaviour, including the usual frequency of drinking and the number of units of alcohol consumed in the past week, is presented in Chapter 16 of the Main Report.

7.3 Oral health

The number and condition of teeth and the presence of dentures can influence food choice; equally, oral health is influenced by diet. Questions relating to the presence or absence of natural teeth and difficulty in eating specified foods were therefore included in LIDNS.

About one-fifth of men and women in the low income population aged 50-64 years were edentate (without any natural teeth). Among adults aged 65 years and over, 50% of men and 59% of women were edentate, with the proportions higher in Scotland compared with other countries.

Edentate adults reported more difficulty eating a range of foods than their dentate (those with any natural teeth) counterparts, particularly among those aged 50-64 years. They consumed less fruit and vegetables than dentate adults, had lower intakes of vitamin C and (for women only) non-starch polysaccharides and protein.

The findings for those aged 65 years and over were similar in LIDNS to those in the NDNS 65 years and over, with edentate adults being disadvantaged compared with the dentate in relation to nutrient intake and fruit and vegetable consumption. Furthermore, there was a higher proportion of edentate adults aged 65 years and over in LIDNS, compared with adults aged 65 years and over in the general population.

For further information on oral health, including its relationship to nutrient intake and fruit and vegetable consumption, see Chapter 17 of the Main Report.

8 Environmental, economic and social factors

8.1 Introduction

There are numerous factors that may influence food consumption and nutrient intake. Therefore, one of the aims of LIDNS was to examine the relationship between dietary intake and a range of factors likely to be associated with food choice in low income groups. In order to meet this aim, information on the following environmental, economic and social factors was collected during the interview stage:

- Shopping practices (e.g. type of retail outlet used, frequency of shopping, distance to shops, usual mode of transport)
- Income and food expenditure
- Type of area of residence (e.g. rural, suburban, urban, level of deprivation)
- Entitlement to and receipt of free school meals
- Home-grown fruit and vegetables or foods (e.g. berries) gathered from the environment
- Level of educational achievement
- Cooking skills
- Attitudes to healthy eating
- Food security

For some factors, this is the first time that this information has been collected on such a large sample in the UK. Nonetheless, the relatively small bases together with the wide range of factors involved and the interactions between them make it difficult to draw clear conclusions from the data. The results do, however, give a preliminary indication of the relative importance of the different factors.

8.2 Environmental and economic factors

Less than 20% of respondents lived in households that relied mainly on small supermarkets, local/corner shops, garage forecourts or street markets; most (80%) shopped mainly at large supermarkets. A private car was used for shopping in about half of households, with others walking, cycling, or using a bus, train or taxi; in most cases, the travelling time was less than 30 minutes. There were few obvious or significant differences in food consumption or nutrient intake according to the main shop used. However, women in households that shopped at a large supermarket consumed significantly higher amounts of fruit and vegetables compared with other women.

There were some differences in the amount of food consumed and in nutrient intakes by income, although many of the differences did not reach statistical significance. For example, men and boys in the lower income group (equivalised household income⁴⁰ <£160/week) had lower energy intakes (expressed as a percentage of the EAR) compared with those in the higher income group (≥£160/week).

Those living in urban areas and those living in the most deprived areas (which were often associated) tended to consume less food (on a weight basis) and have lower nutrient intakes compared with those in suburban (including rural) areas. For example, energy intake expressed as a percentage of the EAR was lower in men, women and girls living in urban areas. The percentage of men and women with intakes of riboflavin, potassium and calcium below the LRNI was also higher amongst those living in urban areas.

Overall, 53% of low income school children received a free school meal, as specified by the meal place code on the 24h recall.

Further details on the effect of economic and environmental factors on food choice and nutrient intakes are provided in Chapter 18 of the Main Report.

8.3 Social factors and food choice

Men and women with lower levels of educational achievement tended to have lower intakes of some nutrients (expressed as a proportion of the relevant DRV) compared with those with qualifications at GCSE level (Grade A-C) or above. For example, a higher proportion of both men and women with lower levels of educational achievement had intakes of magnesium below the LRNI; they also consumed lower amounts of vegetables.

Most women (91%) and nearly two-thirds (64%) of men reported that they could cook a meal from basic ingredients without help (defined as having 'better developed' cooking skills). There were few significant differences in nutrient intakes between this group and those living in households where cooking skills were less developed.

The influences most commonly cited as affecting food choice were price/value/money available for food, and quality or freshness of the food. Having more money and/or greater availability of cheaper healthier foods were the factors reported most often that would help to facilitate changes in diet.

Most men (71%) and women (81%) considered healthy eating to be important. Overall, 35% of men and 44% of women indicated that they would like to change their diet, while 60% of parents/carers would like to change their children's diet. Common desired changes included increasing fruit and vegetable consumption, eating less sugar or sugary foods, and, for adults, eating less fatty foods.

Further details are provided in Chapter 19 of the Main Report.

