Scientific Advisory Committee on Nutrition

Paper for agreement: The nutritional health of the population

Agenda Item: 4

The attached paper summarises evidence from the National Diet and Nutrition Surveys carried out between 1992 and 2001 on the diet and nutritional status of the British population. This paper was first discussed by the Committee at the Horizon Scanning meeting in February 2005 and revised versions were discussed at the meetings in June and October 2005. This version incorporates comments made at those meetings.

A list of the changes requested at the October meeting and the actions taken is also included at the beginning of the paper.

Amendments made to reflect comments provided at SACN meeting held on 19 October 2005

SACN comment	Action
Unclear throughout paper which differences are statistically significant.	Para 4 now states that differences highlighted in the commentary are statistically significant unless otherwise indicated.
Under-reporting not given sufficient acknowledgement.	Additional paragraph on under-reporting added to background section (para 9).
Consider excluding under-reporters from analysis	Not done due to lack of accepted methodology and lack of resource.
Comment on whether level of under-reporting has changed between 86/87 and 00/01.	Comment added to para 9. Not possible to say whether level of under-reporting has changed as no information available from 1986/87 survey on physical activity levels or doubly labelled water
Relate NDNS meat consumption data to COMA recommendation for red and processed meat	Direct comparison difficult as NDNS groups for meat include non-meat components of meat dishes. Comment added at para 18.
Northumberland study showed inverse relationship between soft drink and milk consumption in children.	Comment added at para 30
Table 5a – should state g/week	Done
Separate paragraphs. on protein and NSP (para 66)	Done
Table 12 – make clear whether the DRVs are minimum or maximum levels	Done
Blood lipids section needs to be strengthened to be more positive about the fall in plasma cholesterol levels and impact on reducing cardiovascular disease risk.	Para 39 redrafted.
Need to look at increase in use of statins over this period – contributory factor in fall in cholesterol levels.	Unable to find data on use of statins. Comment added to para 39.
Need to look at effect of differences in analytical methodology for blood lipids between the two surveys	Limited information available suggests some methodological differences may have contributed to change in lipid levels. Comment added to para 39
Look at blood lipid data from the Health Survey for England for comparison	Blood lipid data available from HSE for 1994, 1998 and 2003. Comment added to para 39.
Statement that LDL cholesterol levels were unchanged between 1986/7 and 2000/01 is incorrect. Levels have fallen in line with	Para 40 corrected. Comments added on reduction in CVD risk

the fall in total cholesterol.	
Change in total: HDL ratio between 1986/7 and 2000/01 shows a proportional reduction in HDL in young men though not in older men.	Comment added to para 41.
Request to check calculations for total:HDL ratio	Calculations have been rechecked and confirmed to be correct. The discrepancy is due to the method of calculation – the figures in the paper are calculated on an individual basis rather than using the means.
Include distribution plots for key nutrients	Not done due to lack of resource.
Consider including urinary potassium data	Not done due to lack of resource
Include 1986/87 salt intake data in Figure 7	Done
Conclusions: mention high sugar and alcohol consumption leading to low nutrient density for older children and young adults.	Drafting change at para. 140
Conclusions: add that poor oral health is a risk factor for poor diet and nutritional status.	Drafting change at para 144
Conclusions: para 143 - blood pressure and physical activity data not covered in main part of report	Paragraph deleted from conclusions.
Recommendation: – make it clear that a lot of work to promote balanced diets is already being done.	Drafting change made to para. 146

SACN Position Paper

Nutritional Health of the Population

Summary

1) This paper brings together evidence relating to the nutritional health of the population in Great Britain. The current situation is described using data from the National Diet and Nutrition Surveys (NDNS), while changes in the adult population are highlighted by comparison of results from the NDNS in 2000/01 with the comparable survey in 1986/87.

2) Although there is some evidence of positive dietary changes in the population, especially lower intakes of fat and saturated fat in the 2000/01 NDNS compared with the 1986/87 adults survey, the findings from surveys of these and other age groups highlight a number of areas for concern. Consumption of fruit and vegetables is below the recommendation in all age groups, and is particularly low for young adults and people in lower socio-economic groups. There is evidence of low intakes and status for a number of vitamins and minerals especially for older children, young adults and older people living in institutions. The proportion of energy intake derived from non-milk extrinsic sugar exceeds the recommendation in most age groups, particularly for children and young adults. There is also evidence of marked differences in diet and nutritional status associated with socio-economic status. These findings indicate a need to improve the balance of the diet for the population as a whole with the focus on children and young adults.

Background

3) This paper presents an overview of the nutritional health of the population based on data from the four surveys in the National Diet and Nutrition Survey programme (NDNS) carried out between 1992 and 2001. Results from the most recent NDNS of adults aged 19-64 years[5,6,7,8,9] (2000/01) are also compared with the 1986/87 Dietary and Nutritional Survey of British Adults aged 16-64 years[1].

4) The paper highlights specific diet and nutritional issues in different age groups, as well as discussing regional and socio-economic differences. Differences highlighted in the commentary are statistically significant unless otherwise indicated.

5) The NDNS is a series of cross-sectional surveys of different population age groups. It aims to provide a comprehensive picture of the dietary habits and nutritional status of the population of Great Britain. The programme is split into four separate surveys. Each survey has examined a nationally representative sample drawn from four different population age groups: children aged 1½-4½ years[2] (fieldwork 1992/93), young people aged 4-18 years[4] (1997), adults aged 19-64 years[5,6,7,8,9] (2000/01) and people aged 65 years and over[3] (1994/95). Each survey collected detailed quantitative information on food consumption and nutrient intake, physical measurements, nutritional status indices and socio-economic, demographic and lifestyle characteristics.

6) The NDNS programme covers the British population aged 1½ years upwards living in private households. The survey of people aged 65 years and over also included a sample of people living in residential and nursing homes. The NDNS programme does not cover infants and children aged under 18 months, pregnant and lactating women or people living in institutions such as prisons, schools, hospitals and care homes.

7) The surveys in the NDNS programme are designed to be representative of the British population within the specified age group. The sample size for each survey permits a more detailed analysis by age and sex but does not allow for separate analysis of specific population sub-groups such as ethnic minority groups, vegetarians etc. In interpreting the data it should be borne in mind that the surveys have been carried out over a 15-year period and so secular trends may confound apparent differences between survey age groups.

8) The methodologies used for collecting food consumption data are comparable between surveys. The analytical methods used for nutritional status measures are also comparable between surveys, with the exception of the 1986/87 adults survey which used different analytical methods and/or laboratories for many measures.

9) Mis-reporting of food consumption in dietary surveys, generally under-reporting, is known to be a problem in NDNS as in dietary surveys worldwide.[6,10] Under-reporting can cause biased low estimates of intake as respondents under-report their actual intake or modify their diet during the recording period. The level of under-reporting needs to be borne in mind when interpreting findings from dietary surveys, for example in comparing intakes with recommendations. Analysis of data from the NDNS adults 2000/01indicated that energy intake was under-reported to a level of 25% of energy needs on average. It is not possible to ascertain whether under-reporting was higher in this survey than in the 1986/87 survey because there was no assessment of physical activity or energy expenditure in the earlier survey. Doubly labelled water studies suggest similar levels of under-reporting for other age groups except for pre-school children where levels were lower. There is evidence that under-reporting is selective – fatty, sugary and snack foods and alcohol are more likely to be under-reported than are other foods such as fruit and vegetables. However the level of under-reporting for specific macro and micronutrients is not known.

10) Following a review of the Food Standards Agency's dietary survey programme in 2002/03 the Agency's Board has agreed to move to a rolling programme format for future NDNS, whereby the survey runs continuously and fieldwork is carried out every year. This new approach will strengthen the ability to track trends over time and give more flexibility to respond to policy needs.

Diet and nutritional status in the population

11) This section sets out findings under the headings of dietary habits, energy and macronutrient intakes, micronutrient intakes and nutritional status, and oral health, focusing on the following age groups: adults, older adults (including free-living and institution groups), children and young people.

12) Throughout the paper, nutrient intakes are compared with COMA Dietary Reference Values[11] and other COMA recommendations[12,13]. Nutritional status indices are compared with published threshold values.

Dietary habits

13) This section considers findings for consumption of fruit and vegetables, oily fish, meat and meat products, soft drinks and dietary supplements and compares dietary habits in adults between the 1986/87 and 2000/01 surveys. Consumption of fruit and vegetables and oily fish are compared with Government recommendations.

Adults

Fruit and vegetables[i] (Table 1 & 2; Figure 1)

14) In the most recent NDNS (2000/01) the average consumption of fruit and vegetables for adults aged 19-64 years was 2.7 portions per day for men and 2.9 portions for women, calculated based on the definition used in the five-a-day programme[ii] (Table 1). Seventeen percent of adults ate less than one portion of fruit and vegetables a day, while 13% of men and 15% of women met the five-a-day target. Mean consumption increased with age for both men and women but was below the five-a-day recommendation in all age groups. Mean consumption was lowest in the 19-24 group at 1.3 portions per day for men and 1.8 portions for women.

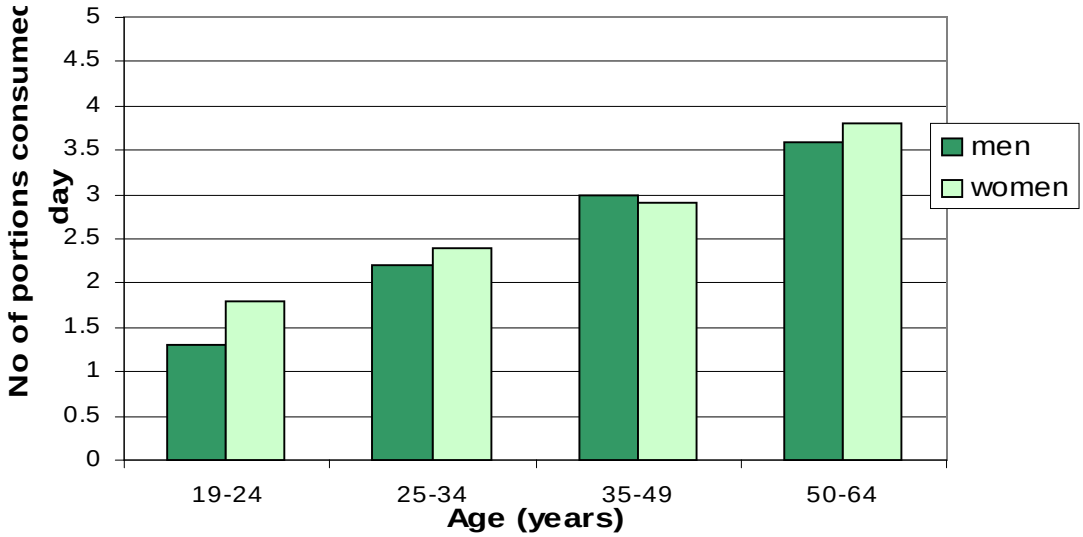
15) Comparing the consumption of fruit and vegetables by adults in the 1986/87 and 2000/01 surveys[iii] consumption was higher in 2000/01 by 140 grams/week on average for men and 280g/week for women. The greatest difference in consumption was in the 50-64 age group for both men and women. In young adults (19-24 years) there was no evidence of an increase in consumption and in men aged 19-24 years there was evidence of lower consumption in 2000/01 although this did not reach statistical significance (Table 2).

Figure 1. Mean number of portions of fruit and vegetables consumed per day (based on five-a-day definition) by adults in 2000/01

[i] Includes fruit juice

[ii] The definition of fruit and vegetable consumption used for the five-a-day programme is: daily consumption of fruit and vegetables (excluding potatoes), including those in selected composite dishes (fruit pies and vegetable dishes), and including all fruit juice consumed as one portion only, and similarly all baked beans and other pulses consumed as one portion only.

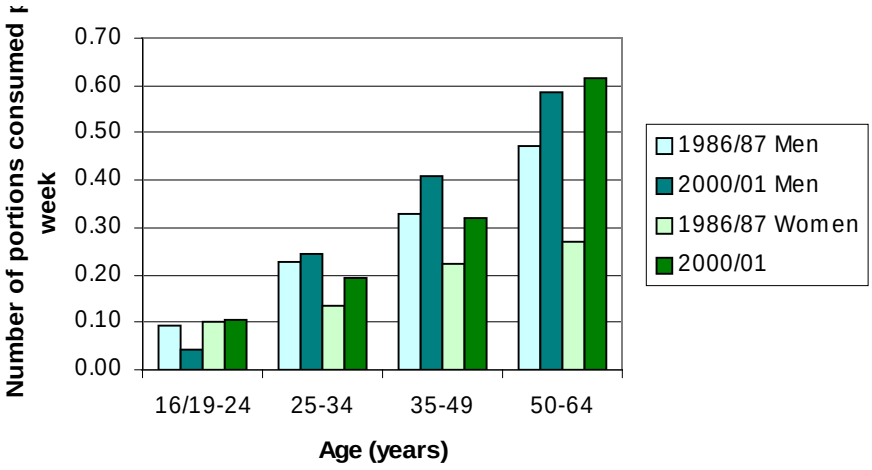
[iii] Comparison of fruit and vegetable consumption in the 1986/87 and 2000/01 surveys is not based on the 5-a-day definition as this analysis is not available for the 1986/87 survey.



Oily fish (Table 3; Figure 2)

16) Mean consumption of oily fish (excluding canned tuna)[iv] in the 2000/01 adults survey was one-third of a portion[v] per week, below the recommendation of one portion per week. Mean consumption increased with age from around 0.1 portions per week in the 19-24 age group to 0.6 portions per week in the 50-64 year age group. Consumption in the 50-64 group was higher in 2000/01 compared to 1986/87 for both men and women but this difference was not seen in the 19-24 group (Table 3).

Figure 2: Comparison of average number of portions of oily fish (excluding canned tuna) consumed per week between 1986/87 and 2000/01



[iv] canned tuna is not included in the definition of an oily fish, as processing of tuna during the canning process reduces the fat content of the fish to a low level

[v] A portion of oily fish is defined as around 140grams

Meat, meat products and dishes (Table 4a and b)

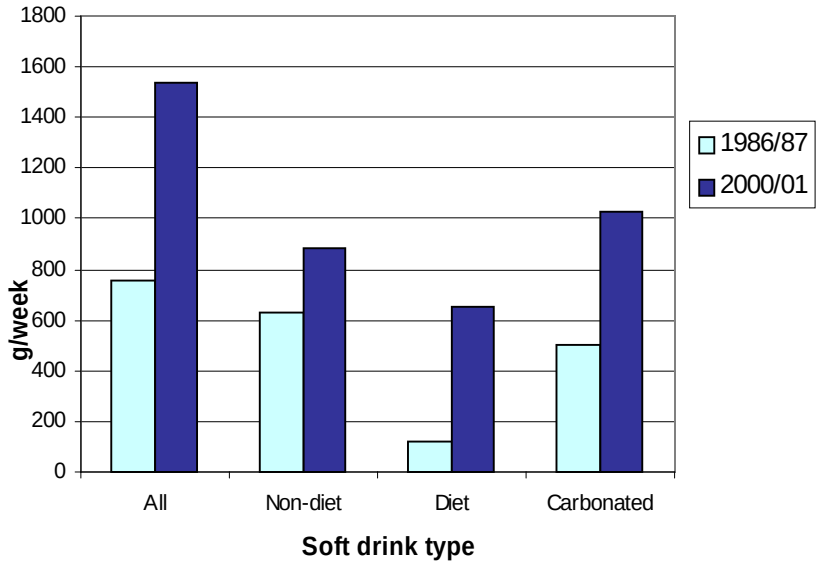
17) Mean consumption of meat, meat products and dishes as a group was higher for men in 2000/01 (1398g/week) compared with 1986/87 (1280g/week). There was no significant difference for women. Mean consumption of liver (including products and dishes), meat pies and pastries and "other" meat and meat products was lower in 2000/01 than in 1986/87, for both men and women, whereas consumption of coated chicken & turkey, chicken and turkey dishes and, for men only, burgers and kebabs was higher in 2000/01 than in 1986/87. Chicken and turkey was the most commonly consumed type of meat in 2000/01 for both men and women whereas in 1986/87 the most commonly consumed type was beef and veal.