8.4 Food security

'Food security' means having access at all times to enough food that is both sufficiently varied and culturally appropriate to sustain an active and healthy life. Seventy-one percent of the low income population reported living in food secure households. For the remaining 29%, access to enough food had been limited by factors such as lack of money or other resources (e.g. storage facilities, transport) at some time during the previous year.

Compared with respondents living in other household types, food insecurity was reported more often for working adults living alone and for adults and children living in households containing one adult and one or more children. However, associations with food consumption and nutrient intakes suggested that the sample population was generally protected from lack of food and hunger.

Just under two-fifths (39%) of the low income population reported that, in the last year, they had been worried that their food would run out before they got money for more, while a similar proportion (36%) indicated that they could not afford to eat balanced meals.⁴¹ Overall, 22% reported reducing or skipping meals, and 5% reported not eating for a whole day, because they did not have enough money to buy food.

Further details are provided in Chapter 20 of the Main Report.

9 Conclusions

The survey captured a representative sample of the most materially deprived households on low incomes (roughly the bottom 15% of the UK population). It is the most comprehensive survey of its kind in the UK and provides, for the first time, a wealth of information on the dietary habits and nutritional status, and the factors affecting these, in this population subgroup. Data from the survey can be used by the Agency, other Government departments and non-Government bodies to understand and address barriers to the uptake of a healthy balanced diet by low income groups.

In many respects, the areas of concern highlighted in the low income population are similar to those already identified in the general population, although some are more marked in LIDNS. For example:

- Average consumption of fruit and vegetables was one-half of the recommended five portions per day.
- Intakes of non-milk extrinsic sugars (particularly among children) and saturated fatty acids were above the (maximum) UK recommendations.
- Intakes of non-starch polysaccharides fell below the (minimum) UK recommendations.
- There was evidence of inadequate nutritional status for iron, folate and vitamin D.
- A substantial proportion of men and women were overweight or obese.

Social factors, such as access to cooking facilities and shops did not seem to be a limiting factor in terms of food consumption or nutrient intake, although more education was associated with better diets. The poor diets of the low income population were accompanied by higher levels of smoking, higher alcohol intake (amongst consumers) and lower physical activity compared with the general population. These are known risk factors for chronic disease, and may increase the risk of nutrition-related ill-health and disease within the low income population.

While some of the issues mentioned may already be targeted for action in the general population, different approaches might be required to achieve effective changes in the low income population.

Notes and references

- 1 The term 'low income' is used in this Summary and throughout the report to reflect not simply low levels of income but also wider aspects of material deprivation. See Summary Section 1.2 and Main Report Chapter 2 for further details.
- 2 Nelson M, Erens B, Bates B, Church S, Boshier T. Low Income Diet and Nutrition Survey. Volumes 1-3. London: TSO, 2007
- 3 Gregory J, Collins DL, Davies PSW, Hughes JM, Clarke PC. National Diet and Nutrition Survey: children aged 1½ to 4½ years. London: HMSO, 1995.
- 4 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.
- 5 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.
- 6 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.
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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.
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- 7 For example:
 - Dobson B, Beardsworth A, Keil T, Walker R. Diet, choice and poverty. London: Family Policy Studies Centre, 1994.
 - Dowler E, Calvert C. Nutrition and diet in lone-parent families in London. London: Family Policy Studies Centre, 1995.
 - National Children's Home. Poverty and nutrition survey. London: NCH, 1991.
- 8 Acheson D. Independent inquiry into inequalities in health. London: TSO, 1998.
- 9 Department of Health. Our healthier nation. London: TSO, 1998.
 - Department of Health. Choosing health: making healthy choices easier. London: TSO, 2004.
 - Welsh Assembly Government / Llywodraeth Cynulliad Cymru. Food and well being: reducing inequalities through a nutrition strategy for Wales. Cardiff: Food Standards Agency and Welsh Assembly Government, 2003.
 - The Scottish Office. Eating for health: a diet action plan for Scotland. London: HMSO, 1996.
- 10 Dowler E, Draper A, Nelson M, Thomas R, Dobson B. Scoping study for a proposed national dietary and nutritional survey of people living on low incomes in the UK. [A report to the Ministry of Agriculture, Fisheries and Food. Grant No. AN1060. October 1998.]
- 11 Nelson M, Dick K, Holmes B, Thomas R, Dowler EA. Low Income Diet Methods Study. London: Food Standards Agency, 2002.
- 12 Bates B, Natarajan L, Erens B, Nelson M, Roberts C, Williamson C, Primatesta P, Hirani V, Finglas P, Speakman J. Low Income Diet and Nutrition Survey (LIDNS): A methodological report on the feasibility study. London: National Centre for Social Research, 2004.
- 13 'Wards' are one of the key building blocks of UK administrative geography. They are spatial units used to elect councillors in metropolitan and non-metropolitan districts, unitary authorities and the London boroughs in England; unitary authorities in Wales; council areas in Scotland; and district council areas in Northern Ireland.
- 14 Non-response bias may occur if the people who refuse to participate in the survey as a whole or in particular stages are systematically different from those who take part.
- 15 The term household has been used throughout the report to indicate what are in fact catering units. The catering unit (CU) is the primary grouping for this study and is defined as 'a group of people who eat food that is bought and prepared for them (largely) as a group'. CUs are either entire households, as defined in censuses and surveys, or (more rarely) form parts of households. Hence, although people may share accommodation and even be related, they may not be in the same CU. For example, adult children sharing a house with their parents may shop, cook and eat by themselves, in which case the parents would be in one CU and the children in another. Almost all households in LIDNS contained only one catering unit.
- 16 McCrory MA, Hajduk CL, Roberts SB. Procedures for screening out inaccurate reports of dietary energy intake. Public Health Nutrition 2002; 5 (6A):873-882.
- 17 Nelson M, Atkinson M, Meyer J. Food portion sizes: a photographic atlas of food portion sizes. London: Food Standards Agency, 1997.
- 18 Foster E, Matthews JN, Nelson M, Harris JM, Mathers JC, Adamson A. Accuracy of estimates of food portion size using food photographs – the importance of using age-appropriate tools. Public Health Nutrition 2006; 9(4):509-514.
- 19 Population Trends Number 120. Summer 2005: Table 1.4.
- 20 Regional Trends Number 38. 2004: Table 3.7.
- 21 The household reference person was defined as the householder (a person in whose name the property is owned or rented) with the highest income. If there was more than one householder and they had equal income, then the eldest was chosen.
- 22 Social Trends Number 35. 2005: Table 3.16.
- 23 Six of the food groups (dietary supplements, artificial sweeteners, toddlers food and drink (2 codes), polyunsaturated oil, and low alcohol and alcohol-free cider and perry) are not reported in the tables of food consumption. The tables showing 30 food groups are based on aggregations of the 82 food groups.
- 24 See Main Report, Chapter 4, Annex 4B for further details of the methodology used.
- 25 See Main Report, Appendix N for further details.
- 26 Department of Health. Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. London: HMSO, 1991. [Report on Health and Social Subjects: 41.]
- 27 There were too few children who took supplements to be able to comment on the typical contribution to micronutrient intakes.
- 28 'Vitamin A' represents the combined dietary contribution from preformed retinol and carotenoids (see Main Report, Chapter 8, Section 8.2.1).
- 29 Scientific Advisory Committee on Nutrition. Review of dietary advice on vitamin A. London: TSO, 2005.
- 30 Scientific Advisory Committee on Nutrition. Salt and health. London: TSO, 2003.
- 31 World Health Organization. Nutritional anaemias. Technical Report Series: 503. Geneva: WHO, 1972.
- 32 Sproston K, Primatesta P, eds. Health Survey for England 2003. London: TSO, 2004.