18) COMA recommended in its 1998 report on nutritional aspects of cancer that average consumption of red and processed meat should not increase from the then current average of 90g/day[14]. The data show that consumption of red and processed meat and meat-based dishes (that is excluding chicken and turkey and dishes) was lower in 2000/01 than in 1986/87 for both men (138g/day in 2000/01) and women (79g/day in 2000/01)[vi].

Soft drinks (Table 5a&b; Figure 3)

19) Consumption of soft drinks in adults was substantially higher in 2000/01 than in 1986/87. Mean consumption levels in 2000/01 were equivalent to 4-5 cans per week, compared to less than 3 cans per week in 1986/87. The majority of soft drinks consumed were carbonated. Women consumed similar amounts of diet and non-diet varieties on average while men consumed more of the non-diet type. In 2000/01 young men (19-24 years) consumed over 4 times the quantity of soft drinks and young women over 3 times the quantity, as did the oldest group (50-64 years),

Figure 3: Mean consumption of soft drinks by adults in 1986/87 and 2000/01



[vi] Consumption figures include non-meat components of meat-based dishes and so are not directly comparable with the COMA recommendation

Dietary supplements

20) Forty percent of women and 29% of men overall in the 2000/01 adults survey reported taking dietary supplements in the survey week. This compared with 17% of women and 9% of men in 1986/87. Use of supplements increased with age to 55% of women in the 50-64 age group. Cod liver oil and other fish oil based supplements and multi-vitamins and multi-minerals were the most commonly used types of supplements in this age group.

Older adults aged 65 and over

Fruit and vegetables group (Table 6)

21) Mean fruit and vegetable consumption[vii] in the free-living group aged 65 and over was slightly lower than in the adult population at 244 and 230g/day for men and women respectively, the difference being due to lower consumption of vegetables and fruit juice. In the institution group mean consumption was substantially lower than in the free-living group at 171 and 163g/day in total for men and women respectively.

Oily fish (Table 7)

22) Mean consumption of oily fish (excluding canned tuna) in the free-living group was substantially lower than that in the adult population at 12g/week for men and 7g/week for women. Older adults living in institutions had a lower average oily fish consumption than their free-living counterparts at 4g/week for men and women. Data on this age group was collected in the mid-1990s and oily fish like salmon has become cheaper and more available since then.

Meat, meat products and dishes (Table 8)

23) Mean consumption of meat, meat products and dishes in the free-living group aged 65 and over was lower than in the 50-64 age group, at 894g/week and 683g/week for men and women respectively. Mean consumption in the institution group was lower than in the free-living group. Beef and veal dishes were the most commonly consumed type of meat in both the free-living and institution groups.

Soft drinks (Table 10)

24) Consumption of soft drinks by older adults was lower than in the 19-64 age group. Mean consumption was 347 and 322g/week for men and women respectively in the free-living group (equivalent to about 1 can per week). Non-diet concentrated squashes and carbonates were the most commonly consumed types. Consumption in the institution group was over twice that in the free-living group at about 850g/week, largely due to high consumption of non-diet fruit squashes in this group.

[vii] consumption estimates not based on the 5-a-day definition. Includes fruit juice

Dietary supplements

25) In older people aged 65 and over, 28% of men and 34% of women in the free-living group reported taking supplements, most commonly cod-liver oil based. In the institution group the proportion that reported taking supplements was much lower – 5% of men and 9% of women.

Children and young people aged 1½-18 years

Fruit and vegetables (Table 6)

26) Mean consumption of fruit and vegetables[viii] in the 4-18 year group was around 170-190 grams/day in the 4-6, 7-10 and 11-14 age groups and around 200g/day in the 15-18 age group. Twenty percent of the 4-18 age group did not consume any fruit (excluding fruit juice) during the survey week and 4% consumed no vegetables. Mean consumption in the 1½-4½ year group was 125 grams/day.

Oily fish (Table 7)

27) Consumption of oily fish (excluding canned tuna) was less than 0.1 portions (5-10 grams) per week in all age groups.

Meat, meat products and dishes (Table 9)

28) Mean consumption of meat, meat products and dishes was 362g/week in the 1½-4½ year age group. Beef, veal and dishes was the most commonly consumed type providing about a quarter of consumption, followed by sausages. In the 4-18 year age group mean consumption in boys aged 15-18 was double that in the 4-6 year group. There was a less marked increase with age in girls. Chicken and turkey dishes was the main type of meat consumed in all age/sex groups but the contribution of beef, veal and dishes, bacon and ham, burgers and kebabs increased substantially in the 15-18 year old boys.

Soft drinks (Table 10)

29) Consumption of soft drinks in the 1½-4½ year age group was 2.8 litres/week, equivalent to about 8 cans or 14 cartons. Concentrated squashes were the main type of soft drink consumed by this age group. In older children consumption was over 3 litres per week in the 7-10 year age group and over 3.5 litres/week for 11-18 year old boys. Consumption in girls in the same age group was slightly lower at 2.6 litres/week. Carbonated drinks were the main type of soft drink consumed in the 11-18 age group.

30) There is no earlier comparable national survey of this age group from which to assess trends in soft drink consumption. However two comparable studies of 11-12 year olds in Northumberland carried out in 1980 and 2000[15] show that carbonated soft drink consumption in this group was 2½ times higher in 2000 (191g/day; 1337g/week) than in 1980 (78g/day; 546g/week)[ix]. These studies also

[viii] Consumption estimates not based on 5-a-day definition. Includes fruit juice

[ix] Data from this study for total soft drink consumption are not comparable with NDNS data. Total soft drink consumption in this study was 109g/day (763g/week) in 1980 and 291g/day (2047 g/week) in

showed an inverse relationship between consumption of soft drinks and of milk. The consumption data from 2000 for carbonated drinks are similar to the NDNS data collected in 1997 for the 11-14 year age group (1266g/week for boys and 1035g/week for girls).

Dietary supplements

31) In children aged 1½-4½ years, surveyed in 1992, a fifth of this age group reported taking supplements, mainly vitamins A, C and D and multivitamins. In the later survey of the 4-18 year age group in 1997 a fifth of this group overall reported using supplements. Reported usage was 32% and 23% of boys and girls in the 4-6 age group and 13% and 22% of boys and girls in the 15-18 age group.

Overview of dietary habits

32) Mean consumption of fruit and vegetables (including fruit juice) was below the five-a-day target in all age groups. There was evidence of higher consumption in the 50-64 age group compared with 1986/87 but there was no evidence of this for the youngest group (19-24 years); the data suggested that consumption by young men was slightly lower in the more recent survey. Mean consumption of oily fish was below the recommended level of one portion per week in all age groups. Again there was some evidence of higher consumption in adults (particularly women) aged 50-64 years in 2000/01 compared with 1986/87 but not in the 19-24 year group. Consumption of soft drinks in the 19-64 age group in the more recent survey was substantially higher than in 1986/87, mainly due to higher consumption of carbonated drinks. Mean consumption of meat, meat products and dishes was slightly higher for men but not women in 2000/01 compared with 1986/87 though when chicken and turkey were excluded consumption was slightly lower for both men and women. Consumption of chicken and turkey dishes in 2000/01 was double that in 1986/87 for men and women while consumption of liver, meat pies and 'other' meat and products was lower in the more recent survey. Over a third of adults reported taking dietary supplements in the most recent survey.

2000/01.

Table 1: Consumption of fruit and vegetables (using five-a-day definition) by adults aged 19-64 years (portions* per day)**

Cumulative percentages

Average daily number of portions of fruit and vegetables consumed	Men aged (years):				All men	Women aged (years):				All women	All
	19-24	25-34	35-49	50-64		19-24	25-34	35-49	50-64		
	cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %
None	6	1	0	1	1	2	1	1	0	1	1
Less than 1 portion	38	27	14	7	18	36	19	16	7	16	17
Less than 2 portions	86	54	36	29	45	64	46	41	20	39	42
Less than 3 portions	95	76	59	45	64	83	71	61	44	61	62
Less than 4 portions	95	86	75	60	76	96	82	73	60	74	75
Less than 5 portions	100	93	86	76	87	96	91	83	78	85	86
Number of subjects	*108*	*219*	*253*	*253*	*833*	*104*	*210*	*318*	*259*	*891*	*1724*
Mean number of portions consumed (average value)	1.3	2.2	3.0	3.6	2.7	1.8	2.4	2.9	3.8	2.9	2.8

** The definition of fruit and vegetable consumption used for the five-a-day programme is: daily consumption of fruit and vegetables, including those in selected composite dishes (fruit pies and vegetable dishes), and including all fruit juice consumed as one portion only, and similarly all baked beans and other pulses consumed as one portion only

- 1 portion = 80 grams

Table 2: Consumption of fruit and vegetables* for adults in 1986/87 and 2000/01 (grams per week)

Mean consumption g/week	1986/87 Adults Survey Men aged:					2000/01 NDNS Men aged:				
	16-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
Vegetables (excluding potatoes)	832	1000	1139	1137	1046	665	854	1006	1135	961
Fruit	253	430	504	596	460	190	428	694	855	607
Fruit Juice	313	322	233	181	257	264	258	393	385	339
Total (Vegetables, Fruit, Fruit juice)	1398	1752	1876	1914	1763	1119	1540	2093	2375	1907
Number of subjects	*214*	*254*	*346*	*273*	*1087*	*108*	*219*	*253*	*253*	*833*

Mean consumption g/week	1986/87 Adults Survey Women aged:					2000/01 NDNS Women aged:				
	16-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
Vegetables (excluding potatoes)	700	828	905	965	868	626	911	970	1004	926
Fruit	371	419	580	709	540	379	521	687	1060	720
Fruit Juice	311	312	259	259	280	353	316	301	358	327
Total (Vegetables, Fruit, Fruit juice)	1382	1559	1744	1933	1688	1358	1748	1958	2422	1973
Number of subjects	*189*	*253*	*385*	*283*	*1110*	*104*	*210*	*318*	*259*	*891*

* Not calculated using 5-a-day definition. May include more than one portion of fruit juice and more than one portion of beans/pulses.

Table 3: Consumption of oily fish* per week in adults in 1986/87 and 2000/01

Gender and age	1986/87			2000/01		
	Mean (g/week)*	Number of portions**	*Number of subjects*	Mean (g/week)*	Number of portions**	*Number of subjects*
Male aged (years)						
16/19-24	13	0.1	*214*	5	< 0.1	*61*
25-34	32	0.2	*254*	32	0.2	*160*
35-49	46	0.3	*346*	56	0.4	*303*
50-64	66	0.5	*273*	80	0.6	*242*
All	41	0.3	*1087*	51	0.4	*766*
Female aged (years)						
16/19-24	14	0.1	*189*	14	0.1	*78*
25-34	19	0.1	*253*	28	0.2	*211*
35-49	31	0.2	*385*	46	0.3	*379*
50-64	38	0.3	*283*	88	0.6	*290*
All	27	0.2	*1110*	50	0.4	*958*

* Excludes canned tuna. Includes recipe dishes
** One portion = 140 grams

Table 4a: Consumption of meat, meat products and dishes† by men in1986/7 and 2000/01)(g per week)

	1986/87 Adults Survey					2000/01 NDNS				
Men aged (years)	16-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
g/week	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)
Bacon & ham	131	119	135	159	137	125	128	133	153	137
Beef, veal & dishes	261	361	325	274	308	315	302	299	281	296
Lamb & dishes	69	69	60	96	73	45	73	58	62	61
Pork & dishes	67	96	75	93	83	39	69	87	95	79
Coated chicken & turkey	15	20	15	6	14	85	62	58	24	52
Chicken & turkey dishes	193	205	183	157	184	345	405	419	334	380
Liver & liver products & dishes	17	29	35	34	30	3	12	19	21	15
Burgers & kebabs	127	84	37	20	61	192	128	73	15	86
Sausages	119	96	94	85	97	121	96	98	75	93
Meat pies & pastries	267	173	158	134	177	131	139	137	148	140
Other meat & meat products*	123	116	114	122	118	37	49	58	78	59
Total meat, meat products & dishes**	1389	1367	1232	1177	1280	1438	1462	1439	1286	1398
Number of subjects	*214*	*254*	*346*	*273*	*1087*	*108*	*219*	*253*	*253*	*833*

† Consumption data includes non-meat components of meat-based dishes

*Includes game, duck, goose, all offal (except liver), black pudding, corned beef, salami etc.

**Sum of individual food groups may not equal total consumption of meat, meat products & dishes due to rounding.

Table 4b: Consumption of meat, meat products and dishes† by females in1986/7 and 2000/01 (g per week)

	1986/87 Adults Survey					2000/01 NDNS				
Females aged (years)	16-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
g/week	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)	Mean (g)
Bacon & ham	67	74	87	95	83	62	73	74	86	76
Beef, veal & dishes	201	224	218	183	207	233	175	214	208	205
Lamb & dishes	49	34	52	63	50	25	30	44	50	40
Pork & dishes	56	54	49	53	52	35	39	57	52	48
Coated chicken & turkey	19	13	11	6	11	78	44	48	24	43
Chicken & turkey dishes	122	129	151	127	135	264	273	304	249	276
Liver & liver products & dishes	21	21	32	33	28	3	4	7	10	6
Burgers & kebabs	70	49	33	13	38	104	50	32	11	39
Sausages	53	58	51	50	53	56	48	43	37	44
Meat pies & pastries	104	91	93	85	93	65	55	71	63	64
Other meat & meat products*	80	71	74	65	72	22	14	25	44	27
Total meat, meat products & dishes**	841	817	851	773	821	946	805	919	832	870
Number of subjects	*189*	*253*	*385*	*283*	*1110*	*104*	*210*	*318*	*259*	*891*

† Consumption data includes non-meat components of meat-based dishes

*Includes game, duck, goose, all offal (except liver), black pudding, corned beef, salami etc.

**Sum of individual food groups may not equal total consumption of meat, meat products & dishes due to rounding.

Table 5a: Consumption of soft drinks by adults in 1986/87 and 2000/01 (males) (g per week)

	1986/87 adults survey								2000/01 NDNS							
	19-24		25-34		35-49		50-64		19-24		25-34		35-49		50-64	
	Mean	% consumers	Mean	% consumers	Mean	% consumers	Mean	% consumers	Mean	% consumers	Mean	% consumers	Mean	% consumers	Mean	% consumers
Non diet soft drinks	1,380	*75*	766	*71*	*513*	*57*	308	*49*	2,662	*93*	1338	*78*	766	*58*	478	*44*
Of which:																
Non diet RTD	146	*23*	72	*17*	*58*	*12*	67	*11*	163	*24*	65	*14*	50	*11*	50	*9*
Non diet concentrates**	404	*24*	162	*20*	131	*16*	72	*15*	436	*25*	325	*30*	275	*22*	184	*15*
Non diet carbonates	830	*66*	532	*57*	324	*45*	169	*36*	2,063	*91*	948	*64*	441	*44*	243	*33*
Diet soft drinks	73	*9*	150	*14*	83	*12*	70	*8*	565	*34*	844	*40*	610	*39*	388	*26*
Of which																
Low calorie RTD	7	*1*	1	*1*	2	*1*	0	*0*	-	-	2	*1*	4	*1*	10	*1*
Low calorie concentrates**	13	*2*	30	*2*	12	*2*	25	*2*	240	*12*	284	*15*	231	*15*	137	*9*
Low calorie carbonates	53	*7*	119	*11*	68	*10*	45	*7*	325	*26*	558	*30*	375	*30*	241	*22*
Total soft drinks	1453	*77*	915	*73*	595	*60*	379	*54*	3228	*96*	2182	*89*	1377	*72*	866	*58*
Number of subjects	*214*		*254*		*346*		*273*		*108*		*219*		*253*		*253*	

** Includes water used as a diluent

'-' = no cases

RTD = ready to drink

Table 5b: Consumption of soft drinks by adults in 1986/87 and 2000/01 (females) (g per week)

	1986 /87 Adults Survey								2000/01 NDNS							
Females aged (years)	19-24		25-34		35-49		50-64		19-24		25-34		35-49		50-64	
g/week	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers	Mean (g)	% consumers
Non diet soft drinks	1033	84	652	69	*439*	59	241	48	1712	78	783	63	565	54	418	44
Of which																
Non diet RTDs	115	24	85	17	*55*	14	45	10	103	20	92	15	95	13	72	11
Non diet concentrates**	202	35	140	27	139	24	76	16	393	38	274	23	148	20	118	13
Non diet carbonates	716	72	427	58	245	46	120	36	1211	66	418	47	322	38	229	32
Diet soft drinks	168	24	194	20	159	20	75	14	1016	54	1177	57	556	38	379	32
Of which																
Low calorie RTD	6	3	3	1	3	1	0	0	8	4	10	2	11	3	4	2
Low calorie concentrates	1	1	19	3	6	1	45	5	198	28	282	19	111	9	94	9
Low calorie carbonates**	161	21	171	17	150	19	30	11	811	35	886	49	434	34	281	26
Total soft drinks	1201	89	846	75	598	66	317	56	2728	97	1965	86	1121	71	797	62
Number of subjects	*189*		*253*		*385*		*283*		*104*		*210*		*318*		*259*	

** Includes water used as a diluent

'-' = no cases

RTD = ready to drink

Table 6: Mean vegetable, fruit and fruit juice consumption (grams per day)

Population group	Vegetables	Fruit	Fruit Juice	***Total fruit, vegetables and fruit juice	*Number of subjects*
	g/day	g/day	g/day	g/day	
Males & Females 1.5-4.5 years	39	50	37	125	*1675*
Males aged (years):					
4-6	60	63	44	167	*184*
7-10	58	62	54	174	*256*
11-14	73	42	55	170	*237*
15-18	94	44	62	200	*179*
19-64	137	87	49	273	*766*
65+ *Free-living*	123	97	24	244	*540*
65+ *Living in an institution*	102	60	9	171	*93*
Females aged (years):					
4-6	58	65	49	172	*171*
7-10	69	68	53	190	*226*
11-14	70	48	53	171	*138*
15-18	101	54	61	216	*210*
19-64	132	103	47	282	*891*
65+ *Free-living*	109	96	25	230	*735*
65+ *Living in an institution*	83	61	19	163	*319*

*** Not calculated using 5-a-day definition. May include more than one portion of fruit juice and more than one portion of beans/pulses

Table 7: Average consumption of oily fish* per week

Gender and age	Mean (g)*	Number of portions**	*Number of subjects*
Males and females aged 1.5-4.5 years	5	<0.1	*1675*
Males aged (years)			
4-6	6	<0.1	*184*
7-10	5	<0.1	*256*
11-14	10	<0.1	*237*
15 –18	10	<0.1	*179*
19-64	51	0.4	*833*
65+ *Free-living*	12	<0.1	*540*
65+ *Living in an institution*	4	<0.1	*93*
Females aged (years)			
4-6	7	<0.1	*171*
7-10	8	<0.1	*226*
11-14	5	<0.1	*238*
15 –18	7	<0.1	*210*
19-64	50	0.4	*891*
65+ *Free-living*	7	<0.1	*735*
65+ *Living in an institution*	4	<0.1	*319*

*Excludes canned tuna. Includes recipe dishes
**One portion is about 140g

Table 8: Consumption of meat, meat products and dishes[†] by adults aged 65 years and over (g/week)

	65+ Free-living			65+ Living in an Institution		
Type of Meat in g/week	Males Mean (g)	Females Mean (g)	All Mean (g)	Males Mean (g)	Females Mean (g)	All Mean (g)
Bacon & ham	118	82	98	87	63	69
Beef, veal & dishes	214	185	197	204	160	170
Lamb & dishes	62	41	49	56	48	50
Pork & dishes	63	48	54	44	26	30
Coated chicken & turkey	9	9	9	5	4	4
Chicken & turkey dishes	140	128	133	78	64	67
Liver & liver products & dishes	20	16	18	9	10	10
Burgers & kebabs	11	12	12	8	10	9
Sausages	55	42	47	54	33	38
Meat pies & pastries	142	86	110	111	85	91
Other meat products*	60	34	45	73	54	59
Total meat, meat products & dishes	894	683	772	729	557	597
Number of subjects	*540*	*735*	*1275*	*93*	*319*	*412*

[†] Consumption data includes non-meat components of meat-based dishes

*Includes game, duck, goose, all offal (except liver), black pudding, corned beef, salami etc

Table 9: Consumption of meat, meat products and dishes† by children and young people aged 4 to 18 years (g/week)

	Males & females aged 1.5 to 4.5 years	Males aged 4 to 18 years					Females aged 4 to 18 years				
Type of Meat in g/week	1.5-4.5 Mean (g)	4-6 Mean (g)	7-10 Mean (g)	11-14 Mean (g)	15-18 Mean (g)	All Mean (g)	4-6 Mean (g)	7-10 Mean (g)	11-14 Mean (g)	15-18 Mean (g)	All Mean (g)
Bacon & ham	23	39	51	77	108	70	42	53	47	46	47
Beef, veal & dishes	86	81	111	120	230	138	72	126	137	150	124
Lamb & dishes	14	36	54	73	74	60	26	50	44	33	39
Pork & dishes	13	31	33	47	55	42	21	34	36	49	36
Coated chicken & turkey	21	63	69	66	92	73	61	70	79	88	75
Chicken & turkey dishes	46	98	121	194	273	174	111	133	159	192	150
Liver & liver products & dishes	3	2	3	3	4	3	3	2	2	3	3
Burgers & kebabs	24	37	43	76	140	75	34	43	62	67	52
Sausages	63	97	100	87	116	100	63	75	72	48	65
Meat pies & pastries	42	60	69	106	129	92	47	68	79	72	68
Other meat & meat products*	27	25	17	34	38	29	15	27	18	20	20
Total meat, meat products & dishes	362	569	671	883	1259	856	495	681	735	768	679
Number of subjects	*1675*	*184*	*255*	*237*	*179*	*856*	*171*	*226*	*238*	*210*	*845*

† Consumption data includes non-meat components of meat-based dishes

*Includes game, duck, goose, all offal (except liver), black pudding, corned beef, salami etc.

Table 10: Mean consumption of soft drinks (grams per week)

Consumption (grams per week)	Non-diet				Diet				Diet and non-diet	
	Ready to drink	Conc-entrated**	Carb-onated	**Total non diet drinks**	Ready to drink	Conc-entrated **	Carb-onated	**Total Diet drinks**	**Total soft drinks**	***No of subjects***
Males and females										
1½-4½ years	213	1291	419	1924	22	698	111	831	2755	*1675*
Males aged (years):										
4-6	227	703	491	1421	80	1105	341	1526	2946	*184*
7-10	218	859	807	1884	26	924	447	1396	3280	*255*
11-14	162	660	1266	2088	37	776	599	1412	3500	*237*
15-18	83	758	1889	2731	23	493	419	935	3667	*179*
19-64	69	282	725	1075	5	217	376	598	1673	*833*
65+ (free-living)	18	127	130	275	-	33	39	72	347	*540*
65+ (living in an institution)	68	579	58	705	11	122	11	144	848	*93*
Females aged (years)										
4-6	215	640	563	1418	62	953	332	1347	2764	*171*
7-10	211	758	671	1640	53	810	523	1386	3026	*226*
11-14	167	449	1035	1651	10	641	471	1122	2773	*238*
15-18	115	489	1129	1733	22	365	458	844	2577	*210*
19-64	88	198	420	707	8	157	540	705	1412	*891*
65+ (free-living)	17	126	111	254	2	32	34	68	322	*735*
65+ (living in an institution)	37	565	95	696	8	155	1	163	859	*319*

** Includes water used as a diluent

'- 'no cases

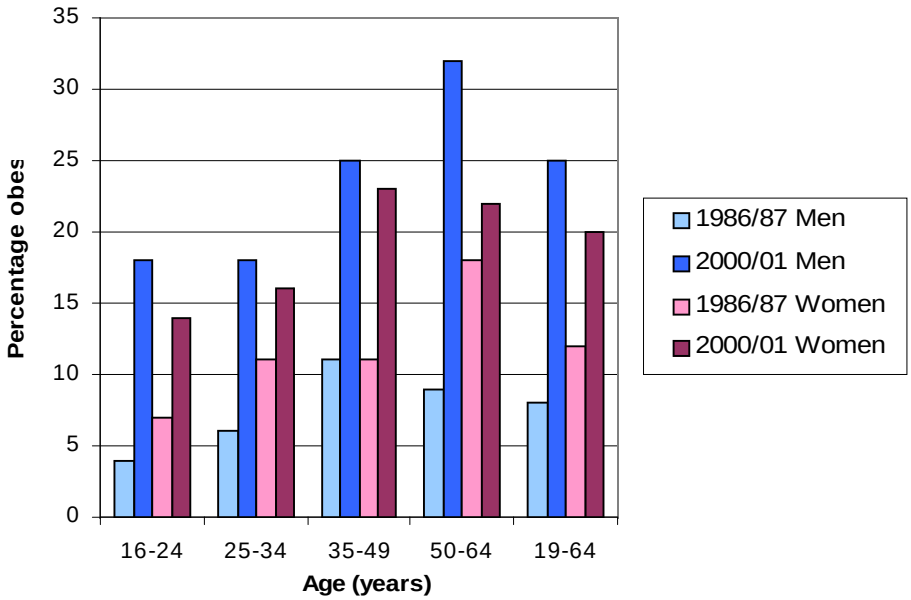
Energy and macronutrient intakes and blood lipids

Adults 19-64 years

Energy intake and body weight (Table 11; Figure 4)

33) Mean energy intakes for adults in 2000/01 fell below Estimated Average Requirements (EARs) for men and women in all age groups, and were 80-90% of EAR. However, the increasing prevalence of obesity suggests that energy intakes are generally in excess of requirements rather than inadequate. Data from the two surveys of adults in 1986/87 and 2000/01 showed that the prevalence of obesity or overweight (BMI above 25) had increased from 45% of men and 36% of women who were obese or overweight in 1986/87 to 66% of men and 53% of women in 2000/01. This trend is confirmed by data from the Health Survey for England. Mean energy intakes in the 1986/87 survey were also below EARs. Comparing the 1986/87 and 2000/01 surveys, mean energy intake had fallen slightly in men but was unchanged in women.

Figure 4: Comparison of prevalence of obesity (BMI greater than 30) in adults in 1986/87 and 2000/01



34) There is evidence of low energy intakes in some younger women and to a lesser extent young men. In the 19-24 age group 10% of women had energy intakes below 4MJ/day (EAR is 8.1MJ/day for this group). Six percent of men in the same age group had energy intakes below 6MJ/day (EAR 10.6MJ/day).

Fat and fatty acids (Table 12; Figure 6)

35) The percentage of food energy from fat in 2000/01 was 35.8% for men and 34.9% for women, close to the DRV of 35% and lower than in 1986/87 (40% for both men and women).

36) The percentage of food energy from saturated fatty acids in 2000/01 was also lower than in 1986/87 - 13% of food energy for men and women in 2000/01 compared with 17% in 1986/87, although intake in 2000/01 was still above the DRV (11% of food energy). Trans fatty acid intake followed a similar pattern and in 2000/01 met the DRV of 2% of food energy.

37) The main source of dietary fat for adults was meat and meat products, followed by cereals and cereal products. The main sources of saturated fat were milk and milk products and meat and meat products, followed by cereals and cereal products.

38) Secondary analysis of the adults 2000/01 dataset[16] to examine the dietary characteristics of high consumers of fat and saturated fat showed differences between high and low consumers of fat and saturated fat in the contribution of food groups to intakes. For example, very high fat consumers (> 39% food energy from fat) derived a higher proportion of their fat intake from cream, cheese, sausages, meat pies, chips, and crisps and savoury snacks, compared with low fat consumers (35% food energy from fat or less).

Blood lipids (Table 17a-c & 18)

39) The blood lipid data from the 1986/87 and 2000/01 adults surveys presented in Tables 17a-c show evidence of substantial changes in blood lipid levels in this age group, especially in older men. Table 17a shows that mean plasma total cholesterol levels were lower in all age/sex groups 2000/01 compared with 1986/87 and the proportion with levels below 5.2mmol/l, the cut-off point related to reduced risk of cardiovascular disease, was higher in 2000/01 than in 1986/87. For example, for men mean total plasma cholesterol levels in 2000/01 were 13% lower in the 50-64 age group and 6% lower in the 19-24 age group compared with 1986/87, and for women levels were 11% and 9% lower in the 50-64 and 19-24 age groups respectively. Generally accepted estimates at the population level predict that a decrease of 1% in total cholesterol will reduce cardiovascular disease risk by 1-2%.[17] On this basis these data suggest reduction in risk of around 20% for the 50-64 age group and around 10% in the 19-24 age group for both men and women. It is unclear whether the differences are entirely attributable to changes in the fat content of the diet over this period as there has also been an increase in the use of Statins to lower blood lipid levels. It should also be noted that differences in the assays used in the two surveys may contribute to the differences seen to some extent, though this is unlikely to explain all the change. Data from the Health Survey for England also shows a drop in mean plasma total cholesterol levels between 1994 and 1998 but there was no significant change between 1998 and 2003.

40) Table 17c shows that mean plasma LDL cholesterol levels were also lower in 2000/01 compared with 1986/87 in adult men and women. This is in line with the fall in plasma total cholesterol discussed above. For example for men mean LDL cholesterol levels in 2000/01 compared with 1986/87 were 16% lower in the 50-64 age group and 4% lower in the 19-24 age group, while for women levels were 13% and 9% lower in the 50-64 and 19-24 groups respectively. A 1% decrease in LDL is estimated to provide a 2% decreased risk of cardiovascular disease

[reference needed] so the data from these surveys suggest a reduction in risk of around a third in the 50-64 group and 8% in the 19-24 group. However the data also suggest that mean HDL cholesterol levels in younger men and women are slightly lower in 2000/01 compared with 1986/87. In the 2000/01 survey mean HDL levels in younger men and women tended to be lower than in the oldest group. Conversely, data from the Health Survey for England shows a marginal increase in mean HDL cholesterol for men between 1998 and 2003.

41) The ratio of total: HDL cholesterol is considered a predictor of the effects of dietary fatty acids on cardiovascular disease risk. A ratio above 5 is associated with increased risk [DN: reference to be added]. Comparing the ratios in the 1986/87 and 2000/01 surveys, for men the ratio was lower in 2000/01 compared with 1986/87 for age groups 25-34, 35-49 and 50-64, indicating a proportional increase in HDL relative to total cholesterol, while in the youngest (19-24) group the ratio was slightly higher in 2000/01, indicating a proportional reduction in HDL. For women there are no clear age differences with the ratio in 2000/01 lower in the youngest and oldest group and higher in the middle two groups. A decrease of one unit has been estimated to reduce risk of CVD by 50%[18] so for the 50-64 year old men this equates to a 46.5% reduction in risk. Mean total: HDL cholesterol ratio for men was higher in 2000/01 (5.55) compared with 1986/87 (5.28). Fifty-one percent of men overall had a ratio of 5 or above and this increased with age from 26% in the 19-24 year group to 56% in the 50-64 age group. The percentage of men with ratios of 5 or above was slightly lower in 2000/01 compared with 53% in 1986/87. In women the mean ratio was similar in 2000/01 (4.41) to 1986/87 (4.39). Twenty eight percent of women had ratios of 5 or above and this increased to 42% in the 50-64 age group. In the 50-64 age group the percentage with ratios of 5 or greater was slightly lower in 2000/01 than in 1986/7 though for women overall there was no difference between the two surveys.