- 33 The laboratory and analytical methods used were the same for both LIDNS and the Health Survey for England. However, the NDNS used a different laboratory and methods.
- 34 Bromley C, Shelton N, eds. *Scottish Health Survey 2003*. Edinburgh: Scottish Executive, 2005.
- 35 This level of activity relates to a previous Department of Health recommendation and was used in the Health Survey for England, from which the LIDNS questions were derived for reasons of comparability.
- 36 Children aged 16-18 years were given the adult physical activity questionnaire to complete and are not reported as a separate group.
- 37 The physical activity score was derived by multiplying the time spent in each activity (or group of activities) (in hours) by the metabolic equivalent (estimate of energy expenditure) for that activity, then taking the sum of the scores for each activity to provide an overall value for one week. For further details, see Main Report, Chapter 15, Section 15.1.4.
- 38 General Household Survey: Results for 2003. 2004; Table 8.1.
- 39 See also the results on alcohol intake in Section 3.7 of this Summary.
- 40 Equivalised income takes into account differences in spending power in different household types according to the age and sex of the household members. For the definition and method of calculation of equivalised income, see Main Report, Chapter 3, Section 3.4 and endnote 11.
- 41 The meaning of 'balanced meals' was not defined in the interview and was left to the interpretation of the respondent.

Low Income Diet and Nutrition Survey

This booklet is a summary of key findings from the Low Income Diet and Nutrition Survey Main Report Volumes 1-3.

Nelson M, Erens B, Bates B, Church S, Boshier T. Low Income Diet and Nutrition Survey. London: The Stationery Office, 2007.

Volume 1: Background; methods; sample characteristics

Volume 2: Food consumption and nutrient intake

Volume 3: Nutritional status; physical activity; economic, social and other factors

An accompanying CD includes the Main Report Volumes 1-3, the Summary, along with Appendices and Supplementary Tables.

Detailed findings are available in the Main Report. An anonymised data file is lodged with the Data Archive at the University of Essex.

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Low Income Diet and Nutrition Survey

LIDNS is a survey of the diets and nutritional status of the low income population in the UK.

Over 3700 adults and children were interviewed between November 2003 and January 2005. Information was collected from face-to-face interviews, four 24 hour dietary recalls, physical measurements and analyses of blood samples. This summary presents key findings from Volumes 1-3 of the Main Report.

Volume 1: Background; methods; sample characteristics

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