Carbohydrate and non-milk extrinsic sugars (Table 12&13; Figure 6))

42) The most recent data on adults 19-64 years (2000/01) showed mean intakes of total carbohydrate at 47.7% of food energy for men and 48.5% for women, close to the DRV of 50% and higher than in 1986/87.

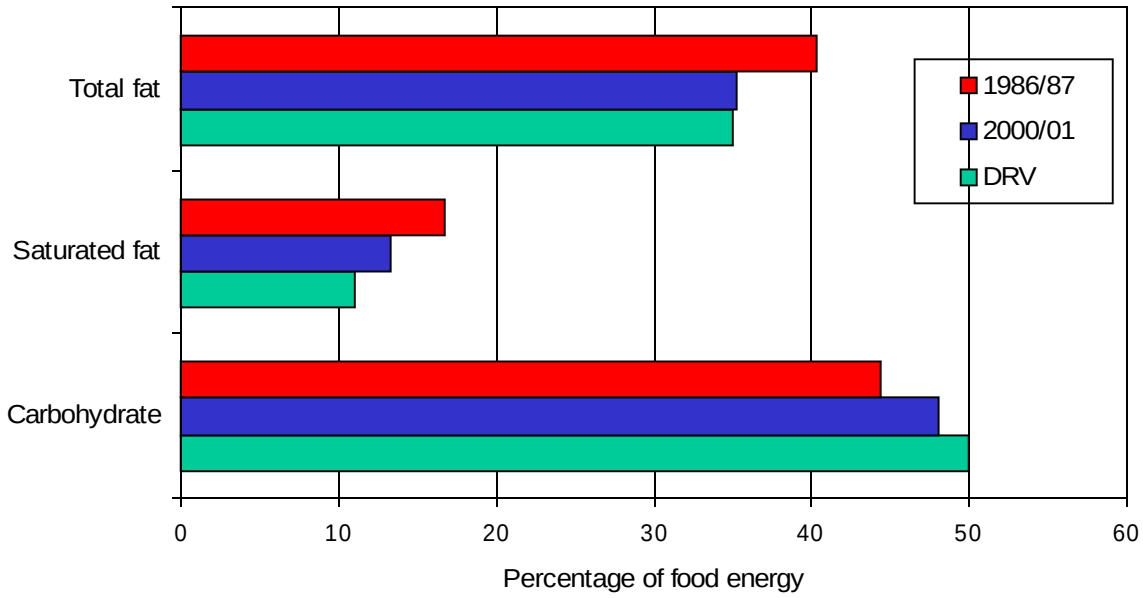
43) Mean intake of non-milk extrinsic sugars (NMES) exceeded the DRV of 11% of food energy, at 13.6% for men and 11.9% for women. Intakes were highest in the 19-24 age group in which the mean percentage of food energy derived from NMES was 17.4% for men and 14.2% for women. Intakes at the upper 2.5%ile were almost 30% of food energy.

44) The main single source of NMES for the 19-64 age group overall was table sugar, followed by soft drinks and biscuits, buns, cakes and pastries. In the 19-24 age group soft drinks was the major source and provided over a third of mean intake.

45) Secondary analysis of NDNS adults 2000/01 data to examine the characteristics of high consumers of NMES[16] (>15% food energy from NMES) showed that compared with low NMES consumers (11% or less food energy from NMES), this group derived a higher proportion of their NMES intake from table sugar,

confectionery, soft drinks and alcopops. Men in this group also derived a higher proportion of their intake from puddings and beer and lager and women from breakfast cereals, biscuits, buns, cakes and pastries and fruit juice.

Figure 6: Comparison of food energy intakes from total fat, saturated fat and total carbohydrate between 1986/87 and 2000/01 adult surveys.



Non-starch polysaccharides (NSP) (Table 14)

46) Mean NSP intakes in 2000/01 were 15.2g/day for men and 12.6g/day for women, well below the DRV of 18g/day. A third of men and half of women had intakes below 12g per day, the COMA individual minimum. Cereals and cereal products was the main source, providing over 40% of intake. Vegetables and vegetable dishes provided a fifth of intake. It is not possible to compare intakes with the 1986/87 survey of adults as that survey used the Southgate analytical method for dietary fibre.

Alcohol (Tables 15 & 16)

47) In the 2000/01 survey, 60% of men and 44% of women exceeded the recommended daily benchmarks for sensible drinking[x] on at least one of the seven reporting days. Six percent of men and 4% of women exceeded the benchmarks on four or more days of the week, with 3% of men exceeding the benchmark on all seven days. Thirty-nine percent of men and 22% of women drank more than twice the benchmarks on their heaviest drinking day.

48) Alcohol provided 6.5% of total energy intake on average for men and 3.9% for women in the 19-64 age group. There were no significant age differences in the contribution of alcohol to energy intake.

[x] Current advice for adults is that men should drink no more than three to four units of alcohol a day and women no more than two to three units a day. Consistently drinking four or more units a day for men or three or more units a day for women is not advised as a sensible drinking level because of the progressive health risk it carries. One unit is approximately equivalent to half a pint of beer, lager or cider, a single measure of spirits, one glass of wine or a small glass of sherry, port or other fortified wine. One unit is equivalent to 8 grams alcohol.

Older adults 65 years and over

Energy intake (Table 11)

49) Mean energy intakes were below EARs. In the free-living group mean energy intake was 85% of EAR in men and 76% in women and for men was lowest in the 85+ age group.

50) In the institution group mean energy intake was about 90% of the EAR.

Fat and fatty acids (Table 13)

51) In the free-living group, mean fat intakes for men were just above the DRV at 35.7% of food energy and just below the DRV at 36.1% for women. Saturated fat intakes were well above the DRV at 15% of food energy intake. Trans fatty acid intakes met the DRV. The main sources of total fat were cereals and cereal products, meat and meat products and fat spreads, each contributing about a fifth of intake. Milk and milk products was the main source of saturated fat, followed by cereals and meat.

52) In the institution group mean fat intake in men was close to the DRV and in women met the DRV. Saturated fat intakes were well above the DRV at 15% of food energy intake. Trans fatty acid intakes met the DRV. Meat and meat products made less contribution to fat intake than in the free-living group. The main sources of total fat were cereals, milk and fat spreads, and of saturated fat were milk, cereals and fat spreads.

Blood lipids (Table 17a-c)

53) Overall 34% of men and 24% of women in the free-living group and 62% of men and 43% of women in the institution group had a plasma total cholesterol concentration below 5.2mmol/l. Severely elevated levels (>7.8mol/l) were found in 3% of men and 14% of women in the free-living group and about 1% of men and women in the institution group. In the free-living group mean total cholesterol levels decreased with age in men but not women. Mean LDL cholesterol concentrations also decreased with age for men in both groups.

Carbohydrate and non-milk extrinsic sugars (NMES) (Table 13)

54) Total carbohydrate intake in the free-living group was 48% of food energy intake, close to the DRV and similar to the 19-64 group. NMES intake in men exceeded the DRV at 13% of food energy and in women was just above the DRV.

55) In the institution group total carbohydrate intake was higher than in the free-living group and met the DRV, at 51% of food energy intake for both men and women. This was largely due to the higher intake of NMES in this group, 17.9% and 18.5% of food energy in men and women respectively. Sugars, preserves and confectionery contributed about half the total intake; table sugar was the largest single contributor. Buns, cakes, pastries and puddings provided another fifth of intake and 9% came from drinks.

56) Sugar, preserves and confectionery was the main source of NMES intake in both the free-living and institution groups, providing over 40% of intake in the free-living group and about half in the institution group. Table sugar was the largest single contributor. Cereals provided around 30% of intake.

Non-starch polysaccharides (NSP) (Table 14)

57) Mean NSP intakes were below the DRV of 18 grams/day in both groups. Intake in the institution group was lower than in the free-living group.

Alcohol (Table 15)

58) In the free-living group the percentage of total energy intake derived from alcohol was 4% for men and 1% for women. Reported alcohol consumption and the percentage of total energy derived from alcohol was lower in the institution group than in the free-living group.

Children and young people 1½-18 years

Energy intake (Table 11)

59) Mean energy intakes were below the EARs in all groups. In girls aged 15-18 years mean energy intake was 77% of the EAR and in other groups 80-90% of EAR.

Fat and fatty acids (Table 13)

60) The mean percentage of food energy from total fat was above the DRV in all age groups, at about 36% on average. Mean intake of saturated fat was 17% of food energy in the 1½-2½ year group and declined with age to 15% of food energy in the 4-6 year group and 14% in the oldest group. Trans fatty acid intakes met the DRV in all age groups. Milk and milk products was the main source of total fat and saturated fat in the 1½-4½ group, providing over a quarter of total fat and over a third of saturated fat. In older children cereals and cereal products, meat and meat products and vegetables, potatoes and savoury snacks replaced milk as the main source of fat. The main sources of saturated fat in older children were milk, cereals and meat.

Carbohydrate and non-milk extrinsic sugars (Table 13)

61) Mean intakes of total carbohydrate met the DRV for all age groups.

62) Mean NMES intakes exceeded the DRV in all age groups. The 1½-4½ year age group had the highest mean intakes at 18.8% of food energy for boys and 18.6% for girls. In older children mean intakes were at 16-17% of food energy. There was a wide range of intakes, from 2-8% of food energy at the lower 2.5 percentile to 28-29% at the upper 2.5%ile. In the youngest children intakes at the upper 2.5 percentile were 35-37% of energy. Soft drinks (mainly carbonated) was the single largest contributor to NMES intake in all age groups, providing a third of intake on average. Sugar, preserves and confectionery contributed around 30% of intake and cereals and cereal products (including biscuits, buns, cakes and pastries) 25%.

The contribution of soft drinks increased with age, carbonated soft drinks alone provided 28% of NMES intake for boys aged 15-18. The contribution of cereals and cereal products tended to fall with age.

Non-starch polysaccharides (NSP) (Table 14)

63) Mean NSP intakes in all age groups were below the DRV of 18g/day for adults. Intakes increased with age from 6g/day in the 1½-4½ age group to 13g in boys and 11g in girls in the 15-18 age group.

Alcohol (Table 15)

64) In the 15-18 age group 1.9% of energy intake for boys and 1.4% for girls was derived from alcohol. Alcohol consumption reported in the dietary interview was 9 units[xi] per week for boys and 7 units per week for girls. Consumption in the 11-14 group was reported at 0.5 units per week.

Overview of energy and macronutrient intakes

65) Mean energy intakes fell below EARs in all age/sex groups. The difference between reported energy intakes and EARs is likely to arise from a combination of factors including mis-reporting and the possible overestimation of energy requirements due to a decrease in physical activity levels.

66) Fat intakes were generally just above the DRV and met the DRV for women aged 19-64 and women aged 65 and over living in an institution. Saturated fat intakes exceeded the DRV in all groups. Milk, cereals and meat were the major sources of fat and saturated fat, the contribution of milk decreasing with age, and that of meat increasing.

67) The percentage of food energy derived from carbohydrate met or was close to meeting the DRV of 50% in all age groups. Intakes in children and older people are above the DRV although this is largely due to the high consumption of non-milk extrinsic sugars (NMES) in these age groups. NMES intake exceeded the DRV in all age groups and was highest in children and older people in institutions. Soft drinks were the major source of NMES in children and young adults and table sugar in older adults.

68) All groups had mean protein intakes above the Reference Nutrient Intake levels.

69) Intake of non-starch polysaccharides was low overall and no groups met the DRV for adults.

[xi] One unit is approximately equivalent to half a pint of beer, lager or cider, a single measure of spirits, one glass of wine or a small glass of sherry, port or other fortified wine. One unit is equivalent to 8 grams alcohol.

Table 11: Average daily total energy intake (MJ) as a percentage of the estimated average requirement (EAR) by sex and age of respondent***

Gender and age of respondent	Mean energy intake (MJ)	Intake as % EAR**	*Number of subjects*
Males and females aged 1.5-3.5 years***	4.64	87%	*1179*
Males aged (years)			
3.5-4.5***	5.36	82%	*250*
4 – 6	6.39	89%	*184*
7 – 10	7.47	91%	*256*
11- 14	8.28	89%	*237*
15 – 18	9.60	83%	*179*
19 – 24	9.44	89%	*108*
25 – 34	9.82	93%	*219*
35 – 49	9.93	94%	*253*
50 – 64	9.55	92%	*253*
65+ *Free-living*	8.02	85%	*540*
65+ *Living in an institution*	8.14	91%	*93*
Females aged (years)			
3.5-4.5***	4.98	82%	*243*
4 – 6	5.87	91%	*171*
7 – 10	6.72	92%	*226*
11- 14	7.03	89%	*238*
15 –18	6.82	77%	*210*
19-24	7.00	86%	*104*
25-34	6.61	82%	*210*
35-49	6.96	86%	*318*
50-64	6.91	87%	*259*
65+ *Free-living*	5.98	76%	*735*
65+ *Living in an institution*	6.94	90%	*319*

**Standard EAR values used for each age/sex group as published in the UK Dietary Reference Values[11] EAR values for each age/sex group were derived from BMR calculated from the modified Schofield equations using mean body weight values for each age/sex group. PAL for adults taken as 1.4. The Estimated Average Requirements (EARs) for energy used are:

Men:	Women:
4-6 years: 7.16 MJ/day	6.46 MJ/day
7-10 years: 8.24 MJ/day	7.28 MJ/day
11-14 years 9.27 MJ/day	7.92 MJ/day
15-18 years 11.51 MJ/day	8.83 MJ/day
19 to 50 years: 10.60MJ/d	19 to 50 years: 8.10MJ/d
51 to 59 years: 10.60MJ/d	51 to 59 years: 8.00MJ/d
60 to 64 years: 9.93MJ/d	60 to 64 years: 7.99MJ/d

Energy intake as a percentage of EAR was calculated for each respondent using the EAR appropriate for sex and age.

***Energy intakes per kilogram body weight were used to calculate 'Intake as % of EAR'.

Table 12: Macronutrient intakes for adults in 1986/87 and 2000/01

Macronutrient	1986/87 Adults survey 16-64 years	2000/01 NDNS Adults 19-64 years	Dietary Reference Value[10] (population average)
Men			
Mean daily total energy intake (kcal)	2450	2313	2550 (19-59yrs) 2380 (60-64yrs)
% food energy from total carbohydrate	44.7	47.7	50%
% food energy from non-milk extrinsic sugars	n/a	13.6	No more than 11%
% food energy from protein	15.2	16.5	n/a
% food energy from total fat	40.4	35.8	No more than 35%
% food energy from saturated fatty acids	16.5	13.4	No more than 11%
% food energy from trans unsaturated fatty acids	2.2	1.2	No more than 2%
% food energy from cis monounsaturated fatty acids	12.4	12.1	Population average 13%
% food energy from cis n-3 polyunsaturated fatty acids	0.8	1	
% food energy from cis n-6 polyunsaturated fatty acids	5.4	5.4	
Women			
Mean daily total energy intake (kcal)	1680	1632	1940 (19-50yrs)
% food energy from total carbohydrate	44.2	48.5	50%
% food energy from non-milk extrinsic sugars	n/a	11.9	No more than 11%
% food energy from protein	15.6	16.6	n/a
% food energy from total fat	40.3	34.9	No more than 35%
% food energy from saturated fatty acids	17	13.2	No more than 11%
% food energy from trans unsaturated fatty acids	2.2	1.2	No more than 2%
% food energy from cis monounsaturated fatty acids	12.2	11.5	13%
% food energy from cis n-3 polyunsaturated fatty acids	0.8	1	
% food energy from cis n-6 polyunsaturated fatty acids	5.3	5.3	

n/a data not available

Table 13: Percentage of food energy from total carbohydrate, non-milk extrinsic sugars (NMES), protein, total fat, saturated fatty acids and trans fatty acids and comparison with COMA Dietary Reference Values (DRVs)

Gender and age	Percentage food energy from:						*No of subjects*
	Total carbohydrate	NMES	Protein	Total fat	Saturated fatty acids	Trans fatty acids	
Males aged (years)							
1.5-4.5	51.4	18.8	12.8	35.7	16.2	1.7	*848*
4 – 6	51.6	16.2	12.9	35.5	14.8	1.3	*184*
7 – 10	52.4	17.5	12.4	35.2	14.3	1.4	*256*
11 – 14	51.7	16.9	13.1	35.2	13.8	1.3	*237*
15 –18	50.5	15.8	13.9	35.9	13.9	1.4	*179*
19 – 24	49.0	17.4	14.9	36.0	13.5	1.2	*108*
25 – 34	47.7	13.9	16.5	35.8	13.2	1.2	*219*
35 – 49	47.5	13.1	16.7	35.9	13.5	1.2	*253*
50 – 64	47.4	12.2	17.0	35.6	13.4	1.2	*253*
65+ Free -living	48.2	13.2	16.1	35.7	14.6	1.5	*540*
65+ Living in an institution	50.8	17.9	14.1	35.1	15.2	1.7	*93*
Females aged (years)							
1.5-4.5	50.8	18.6	13.1	36.1	16.2	1.7	*827*
4 – 6	51.4	17.6	12.7	35.9	15.3	1.3	*171*
7 – 10	51.3	16.7	12.8	35.9	14.5	1.4	*226*
11 – 14	51.2	16.2	12.7	36.1	14.0	1.3	*238*
15 –18	50.6	15.3	13.9	35.9	13.8	1.3	*210*
19 – 24	49.1	14.2	15.4	35.5	12.9	1.1	*104*
25 – 34	48.7	11.8	15.9	35.4	13.2	1.1	*210*
35 – 49	48.6	11.8	16.7	34.7	13.2	1.2	*318*
50 – 64	48.1	11.0	17.4	34.5	13.3	1.2	*259*
65+ *Free-living*	47.5	11.5	16.5	36.1	15.3	1.6	*735*
65+ *Living in an institution*	51.3	18.5	14.0	34.8	15.4	1.8	*319*

Dietary reference values (DRVs) are:
Total carbohydrate should make up more than 50% of food energy intake
NMES should make up less than 11% of food energy intake
Total fat should make up less than 35% of food energy intake
Saturated fats should make up less than 11% of food energy intake
Trans fatty acids should make up less than 2% of food energy intake

Table 14: Mean non-starch polysaccharides intake (grams per day)

Gender and age	Mean intake (g)	*Number of subjects*
Males aged (years)		
1.5-4.5	6.3	*848*
4 – 6	9.1	*184*
7 – 10	10.3	*256*
11 – 14	11.6	*237*
15 –18	13.3	*179*
19 – 24	12.3	*108*
25 – 34	14.6	*219*
35 – 49	15.7	*253*
50 – 64	16.4	*253*
65+ *Free-living*	13.5	*540*
65+ *Living in an institution*	11.0	*93*
Females aged (years)		
1.5-4.5	5.9	*827*
4 – 6	8.0	*171*
7 – 10	9.8	*226*
11 – 14	10.2	*238*
15 –18	10.6	*210*
19 – 24	10.6	*104*
25 – 34	11.6	*210*
35 – 49	12.8	*318*
50 – 64	14.0	*259*
65+ *Free-living*	11.0	735
65+ *Living in an institution*	9.5	*319*

Table 15: Alcohol consumption

Gender and age	% total energy from alcohol*	Mean weekly alcohol consumption (units)**	*Number of subjects*
Males aged (years)			
11-14	0.0	0.5	*237*
15-18	1.9	9.1	*179*
19-24	6.0	27.8	*142*
25-34	6.6	21.6	*287*
35-49	6.8	20.7	*330*
50-64	6.4	18.3	*330*
65+ *Free-living*	4.0	N/a	*540*
65+ *Living in an institution*	0.9	N/a	*93*
Females aged (years)			
11-14	0.1	0.5	*238*
15-18	1.4	6.7	*210*
19-24	4.6	16.2	*136*
25-34	4.0	10.0	*275*
35-49	3.9	8.0	*415*
50-64	3.7	6.5	*337*
65+ *Free-living*	1.3	N/a	*735*
65+ *Living in an institution*	0.2	N/a	*319*

* Data from 7- day dietary record includes alcohol consumed as part of recipe dishes.
** Data from interview.
N/a – data not available

Table 16: Number of days on which units of alcohol consumed exceeded the recommended daily benchmarks

Number of days on which units of alcohol consumed exceeded the recommended daily benchmarks	Aged 19-64	
	Men	Women
	%	%
0	40	56
1	18	18
2	14	11
3	10	7
4	6	4
5	6	2
6	3	1
7	3	0
Number of subjects	*833*	*891*

Table 17(a) Percentage distribution of plasma total cholesterol by sex and age of respondent

	Males aged (years)												
Total cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 5.20	*75*	*41*	*21*	*13*	*84*	*59*	*44*	*41*	*29*	*39*	*60*	*55*	*73*
Less than 7.80	*100*	*96*	*91*	*90*	*100*	*98*	*98*	*98*	*96*	*97*	*100*	*99*	*100*
Mean (average)	4.7	5.5	6.1	6.4	4.40	5.04	5.38	5.56	5.75	5.37	4.84	5.07	4.39
Median	4.6	5.5	6.0	6.3	4.29	4.93	5.41	5.56	5.70	5.40	4.80	4.92	4.25
Upper 2.5%ile	*6.4	*7.4	*8.1	*8.3	6.33	7.80	7.47	7.76	8.10	7.75	7.25	7.34	6.32
Lower 2.5%ile	*3.4	*4.0	*4.6	*4.8	3.20	2.99	3.06	3.35	3.56	2.97	2.18	2.95	2.10
Number of subjects	*139*	*216*	*317*	*251*	*81*	*164*	*186*	*187*	*200*	*191*	*67*	*82*	*54*

	Females aged (years)												
Total cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 5.20	*66*	*61*	*35*	*10*	*83*	*68*	*52*	*25*	*24*	*23*	*27*	*42*	*44*
Less than 7.80	*98*	*99*	*97*	*79*	*100*	*99*	*99*	*91*	*85*	*86*	*90*	*99*	*99*
Mean (average)	4.9	5.1	5.7	6.8	4.46	4.84	5.13	6.06	6.24	6.30	5.95	5.60	5.36
Median	4.8	5.0	5.6	6.8	4.55	4.69	5.16	6.05	6.09	6.29	5.83	5.45	5.29
Upper 2.5%ile	*6.7	*6.3	*7.4	*9.0	6.04	6.92	7.17	8.69	9.27	9.85	8.25	7.52	7.52
Lower 2.5%ile	*3.6	*3.9	*4.1	*4.9	2.83	3.01	3.44	4.16	3.74	3.06	3.07	2.90	2.90
Number of subjects	*84*	*170*	*315*	*240*	*77*	*157*	*234*	*192*	*178*	*150*	*100*	*55*	*57*

* Values for 86/87 are 5.0 percentile

Table 17(b) Percentage distribution of plasma high-density lipoprotein (HDL) cholesterol by sex and age of respondent

	Males aged (years)												
HDL cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 1.00	*27*	*36*	*31*	*39*	*43*	*44*	*46*	*42*	*41*	*38*	*41*	*56*	*59*
Less than 1.20	*63*	*58*	*64*	*65*	*77*	*77*	*77*	*69*	*58*	*59*	*56*	*78*	*68*
Less than 1.40	*85*	*76*	*81*	*81*	*92*	*91*	*89*	*84*	*78*	*78*	*73*	*84*	*94*
Less than 1.60	*94*	*89*	*90*	*91*	*100*	*98*	*95*	*92*	*85*	*85*	*88*	*94*	*98*
Mean (average)	1.1	1.2	1.2	1.1	1.06	1.04	1.04	1.12	1.17	1.19	1.14	0.99	0.97
Median	1.1	1.1	1.1	1.1	1.07	1.02	1.01	1.04	1.09	1.10	1.06	0.94	0.87
Upper 2.5%ile	*1.62	*1.76	*1.84	*1.76	1.49	1.58	1.87	1.85	2.32	2.28	1.95	1.80	1.49
Lower 2.5%ile	*0.74	*0.73	*0.73	*0.63	0.68	0.61	0.56	0.64	0.52	0.58	0.58	0.46	0.45
Number of subjects	*139*	*214*	*315*	*251*	*81*	*164*	*186*	*186*	*200*	*191*	*67*	*82*	*53*

	Females aged (years)												
HDL cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 1.00	*15*	*9*	*12*	*10*	*24*	*20*	*22*	*18*	*18*	*17*	*21*	*38*	*36*
Less than 1.20	*35*	*29*	*32*	*29*	*52*	*42*	*45*	*38*	*38*	*33*	*40*	*53*	*63*
Less than 1.40	*66*	*50*	*52*	*50*	*76*	*68*	*71*	*64*	*59*	*52*	*53*	*66*	*78*
Less than 1.60	*84*	*72*	*71*	*70*	*90*	*86*	*84*	*79*	*72*	*71*	*76*	*77*	*84*
Mean (average)	1.3	1.4	1.4	1.4	1.21	1.26	1.27	1.34	1.39	1.41	1.35	1.26	1.19
Median	1.3	1.4	1.4	1.4	1.18	1.24	1.24	1.31	1.29	1.35	1.33	1.11	1.10
Upper 2.5%ile	*1.80	*2.01	*2.09	*2.19	1.71	1.97	2.34	2.36	2.58	2.36	2.22	2.69	2.05
Lower 2.5%ile	*0.88	*0.92	*0.89	*0.83	0.75	0.66	0.70	0.69	0.71	0.71	0.59	0.66	0.63
Number of subjects	*82*	*170*	*314*	*240*	*77*	*157*	*234*	*192*	*178*	*150*	*100*	*56*	*57*

Values for 86/87 are 5.0 percentile

Table 17(c) Percentage distribution of plasma low-density lipoprotein (LDL) cholesterol by sex and age of respondent

	Males aged (years)												
LDL cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 3.40	45	22	8	3	60	30	23	18	13	25	41	27	49
Less than 4.10	75	44	25	16	81	61	42	39	32	47	64	52	79
Mean (average)	3.5	4.3	5.0	5.3	3.35	4.00	4.34	4.44	4.58	4.17	3.69	4.08	3.42
Median	3.5	4.3	4.8	5.3	3.18	3.84	4.39	4.37	4.52	4.16	3.60	3.84	3.28
Upper 2.5%ile	*5.2	*6.4	*7.2	*7.3	5.37	6.77	6.78	6.64	7.06	6.71	6.40	6.35	5.25
Lower 2.5%ile	*2.2	*2.7	*3.2	*3.5	1.84	1.86	2.00	2.25	2.26	1.82	1.32	2.03	0.94
Number of subjects	*139*	*214*	*315*	*251*	*81*	*164*	*186*	*187*	*200*	*191*	*67*	*82*	*53*
	Females aged (years)												
LDL cholesterol	**1986/87 Adults Survey**				**2000/01 NDNS**				**Free-living participants**			**Institution participants**	
(mmol/l)	**18-24**	**25-34**	**35-49**	**50-64**	**19-24**	**25-34**	**35-49**	**50-64**	**65-74**	**75-84**	**85 & over**	**65-84**	**85 & over**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Less than 3.40	47	40	19	5	57	49	35	13	19	14	18	13	33
Less than 4.10	79	75	46	16	86	77	63	31	30	32	33	46	50
Mean (average)	3.6	3.7	4.3	5.4	3.26	3.57	3.85	4.72	4.85	4.89	4.59	4.34	4.17
Median	3.5	3.5	4.2	5.3	3.24	3.43	3.79	4.59	4.84	4.59	4.63	4.36	4.06
Upper 2.5%ile	*5.4	*5.1	*6.1	*7.7	4.98	5.84	6.00	7.22	7.73	8.58	6.75	6.23	6.53
Lower 2.5%ile	*2.3	*2.6	*2.8	*3.4	1.86	1.94	2.20	2.71	2.30	1.65	1.73	1.88	1.91
Number of subjects	*82*	*170*	*314*	*240*	*77*	*157*	*234*	*192*	*178*	*150*	*100*	*55*	*57*

*Values for 86/87 are 5.0 percentile.

Table 18 Percentage distribution of plasma total cholesterol to HDL cholesterol ratio by sex and age of respondent

Total cholesterol to HDL cholesterol ratio	Males aged (years)									
	1986/87 Adults Survey					2000/01 NDNS				
	19-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
Less than 5.0	*75*	*57*	*41*	*31*	*47*	*74*	*56*	*46*	*44*	*49*
Mean (average)	4.34	5.17	5.65	6.31	5.55	4.40	4.99	5.51	5.38	5.28
Median	4.10	4.59	5.35	6.05	5.17	4.04	4.65	5.26	5.24	5.03
Lower 2.5%ile	2.40	2.82	2.79	3.12	2.73	2.40	2.20	2.51	2.37	2.48
Upper 2.5%ile	7.61	9.81	10.07	12.16	10.29	8.20	8.49	10.36	9.11	9.32
Number of subjects	*112*	*199*	*297*	*240*	*848*	*46*	*114*	*237*	*183*	*580*
Total cholesterol to HDL cholesterol ratio	**Females aged (years)**									
	1986/87 Adults Survey					2000/01 NDNS				
	19-24	25-34	35-49	50-64	All	19-24	25-34	35-49	50-64	All
Less than 5.0	*82*	*85*	*78*	*55*	*74*	*89*	*80*	*74*	*58*	*72*
Mean (average)	4.09	3.84	4.31	5.12	4.39	3.85	4.09	4.34	4.88	4.41
Median	3.96	3.58	3.99	4.85	4.03	3.68	3.75	4.01	4.57	4.07
Lower 2.5%ile	2.57	2.46	2.51	2.68	2.53	2.34	2.32	2.25	2.52	2.33
Upper 2.5%ile	7.22	6.65	7.85	9.54	7.95	6.57	8.23	8.24	8.92	8.41
Number of subjects	*90*	*217*	*324*	*240*	*871*	*47*	*152*	*293*	*200*	*692*

Micronutrient intakes and status

70) The survey collected data on intakes of vitamins and minerals estimated from food consumption records over a seven-day period and on status measures for some vitamins and minerals from analysis of blood samples taken, usually within two weeks of the dietary recording period. Status measures are available for most vitamins for which intakes were assessed, but not minerals, with the exception of iron.

71) Associations between intake measures and nutritional status measures are generally weak for most micronutrients. There are a number of reasons for this. Many measures of nutritional status indicate long-term body stores and do not reflect short-term intakes, e.g. retinol.[19] In other cases there are physiological reasons why intake is not directly related to status, e.g. iron status is affected by controls on intestinal absorption, variation in bioavailability and in women menstrual blood loss[20].

72) The analytical methods used for individual nutritional status measures are generally comparable between the NDNS surveys. Where there is doubt about comparability this has been highlighted.

73) It is not possible to make comparisons of nutritional status between the 2000/01 and the 1986/87 surveys of adults because differences in the analytical methods used.

Adults 19-64 years

Vitamins (Table 19, 22, 23)

74) Mean intakes of all vitamins were above the Reference Nutrient Intakes (RNI) for men and women overall (taking all ages together).

75) There was some evidence of low intakes of vitamin A and riboflavin in younger groups (Table 19). Mean intakes of vitamin A fell below the RNI for men and women aged 19-24. Sixteen percent of men and 19% of women in this age group Intakes below the Lower Reference Nutrient Intake (LRNI) were found in 16% of men and 19% of women in the 19-24 age group and 7% of men and 11% of women in the 25-34 group. The main sources of vitamin A were meat and meat products and vegetables. Plasma retinol levels, which indicate long-term status and do not reflect recent vitamin A intake, were above threshold levels[19] except for 1% of men aged 50-64 years who had marginal status.

76) Mean riboflavin intakes were above the RNI in all age/sex groups but intakes below the LRNI were found in 8% and 15% of 19-24 year old men and women respectively and in 10% of women aged 25-34. The main sources of riboflavin were milk and milk products and cereals and cereal products (mainly from fortified breakfast cereals). A high proportion of adults had marginal status levels for riboflavin based on the EGRAC index[21][xii].

[xii] Erythrocyte Glutathione Reductase Activation Co-efficient (EGRAC) is a measure of red cell enzyme saturation with its riboflavin-derived –co-factor, flavin adenine dinucleotide. There are issues with the activation coefficient used to define those subjects who have marginal riboflavin status. An

77) Mean intakes of folate were above the RNI in all age/sex groups and no more than 3% of any age group had intakes below the LRNI. However only 14% of women aged 19-24 years, 8% of the 25-34 year group and 16% of the 35-49 group had a folate intake of 400µg/day or more, including intake from supplements[xiii]. The main dietary source of folate was cereals and cereal products, which provided a third of intake. Five percent of men and women had a red cell folate concentration indicative of marginal status with increased risk of deficiency[22]. This increased to 8% of the 19-24 year old women and 13% of the 19-24 year old men. No more than 1% of any age/sex group had a red cell folate concentration indicating severe deficiency (Tables 19 & 22).

78) Five percent of men and 3% of women had plasma vitamin C levels below 11µmol/l indicating biochemical depletion[23]. The proportion with vitamin intakes below the LRNI was below 0.5%.

79) Low vitamin D status (plasma hydroxy vitamin D level below 25nmol/l)[24] was found in around 15% of the adult population overall and a quarter of the 19-24 age group (24% of men and 28% of women). The proportion with low status was higher during the winter months. This threshold for low vitamin D status has been questioned recently and there is currently no consensus[25]. No RNI has been set for vitamin D in adults aged under 50 years.

Minerals (Table 20, 21)

80) Mean intakes of most minerals were above the RNIs for men and women overall (taking all age groups together). However there was evidence of low intakes of a number of minerals, including potassium, magnesium, zinc, and, for women, iron, calcium, copper and iodine, especially in the younger age groups.

81) Mean iron intakes in women were well below the RNI in all but the 50-64 age group. In the 19-24 and 25-34 groups over 40% had intakes below the LRNI. Cereals and cereal products was the main food source, providing over 40% of average intake. Under a fifth of intake came from meat and meat products on average for the group as a whole. Eight percent of women and 3% of men overall had haemoglobin levels below the WHO thresholds defining anaemia[26]. Eleven percent of women and 4% of men had serum ferritin levels below the normal range[27], increasing to 16% of women in the 19-24 group.

82) Mean potassium intakes were below the RNI in all age groups for women and in the youngest men (19-24). Intakes below the LRNI were found in 30% of women aged 19-34 and 18% of men aged 19-24.

activation coefficient of >1.2 was originally proposed to define marginal riboflavin status (Glatzle *et al*., 1970). Subsequent revisions to the methodology (Thurnham *et al*., 1972; Thurnham & Rathakette, 1982) resulted in a systematic increase in activation coefficients and the adoption of an activation coefficient of >1.3 to define marginal riboflavin status. Further increases in activation coefficients may have occurred as a consequence of methodological changes to the EGRAC assay and the activation coefficient used to define marginal riboflavin status should be re-evaluated.

[xiii] The Department of Health currently recommend that those women who could become pregnant take a supplement of 400µg folic acid per day prior to conception and until the twelfth week of pregnancy in order to minimise the risk of neural tube defects.

83) Mean intakes of magnesium were below the RNI for women in all age groups and men in the youngest group. Nine percent of men and 13% of women had intakes below the LRNI, increasing to 17% of men aged 19-24 and around a fifth of women in the 19-24 and 25-34 age groups. Cereals and cereal products was the main source, followed by drinks. Beer and lager was a significant source for men.

84) Mean intakes of zinc were close to or above the RNI or above in all age / sex groups. Intakes below the LRNI were found in 7% and 5% of the youngest men and women respectively. About a third of intake came from meat, a quarter from cereals and a sixth from milk.

85) Five percent of men and 8% of women in the youngest 19-24 age group had calcium intakes below the LRNI. Milk and milk products provided over 40% of average intake, and cereals 30%.

86) Twelve percent of women in the 19-24 age group had iodine intakes below the LRNI. Milk and milk products provided over 40% of intake for women and fish 12% of intake. Mean copper intakes fell below the RNI for women in all age groups. For adults as a group, around a third of copper intake came from cereals and a sixth of intake from meat.

Older adults 65 years and over

Vitamins (Tables 19, 22, 23)

87) Mean intakes of almost all vitamins were above RNIs in the free-living and institution groups. However there was evidence of intakes below the LRNI for a number of vitamins in the free-living group, including riboflavin, folate, and vitamin A, particularly in women and in the oldest group, aged 85 and over. Eleven percent of women in the free-living group aged 85 and over had folate intakes below the LRNI, 15% fell below the LRNI for riboflavin, 6% for vitamin B6 and 4% for vitamin C, vitamin A and vitamin B12.

88) There was also evidence of low status for these vitamins. Fifteen percent of the free-living group had serum folate concentrations below the normal range[22]. Eight percent had red cell folate concentrations indicating severe deficiency while 21% had a marginal status. Low plasma vitamin C levels, indicating biochemical depletion, were found in 14% overall and about a fifth of the oldest men and women. Over 40% overall had EGRAC levels indicating marginal riboflavin status[xiv].

89) Vitamin D intakes were below the RNI in all groups. Overall, 6% of men and 10% of women in the free-living group had low vitamin D status based on the threshold of low status of plasma hydroxy vitamin D below 25nmol/l [24,25]. This increased in the winter months.

90) In the institution group there was also some evidence of low intakes of riboflavin and folate especially in women. There was also a higher proportion with low status for some vitamins than in the free-living group. Mean serum folate

[xiv]There are issues with the activation coefficient used to define those subjects who have marginal riboflavin status.

concentration was significantly lower than in the free-living group and 39% of participants had a concentration below 6.3nmol/l. About 16 percent of the group overall had red cell folate levels indicating severe deficiency while 29% of men and 15% of women had marginal status. Low vitamin C status was found in around 40% of participants and low riboflavin status in 41% of men and 32% of women.

91) Vitamin D status was significantly lower in the institution group than in the free-living group. Over a third of men and women had low status though there was no evidence of seasonal variation. Vitamin D intakes from food sources were below the RNI in almost all participants and the contribution from supplements was low.

Minerals (Tables 20, 21)

92) Taking the age groups together, mean intakes of potassium and magnesium fell below the RNI for men and women in the free-living group and additionally copper for women. Magnesium intakes below the LRNI were found in a fifth of the free-living group overall and over a third of the oldest group. Potassium intakes below the LRNI were found in 17% of men and 39% of women, increasing to 57% of women aged 85 and over.

93) Low iron intakes were found in 6% of women overall and 10% aged 85 and over. Although iron intakes in men were adequate, low haemoglobin levels were found in 11% of men overall and 37% in the 85+ group. Comparable figures for women were 9% and 19%.

94) Low zinc intakes were found in 8% of men and 5% of women overall, increasing to 15% of men and 10% of women in the oldest group. Low calcium intakes were found in 9% of women overall and 15% of the oldest group.

95) The institution group also had a high proportion with intakes below the LRNI for magnesium and potassium and to a lesser extent for zinc. Iron intake in the institution group was similar to that in the free-living group but the proportion with low iron status was higher. Over half the men and 40% of women in institutions had low haemoglobin levels.

<u>Children and young people 1½-18 years</u>

Vitamins (Table 19, 22, 23)

96) Mean intakes of all vitamins except vitamin A were above RNIs. Mean vitamin A intakes were close to or above the RNI in younger children but below the RNI in older groups. A fifth of 11-14 year old girls and 13% of boys in the same age group had vitamin A intakes below the LRNI, as did 12% of boys and girls aged 15-18. However there was little evidence of low vitamin A status based on plasma retinol levels[19]. The main food sources of vitamin A in this age group were vegetables, providing about a quarter of average intake and milk and milk products, providing about a fifth.

97) Intakes were below the LRNI for riboflavin in 6% of boys and a fifth of girls in the 11-18 age groups. Raised levels of EGRAC, indicating marginal riboflavin status, were found in a high proportion of this age group[xv].

98) Mean vitamin D intakes from food for children under 4 years was 18% of the RNI. However there was no evidence of low status in this group. In older children status indices for vitamin D indicate that 13% of 11-18 year-olds had low status (below the normal adult range [24,25]). This proportion increased in the winter months.

99) Although dietary intakes of vitamin B_6 appear to be adequate, raised EAATAC levels[xvi][27] indicating deficiency were found in 10% of the 4-18 year age group. Low levels of serum B12[27] were also found in 8% of 15-18 year old girls although intakes were adequate.

100) Secondary analysis of the NDNS dataset for 4-18 year-olds[28] found that high consumers (the top third of population) of breakfast cereals had better folate, vitamin B_{12} and riboflavin status; there was also an association with thiamin and vitamin B_6 status in girls. The author found that there was no difference in iron status between groups, possibly due to lower meat intakes in high consumers of cereal.

Minerals (Table 20, 21)

101) Mean intakes of most minerals in young children were above the RNI, with the exception of iron in the under 4s, and zinc. However, in the older groups, mean intakes for a number of minerals were below the RNI: zinc in all groups, potassium, magnesium and calcium in older boys and girls, and iron and copper in older girls. Significant proportions of young people had intakes below the LRNI for potassium, magnesium and zinc, and for older girls, iron, calcium and iodine.

102) Sixteen percent of children under 4 years had iron intakes below the LRNI (data collected in 1992) but there were no intakes below the LRNI in the 4-6 age group (data collected in 1997). A substantial proportion of both age groups was anaemic and/or had low iron stores. In 11-14 and 15-18 year old girls, 45% and 50% respectively did not meet the LRNI and 14% and 27% had low serum ferritin levels.

103) Further analysis of the data[29] found that 30% of girls aged 11-18 had at least one indicator of low iron status, low haemoglobin, ferritin or transferrin saturation levels. It was found that eating red meat, fruit and fruit juice and salads were positively correlated with iron status while drinking more than one cup of tea a day and the onset of menarche was negatively correlated with iron status.

104) Further analysis of the NDNS 1½-4½ year dataset[30] found that dietary iron intake from food sources was only related to iron status in children with the lowest iron status. The key dietary variables for haemoglobin were vitamin C and copper

[xv] There are issues with the activation coefficient used to define those subjects who have marginal riboflavin status..

[xvi] Erythrocyte Aspartate Aminotransferase Activation Co-efficient (EAATAC) is a measure of the saturation of a red cell enzyme with a co-factor derived from vitamin B_6.

(positively associated) and polyunsaturated fats (negatively associated). Polyunsaturated fats were also negatively correlated with ferritin levels. Another secondary analysis[26] found that adolescent girls who were non-Caucasian or vegetarian had significantly poorer iron status than Caucasians or meat eaters.

105) Intakes of zinc were low across the age group. Further analysis of the NDNS 4-18 data[32] found that low zinc intakes were consistently more prevalent in children with a poor self-reported variety of foods in the diet and appetite rating. In addition, low intakes were less prevalent in girls aged 11-18 who consumed higher amounts of breakfast cereals.

Overview of micronutrient intakes and status

106) Mean intakes of vitamins were above the RNIs in all age groups except for vitamin A, which fell below the RNI for children and young adults. Vitamin A intakes below the LRNI were found in a substantial proportion of children and adults although there was no evidence of low status based on plasma retinol levels. Intakes below the LRNI were also found for riboflavin in older children, young adults and older people.

107) Mineral intakes were generally lower in relation to the DRVs than vitamin intakes. Intakes of magnesium and potassium were low in all age groups except young children, while a pattern of low intakes of several other minerals including calcium, zinc and iodine was seen in older children and young adults, particularly women.

108) Total iron intakes in girls and women of childbearing age were low compared with the DRVs. Up to 50% of some age groups had intakes below the LRNIs. Status indices (total haemoglobin, percentage iron saturation and serum ferritin) suggest that a smaller proportion of females in the 11-49 age range have a low status than is indicated by the consumption data, although the numbers of both males and females with low status are still significant.

109) The inclusion of dietary supplements increased mean intakes of most vitamins and some minerals, but had little effect on the proportions with intakes below the LRNI, indicating that supplements are generally taken by those who have adequate micronutrient intakes from food.

Table 19: Mean intakes of vitamins from food as a percentage of Reference Nutrient Intake (RNI) and percentage below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Vitamin	Males and females Age (years)		Males aged (years)							
	1½-4½		4-6		7-10		11-14		15-18	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (µg)	128	8	114	8	101	9	93	13	88	12
Thiamin (mg)	154	0	181	-	202	-	189	0	173	-
Riboflavin (mg)	197	0	194	-	162	1	144	6	148	6
Niacin equivalents (mg)	197	-	207	-	216	0	200	0	203	-
Vitamin B_6 (mg)	170	1	189	-	194	-	182	1	180	0
Vitamin B_{12} (µg)	560	-	499	-	395	-	372	0	330	-
Folate (µg)	184	0	191	-	141	-	123	1	152	-
Vitamin C (mg)	160	1	223	-	243	-	218	-	208	-
Vitamin D (µg)	*18*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Number of subjects	*1457*		*184*		*256*		*237*		*179*	

Vitamin	Females aged (years)							
	4-6		7-10		11-14		15-18	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (µg)	112	6	96	10	78	20	91	12
Thiamin (mg)	163	-	182	-	200	1	172	2
Riboflavin (mg)	175	-	137	1	120	22	118	21
Niacin equivalents (mg)	186	-	195	-	205	-	180	1
Vitamin B_6 (mg)	169	-	174	1	190	1	150	5
Vitamin B_{12} (µg)	446	-	347	1	270	1	225	2
Folate (µg)	169	-	126	2	102	3	105	4
Vitamin C (mg)	217	0	245	-	202	1	185	0
Vitamin D (µg)	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Number of subjects	*171*		*226*		*238*		*210*	

Vitamin D is also obtained from the action of sunlight on the skin. There are no DRVs specified for vitamin D intake for children aged 4 years and over.

Table 19 (continued) Mean intakes of vitamins from food as a percentage of Reference Nutrient Intake (RNI) and percentage below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Vitamin	Males aged (years)							
	19-24		25-34		35-49		50-64	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (μg)	80	16	103	7	141	5	164	4
Thiamin (mg)	160	2	232	0	204	0	230	1
Riboflavin (mg)	129	8	163	1	168	2	169	3
Niacin equivalents (mg)	232	-	272	-	270	0	279	0
Vitamin B_6 (mg)	189	-	211	0	206	2	201	1
Vitamin B_{12} (μg)	296	1	395	-	465	0	485	0
Folate (μg)	151	2	173	-	171	0	181	-
Vitamin C (mg)	162	-	185	0	221	-	236	-
Vitamin D (μg)**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of subjects	*108*		*219*		*253*		*253*	

Vitamin	Females aged (years)							
	19-24		25-34		35-49		50-64	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (μg)	78	19	98	11	112	8	136	5
Thiamin (mg)	181	-	194	2	190	1	200	1
Riboflavin (mg)	126	15	131	10	151	5	159	6
Niacin equivalents (mg)	246	2	240	-	263	1	270	0
Vitamin B_6 (mg)	165	5	158	1	170	2	177	2
Vitamin B_{12} (μg)	266	1	264	1	325	1	378	0
Folate (μg)	114	3	117	2	128	2	134	2
Vitamin C (mg)	170	1	181	-	200	0	236	0
Vitamin D (μg)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of subjects	*104*		*210*		*318*		*259*	

**Vitamin D is also obtained from the action of sunlight on the skin. No DRV set for adults

Table 19 (continued) Mean intakes of vitamins from food as a percentage of Reference Nutrient Intake (RNI) and percentage below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Vitamin	Males aged (years)									
	65-74 *Free-living*		**75-84 *Free-living***		**85+ *Free-living***		**65-84 *Institution***		**85+ *Institution***	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (µg)	173	4	160	6	149	2	147	1	157	-
Thiamin (mg)	170	-	179	1	174	1	n/a	1	168	1
Riboflavin (mg)	137	4	130	5	126	5	133	3	146	2
Niacin equivalents (mg)	208	-	215	1	199	<0.5	-	-	194	<0.5
Vitamin B_6 (mg)	169	2	167	1	150	3	n/a	1-2	150	1
Vitamin B_{12} (µg)	427	-	367	1	320	-	327	-	333	-
Folate (µg)	141	*	125	1	117	4	117	4	118	5
Vitamin C (mg)	179	1	148	3	127	2	123	-	127	2
Vitamin D (µg)	43	N/A	38	N/A	32	N/A	36	N/A	41	N/A
Number of subjects	*353*		*160*		*26*		*57*		*36*	

Vitamin	Females aged (years)									
	65-74 *Free-living*		**75-84 *Free-living***		**85+ *Free-living***		**65-84 *Institution***		**85+ *Institution***	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Vitamin A (retinol equivalents) (µg)	161	4	165	5	152	4	156	1	164	-
Thiamin (mg)	153	-	166	-	157	1	n/a	-	153	*
Riboflavin (mg)	133	10	128	9	117	15	155	-	141	6
Niacin equivalents (mg)	214	-	200	-	183	1	207	-	184	*
Vitamin B_6 (mg)	170	2	150	2	140	6	170	-	150	*
Vitamin B_{12} (µg)	307	1	300	1	233	4	300	-	307	-
Folate (µg)	108	4	101	7	92	11	105	2	94	8
Vitamin C (mg)	*168*	1	136	1	122	4	129	-	111	*
Vitamin D (µg)**	30	N/A	30	N/A	23	N/A	33	N/A	33	N/A
Number of subjects	*409*		*249*		*77*		*144*		*174*	

**Vitamin D is also obtained from the action of sunlight on the skin.

Table 20: Mean intakes of minerals from food sources as a percentage of Reference Nutrient Intake (RNI) and percentage with intakes below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Mineral	Males and females aged (years)		Males aged (years)							
	1½- 4½		4-6		7-10		11-14		15-18	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	77	16	134	-	111	1	95	3	111	2
Calcium (mg)	183	1	157	3	135	2	80	12	88	9
Magnesium (mg)	159	0	143	3	97	2	78	28	85	18
Potassium (mg)	187	0	177	-	107	-	77	10	81	15
Zinc (mg)	87	14	85	12	88	5	79	14	92	9
Iodine (µg)	170	3	156	2	140	1	124	3	139	1
Copper (mg)**	119	N/A	117	N/A	116	N/A	112	N/A	106	N/A
Number of subjects	*1457*		*184*		*256*		*237*		*179*	

Mineral	Females aged (years)							
	4-6		7-10		11-14		15-18	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	119	1	96	3	60	45	58	50
Calcium (mg)	146	2	119	5	80	24	82	19
Magnesium (mg)	129	1	89	5	65	51	64	53
Potassium (mg)	161	-	101	1	68	19	62	38
Zinc (mg)	75	26	81	10	66	37	87	10
Iodine (µg)	143	2	119	3	92	13	96	10
Copper (mg)**	106	N/A	105	N/A	98	N/A	80	N/A
Number of subjects	*171*		*226*		*238*		*210*	

** no LRNI set for copper

Table 20 (continued): Mean intakes of minerals from food sources as a percentage of Reference Nutrient Intake (RNI) and percentage with intakes below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Mineral	Males aged (years)							
	19-24		25-34		35-49		50-64	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	131	3	150	0	157	1	156	1
Calcium (mg)	123	5	145	2	149	2	147	2
Magnesium (mg)	86	17	103	9	106	7	106	9
Potassium (mg)	81	18	94	3	99	5	101	5
Zinc (mg)	95	7	108	2	111	4	109	3
Iodine (μg)	119	2	154	1	158	2	164	1
Copper (mg)**	95	N/A	114	N/A	128	N/A	126	N/A
Number of subjects	*108*		*219*		*253*		*253*	

Mineral	Females aged (years)							
	19-24		25-34		35-49		50-64	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	60	42	62	41	69	27	122	4
Calcium (mg)	99	8	104	6	114	6	118	3
Magnesium (mg)	76	22	77	20	87	10	91	7
Potassium (mg)	67	30	68	30	78	16	82	10
Zinc (mg)	98	5	96	5	108	4	112	3
Iodine (μg)	93	12	103	5	116	4	127	1
Copper (mg)**	76	N/A	83	N/A	88	N/A	89	N/A
Number of subjects	*104*		*210*		*318*		*259*	

** no LRNI set for copper

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Table 20 (continued): Mean intakes of minerals from food sources as a percentage of Reference Nutrient Intake (RNI) and percentage with intakes below the Lower Reference Nutrient Intake (LRNI), by age and sex.

Mineral	Males aged (years)									
	65-74 *Free-living*		**75-84 *Free-living***		**85+ *Free-living***		**65-84 *Institution***		**85+ *Institution***	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	128	-	124	2	120	4	110	4	110	5
Calcium (mg)	122	4	116	5	109	2	134	-	140	1
Magnesium (mg)	88	16	80	29	72	36	71	37	72	42
Potassium (mg)	81	14	72	23	66	34	70	27	69	28
Zinc (mg)	95	6	88	12	85	15	88	14	87	12
Iodine (µg)	137	1	129	2	119	4	139	1	137	2
Copper (mg)**	98	N/A	87	N/A	73	N/A	80	N/A	77	N/A
Number of subjects	*353*		*160*		*26*		*57*		*36*	

Mineral	Females aged (years)									
	65-74 *Free-living*		**75-84 *Free-living***		**85+ *Free-living***		**65-84 *Institution***		**85+ *Institution***	
	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI	Mean intake as % RNI	% below LRNI
Total iron (mg)	103	4	97	6	89	10	99	4	90	8
Calcium (mg)	101	8	97	10	92	15	129	1	118	1
Magnesium (mg)	77	19	69	27	66	34	74	16	66	27
Potassium (mg)	66	30	60	47	56	57	65	33	58	50
Zinc (mg)	100	3	96	7	91	10	107	1	96	6
Iodine (µg)	109	6	103	4	102	7	129	1	121	1
Copper (mg)**	76	N/A	69	N/A	66	N/A	72	N/A	68	N/A
Number of subjects	*409*		*249*		*77*		*144*		*174*	

** no LRNI set for copper
- no cases

.

Table 21: Percentage of respondents below thresholds for iron status

Gender and age	Haemoglobin concentration	% Iron saturation	Serum ferritin	*Number of subjects*
	lower threshold for anaemia	lower threshold for anaemia	low iron stores	
	%	%	%	
Male aged (years)				
1.5-4.5	7	n/a	24	*475*
4-6	3	23	18	*86/60/69*
7-10	47	18	14	*185/150/147*
11-14	30	19	17	*181/166/153*
15-18	1	12	5	*164/149/131*
19 – 24	-	6	4	*83/81/85*
25 – 34	2	13	0	*170/165/169*
35 – 49	4	3	6	*191/188/186*
50 – 64	3	6	5	*194/189/194*
65+ Free-living	11	6	7	*411/477*
65+ Living in an institution	52	21	11	*63/141*
Female aged (years)				
1.5-4.5	9	n/a	17	*476*
4-6	8	24	9	*82/61/63*
7-10	16	18	2	*143/119/99*
11-14	4	20	14	*171/155/128*
15-18	9	30	27	*169/159/136*
19 – 24	7	27	16	*81/77/80*
25 – 34	8	17	8	*162/158/156*
35 – 49	10	18	12	*243/238/238*
50 – 64	7	8	8	*196/192/195*
65+ Free-living	9	15	9	*532/451*
65+ Living in an institution	39	30	10	*184/122*

n/a = not available

Thresholds

Haemoglobin (g/dl)[26]: 1½-6 years (male & female) <11.0
7 years + male <13.0
7 years + female <12.0

Iron saturation %[19]: 4 years + (male & female) < 15

Serum ferritin (µg/l)[27] 1½-4½ years (male & female) <10
7 years + male < 20
7 years + female < 15

Table 22: Percentage of respondents with low status for water soluble vitamins

	Plasma vitamin C [23] Biochemical depletion (< 11µmol/l)	Red cell folate [22] severely deficient (<230nmol/l)	Red cell folate [22] marginal status (230-345 µmol/l)	Serum folate[23] Deficient (< 6.3nmol/l)	Serum vit B12[22] Lower limit of normal range (< 118 pmol/l)	Thiamin (ETKAC)[19] Biochemical deficiency (>1.25)	Riboflavin (EGRAC)[21] Marginal /deficient status (>1.3)	Vitamin B6 (EAATAC)[27] biochemical deficiency (> 2.0)	*Number of subjects*
	%	%	%	%	%	%	%	%	
Males aged (years)									
1.5-4.5	3	n/d	n/d	n/d	n/d	n/a	19	n/a	*380-421*
4-6	5	-	3	-	-	1	59	7	*69-86*
7-10	2	1	3	-	-	-	78	8	*165-185*
11 – 14	1	1	7	-	-	0	80	11	*172-181*
15 –18	3	-	12	1	1	-	80	15	*152-161*
19 – 24	7	-	13	-	-	-	82	4	*79-84*
25 – 34	5	1	3	1	-	3	70	10	*156-170*
35 – 49	4	1	4	1	2	2	67	13	*180-191*
50 – 64	5	-	2	1	3	5	54	11	*178-196*
65+ Free-living	14	8	20	16***	8	8	41	n/a	*454-480*
65+ Living in an institution	44	13	29	40***	7	11	41	n/a	*132-142*
Females aged (years)									
1.5-4.5	2	n/d	n/d	n/d	n/d	n/a	27	n/a	*364-407*
4-6	2	-	1	-	-	1	75	6	*76-82*
7-10	3	1	8	-	-	2	85	11	*125-138*
11 – 14	1	-	1	1	-	2	90	14	*161-169*
15 – 18	4	1	13	1	8	3	95	8	*156-169*
19 – 24	4	-	8	-	5	-	77	12	*72-81*
25-34	3	-	4	-	5	1	78	8	*151-162*
35 – 49	4	-	5	0	4	2	69	12	*234-243*
50 – 64	3	0	6	-	3	1	50	13	*188-197*
65+ Free-living	13	8	22	14***	5	9	42		*439-459*
65+ Living in an institution	38	18	15	38***	10	15	32	n/a	*116-122*

n/d = poor status not defined n/a Data not available

Table 23: Percentage of respondents with low status for fat soluble vitamins

	Plasma retinol [15]		Plasma 25-hydroxyvitamin D[24]	Tocopherol: cholesterol ratio[11]	*Number of subjects*
	severely deficient (<0.35µmol/l) %	marginal status (0.35-0.7 µmol/l) %	below lower limit of normal range (<25 nmol/l) %	below lower limit of normal range (< 2.25) %	
Males aged (years)					
1.5-4.5	2*	11**	-	n/a	*377-411*
4-6	-	2	3	-	*70-73*
7-10	-	2	4	-	*162-167*
11 – 14	-	-	11	-	*174-177*
15 –18	-	-	16	-	*152-153*
19 – 24	-	-	24	1	*75-81*
25 – 34	-	-	16	1	*152-165*
35 – 49	-	-	12	1	*170-190*
50 – 64	-	1	9	1	*173-190*
65+ Free-living	-	-	6	-	*432-476*
65+ Living in an institution	-	3	38	-	*129-138*
Females aged (years)					
1.5-4.5	2*	10**	1	n/a	*360-405*
4-6	-	3	2	-	*71-76*
7-10	-	2	7	-	*131-133*
11 – 14	-	-	11	-	*159-164*
15 –18	-	0	10	-	*161-162*
19 – 24	-	-	28	-	*72-78*
25 – 34	-	-	13	2	*146-158*
35 – 49	-	-	15	1	*175-239*
50 – 64	-	-	11	3	*175-194*
65+ Free-living	-	*	10	-	*405-451*
65+ Living in an institution	-	-	37	-	*109-120*

n/d cut-off not defined
N/a data not available

*< 0.5 µmol/l
**0.5 - 0.75 µmol/l

Salt *(Table 24; Figure 7)*

110)Sodium intakes are estimated from 24-hour urine collections as estimates based on dietary records exclude salt added at the table or in cooking and so underestimate actual intake. Sodium intakes based on 24-hour urine collections are available from the 1986/87 and 2000/01 surveys of adults. Average intakes of salt in 2000/01 were 9.5g/day overall (11g/day for men and 8g/day for women); well above 6g/day (the recommended maximum).

Figure 7a: Mean salt intakes in men in 1986/87 and 2000/01

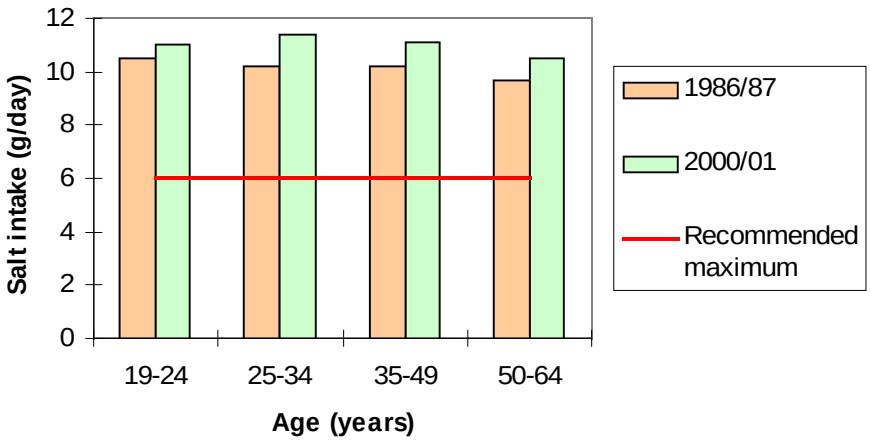
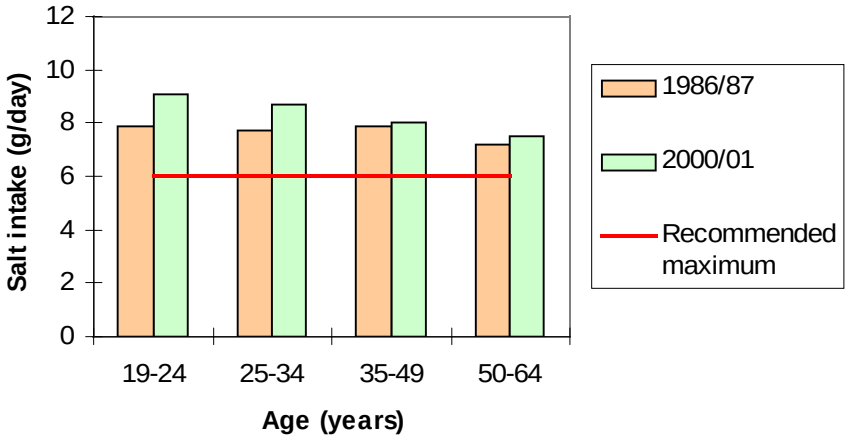


Figure 7b: Mean salt intakes in women in 1986/87 and 2000/01



111)The proportions of the population consuming less than 6g/day were 15% of men and 31% of women. Men and women in the 19-24 age group were least likely to meet the target with only 2% and 17% consuming less than 6g/day, respectively. At the upper end of the distribution, 21% of men and 5% of women had an intake above 15g/day.

112)The average intake of salt has increased from 9g/day in 1986/87 to 9.5g/day in 2000/01.

113) It is estimated that 75% of salt intake comes from processed foods. Of the remainder 10-15% comes from naturally occurring sodium in foods and 10-15% from discretionary salt added to food at the table or in cooking.

Table 24: Percentage distribution of salt intake (g/day) estimated from total urinary sodium

Salt intake (g/day)	Men aged (years)				All men	Women aged (years)				All women
	19-24	25-34	35-49	50-64		19-24	25-34	35-49	50-64	
	cum %	Cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %	cum %
3 or less	-	5	2	5	4	4	6	5	7	6
6 or less	2	20	13	18	15	17	29	31	38	31
9 or less	37	34	39	42	39	66	59	68	69	66
12 or less	60	57	58	65	60	84	81	85	91	86
15 or less	81	73	80	83	79	90	92	96	96	95
18 or less	100	89	91	91	91	92	97	100	99	98
All		100	100	100	100	100	100		100	100
Mean	11.0	11.4	11.1	10.5	11.0	9.1	8.7	8.0	7.5	8.1
Number of subjects	*62*	*152*	*170*	*183*	*567*	*60*	*129*	*203*	*187*	*580*

Oral health

Adults 19-64 years

114)[DN: analysis of NDNS adults oral health data not yet published. Report due to be published early 2006. Include reference in final version.]

Older adults aged 65 years and over

115)The NDNS of people aged 65 years and over included analysis of associations between oral health (in particular the presence of natural teeth) and diet and nutritional status[33]. The survey found that better oral health, including how many natural teeth people had, was associated with better nutritional status. The condition of the mouth and the presence, number and distribution of natural teeth was related to the ease and ability to eat foods such as fresh fruit and uncooked vegetables and foods requiring more chewing. In the free-living group edentate respondents reported greater difficulty with eating a range of foods, for example apples, than did the dentate group. Ease of eating a range of foods was related to the number of natural teeth present and in particular the number of pairs of opposing teeth. The edentate group had a lower mean energy intake than the dentate group and lower intakes of many nutrients including protein, NSP, iron, calcium and vitamin C. This group also had lower status levels for vitamins A, C and E.

116)Prevalence of poor oral health (particularly poor oral hygiene and root decay) was higher in the institution group than in the free-living group. There were few subjects with natural teeth in the institution group. Over half the group reported difficulty with eating foods such as nuts and raw carrots. There were fewer differences in nutrient intakes and nutritional status between the dentate and edentate groups than there were in the free-living group. The median plasma vitamin C level in the edentate group in institutions was 11.4µmol/l, close to the threshold for biochemical depletion (11µmol/l).

Children and young people aged 1½-18 years

117)The oral health component of the NDNS of children aged 1½-4½ years, carried out in 1992/93[34], found that 17% of children in this age group had some experience of dental decay, increasing to 30% in the 3½-4½ year age group. Children in Scotland and the North of England had more decay than children in other parts of England and Wales. Half the 3½-4½ year age group in Scotland and 43% in Northern England had some experience of dental decay, compared with less than a quarter of children in the rest of England and Wales. Having a drink in bed every night was associated with increased decay experience in the 1½-2½ year and 2½-3½ year age groups. The frequency of consumption of sugar confectionery and carbonated drinks was related to dental decay in all age groups. For example, 40% of 3½-4½ year olds who had sugar confectionery most days or more often had experience of caries compared with just over a fifth of less frequent consumers of sugar confectionery.

118)An identical survey carried out as part of the 1997 NDNS of young people 4-18 years[35] found that the proportion with dental decay increased from 37% in the 4-6 year group to 67% in the 15-18 year group. The prevalence of decay was highest in Scotland and lowest in London and the South East. Like the pre-school children there were links between the frequency of consumption of sugary foods and dental decay.

Regional differences in diet and nutritional status

119)Generally the surveys show few clear regional trends or patterns in diet, nutrient intake or nutritional status. This is partly because the sample size in each region was sometimes too small for differences to reach statistical significance, particularly for Scotland.

120)There is some evidence of lower fruit and vegetable consumption in Scotland (and to a lesser extent Northern England) but this is not consistent across surveys. Children in Scotland were less likely to eat most types of vegetables (but not fruit) than children in other regions and older people (65 and over) in Scotland and the North were less likely to eat most types of fruit than those in other regions. The most recent survey of adults (2000/01) found no regional differences in consumption of fruit and vegetables overall, although women in Scotland and in the North ate less vegetables than women in London and the South East.

121)There were very few regional differences in intake of energy and macronutrients. Children and older people in Scotland had lower NSP intakes than other regions, probably reflecting low fruit and vegetable consumption. There was no regional difference in NSP intake in the most recent adults survey.

122)Regional differences in micronutrient intakes and status were more marked than those for macronutrients. Young children (1½-4½ years) in Scotland had the lowest mean intakes of vitamin C and total carotene and the lowest intakes of some minerals. However mean intakes of folate in this age group were lowest in London and the South East and Northern England. Further analysis of this dataset[30] found that higher proportions of children with combined low intakes of vitamin A, iron and zinc (7-9% compared to 2% overall) were found in parts of the North and in Scotland. Children in the North also had lower mean blood levels of water-soluble vitamins, e.g. vitamin C, than those in other regions. In the later survey of the 4-18 year group the differences were less marked. Children in Scotland had lower mean intakes of some vitamins compared to some other regions but there were few consistent patterns. Girls in the North had lower mean plasma vitamin C levels than those in other regions.

123)In the most recent survey of adults 19-64 years, there were very few regional differences in micronutrient intakes or status. There was some evidence of higher mean intakes in London and the South East than elsewhere for some vitamins, e.g. vitamin C for women, but there were no differences for minerals. In Scotland and the North, plasma levels of vitamin C and vitamin D were lower for men and women and serum ferritin and red cell folate levels were lower for women than in other regions.

Socio-economic differences in diet and nutritional status

124)Comparisons of diets, nutrient intakes and nutritional status in people from lower and higher socio-economic status households (based on household receipt of benefits, social class and household income) show clear differences. People from lower socio-economic status households have different dietary patterns, in particular lower consumption of fruit and vegetables and also have lower intakes and blood levels of many micronutrients. Unless otherwise stated, differences refer to mean levels and a lower mean intake or blood level does not necessarily imply deficiency.

125)The 2000/01 survey of adults showed some marked differences in dietary patterns between adults in benefit households[xvii] and others. The benefit group had a much lower consumption of fruit and vegetables than the non-benefit group (2.1 portions a day for men and 1.9 for women in the benefit group compared with 2.8 portions a day for men and 3.1 for women in the non-benefit group). Those in benefit households were also less likely to eat high fibre breakfast cereals, oily fish and softgrain and other bread and were more likely to eat table sugar, whole milk, burgers and kebabs and meat pies.

126)Findings in other age groups were similar. Young children (1½-4½ years) in manual social class households were half as likely to consume fruit juice than were their counterparts in non-manual households and were also less likely to eat fruit and salad vegetables, while the manual social class group were more likely to drink tea. Children aged 4-18 years from less advantaged households ate a smaller range of foods and were less likely to consume salad vegetables, fruit, some types of fruit juice and semi-skimmed milk.

127)Mean energy intakes are lower in lower socio-economic groups compared with other groups and so mean intakes of some macronutrients are also lower. Intakes of protein and NSP in particular tend to be lower in people from lower socio-economic households. There are few differences in the proportion of energy derived from the macronutrients. In the 2000/01 adults survey women in benefit households derived a higher proportion of energy intake from NMES and a lower proportion from protein than those in non-benefit households. Findings in other age groups are similar.

128)Adults living in households in receipt of benefits had lower average intake of many vitamins and minerals, compared with adults in non-benefit households. More than half, 53%, of women aged 19 to 50 years living in benefit households had an iron intake from food sources below the LRNI, compared with about a third, 29%, of those in non-benefit households. People living in households in receipt of benefits had lower status of some micronutrients on average, than people in non-benefit households, specifically vitamin C, folate, vitamin E and selenium for men and women and carotenoids and vitamin D for women.

129)Lower intakes of most vitamins were recorded for young children from manual home backgrounds. When the intakes were adjusted for differences between the groups in energy intake, the diets of children from manual backgrounds were found to have proportionately lower intakes of total carotene, niacin, vitamin B_{12}, vitamin C and E. Children from non-manual home backgrounds tended to have higher average intakes of most minerals, except sodium and chloride for which higher average intakes were recorded in the diets of children from manual home backgrounds. Furthermore, children from manual home backgrounds had lower intakes of many minerals than other children, even after adjusting for energy intakes.

130)A further analysis project showed that low intakes of vitamin A, iron and zinc were associated consistently with lower socio-economic status in the 1½-4½ age group[25].

[xvii] Benefit households are those households where one or more members were receiving Working Families Tax Credit at the time of the survey or had drawn Income Support or (income-related) job-seekers allowance in the previous 14 days.

131)Older people in manual social class households also had lower mean intakes of vitamins and minerals and lower blood levels than those from non-manual households.

Low income diet and nutrition survey

132)The Food Standards Agency commissioned a Low Income Diet and Nutrition survey to provide, for the first time, a single robust, representative, baseline dataset on food consumption, nutrient intake and nutritional status and factors affecting these in low-income/materially deprived consumers. The results of the survey will help to understand and address barriers to the uptake of a healthy balanced diet by low-income groups. Fieldwork took place between November 2003 and March 2005. Over 3,600 people, both adults and children took part, throughout the UK. Results are due to be published later in 2006.

Ethnicity

133)No information is available from the NDNS on diet and nutritional status in ethnic minority groups. The NDNS surveys are designed to be nationally representative and the sample sizes are not large enough to permit separate analysis of ethnic minority groups.

Summary and conclusions

134)The availability of data from the NDNS programme, in the form of a series of cross-sectional datasets on discrete population age groups, has enabled this comprehensive assessment to be made of the nutritional health of the British population. In particular the availability of two data points for adults from 1986/87 and 2000/01 has enabled changes in dietary habits and nutritional health to be assessed in this age group. The rolling programme structure planned for future NDNS will provide more frequent data points on each age group allowing a better assessment of trends in dietary behaviour.

135)The findings presented in this paper show a mixed picture of the diet and nutritional health of the population. While there is some evidence of positive dietary changes, especially the fall in fat and saturated fat intakes over the last fifteen years, there are a number of areas of concern, particularly for older children, young adults and people in lower socioeconomic groups. These groups tend to consume unbalanced diets with low consumption of fruit and vegetables in particular and show evidence of low intakes and status for a number of vitamins and minerals. This gives rise to concerns about the implications for the long term health of these groups.

136)Mean consumption of fruit and vegetables was below the five-a-day recommendation for adults in all age groups and was lowest in children, young adults and people in benefit households. Fruit and vegetable consumption was higher in 2000/01 than in 1986/87 for the 19-64 age group as a whole, the difference attributable to higher consumption in the older age groups. Consumption in the 19-24 age group was not higher in 2000/01. Oily fish consumption was below the recommendation of 1 portion a week in all age groups, one-third of a portion per week for adults. Soft drink consumption was substantially higher compared with the mid-1980s. Mean consumption in adults was 1.5 litres per week, while in children mean consumption was 2.8 litres per week in the 1½-4½ age group and over 3 litres per week in the 7-10 age group. Meat

consumption was slightly higher in men in 2000/01 compared to 1986/87 but the major contributor had changed from beef to chicken and turkey.

137)Data from the most recent survey of adults (2000/01) shows a lower proportion of energy derived from fat and saturated fat and a higher proportion from total carbohydrate and protein than in the 1986/87 survey.

138)Mean intakes of total fat were generally close to the DRV in all population groups while intakes of saturated fat exceeded the DRV in all groups. The fall in total and saturated fat intakes is also reflected in the fall in plasma total cholesterol and LDL cholesterol levels between 1986/87 and 2000/01. This demonstrates the positive effect of dietary changes reducing fat and saturated fat intake leading to beneficial effects on blood lipid profile.

139)Mean intakes of non-milk extrinsic sugars exceeded the DRV for most population groups and were particularly high in children and young adults (mainly from soft drinks) and elderly people living in institutions (mainly from table sugar).

140)Girls aged 11 upwards and young women and teenage boys and young men, particularly those aged under 25, are more likely than other groups to have low intakes of vitamins and minerals, including vitamin A, riboflavin, iron, potassium and magnesium. This is likely to be at least partly due to lack of variety in the diet, including low consumption of fruit and vegetables and high intakes of sugar and alcohol leading to diets of low nutrient density. There was also evidence of low status in this age group for folate and in girls for vitamin B12.

141)Low intakes of some vitamins and minerals were seen in older adults aged over 65, both the free-living and institution groups. There was evidence of low status for some B vitamins, vitamin C and folate, iron and zinc, particularly in the institution group. Diet and nutritional status was clearly associated with oral health in this age group, in particular the number of natural teeth.

142)Evidence of low vitamin D status was found in most population age groups especially in a proportion of older children and young adults, and in elderly people living in institutions.

143)Low iron intakes were found in young children (under 5 years), in some teenage girls and young women and in older adults, particularly those living in institutions. Evidence of low iron status was also seen in these groups.

144)The data showed marked differences in diet and nutritional status associated with socio-economic status. Fruit and vegetable consumption was lower in those in benefit households and those from manual social class groups. Both adults and children living in benefit households were more likely to have low intakes (below LRNI) of vitamins and minerals and there was some evidence of lower micronutrient status in this group. Poor oral health, which is associated with low socio-economic status, is a risk factor for poor diet and nutritional status.

145)Few regional differences were seen in diet or nutritional status. There is evidence from the surveys of some age groups for lower consumption of fruit and vegetables and lower intakes and status of some micronutrients in Scotland and Northern England than

elsewhere. However these differences were inconsistent and were not found in the most recent survey of adults.

Recommendation

146) The findings above indicate that action is needed to improve the overall diet of the population in order to reduce the risk of nutrition-related disease. This could be achieved by improvements to the balance of foods in the diet. It is recommended that high priority continues to be given to work in this area, specifically to promote increased consumption of fruit and vegetables and fish (especially oily fish), to limit consumption of high fat / high sugar foods such as soft drinks, crisps and confectionery and to reduce salt intakes. This work needs to focus in particular on children, young adults and lower socio-economic groups. There is also a need to improve the quality of the diet for older people living in institutions as the nutritional status of this group is particularly poor.

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Glossary

Lower Reference Nutrient Intake (LRNI)	The intake of a nutrient which is likely to meet the needs of 2.5% of the population.
Estimated Average Requirement (EAR)	The intake which is likely to meet the needs of 50% of the population
Reference Nutrient Intake (RNI)	The intake which is considered sufficient to meet the requirements of 97.5% of the population