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

National Diet and Nutrition Survey

Headline results from Year 1 of the Rolling Programme (2008/2009)

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Notes to text and tables

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

2 Two different non-response weights have been used: one for non-response at the interview stage (with adult and child versions) and one for non-response to the nurse visit (again, with adult and child versions). In addition, the Smoking and Alcohol sections in Chapter 3 use a separate weight which allows 16-18 year olds to be included in analysis of adults.

3 The data were analysed in SPSS version 15 using the complex surveys module.

4 The following conventions have been used in tables:

- no observations (zero value)

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

[ ] used to warn of small sample bases, if the unweighted base is less than 30.

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

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

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

8 'Missing values' occur for several reasons, including refusal or inability to answer a particular question; refusal to co-operate in an entire section of the survey (such as the nurse visit or a self-completion questionnaire); and cases where the question is not applicable to the participant. In general, missing values have been omitted from all tables and analyses.

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

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

Chapter 5 Dietary intakes

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1. Background and purpose

Beverley Bates

1.1. Introduction

The National Diet and Nutrition Survey (NDNS) is a survey of the food consumption, nutrient intakes and nutritional status of people aged 1.5 years and older living in private households. The survey is carried out in all four countries of the United Kingdom (UK) and is designed to be representative of the UK population. Additional recruitment was undertaken in Scotland, Northern Ireland and Wales in order to achieve large enough samples in these countries to enable cross-country comparisons to be made[1]. These results will be reported at a later date when sufficient numbers are available for analysis.

The first four years of the NDNS rolling programme were commissioned by the UK Food Standards Agency (FSA) in 2006 with a contribution to funding from the Department of Health (DH) in England. The programme is carried out by a consortium of three organisations: the Health Group at the National Centre for Social Research (NatCen), MRC Human Nutrition Research (HNR), based in Cambridge and the Department of Epidemiology and Public Health at the Royal Free and University College London Medical School (UCL). Fieldwork in Northern Ireland is carried out by the Northern Ireland Statistics and Research Agency (NISRA). Haematological and biochemical analyses of blood samples are carried out at HNR and Addenbrooke's Hospital NHS Trust, Cambridge.

This report presents findings from the first year of the NDNS rolling programme, fieldwork for which was carried out between February 2008 and June 2009[2]. This first chapter provides an overview of the background and aims of NDNS. This is followed by information about the research designs and methodologies and response (chapter 2), socio-demographic characteristics of the sample (chapter 3) and physical measurements (chapter 4). The remainder of the report (chapters 5 and 6) focuses on food consumption and

nutrient intakes of participants and differences by age and sex. Comparisons of intakes with government recommendations (Dietary Reference Values)[3] and with findings from previous surveys are also made.

Results from other elements of the first year of the NDNS rolling programme (blood sampling, 24-hour urine, total energy expenditure measured by doubly labelled water (DLW) and physical activity) will be included in future reports, when sufficient numbers permit meaningful analyses.

1.2. The National Diet and Nutrition Survey

Responsibility for surveillance of the nutrient intake and nutritional status of the general population is shared between FSA and DH. The nutrition remit of FSA is to encourage and facilitate the eating of healthy diets in order to improve the diet and nutrition of the UK population and reduce diet-related disease. The evidence base to support this work is obtained through FSA's dietary survey programme, of which the NDNS is the major component. The NDNS also provides detailed data on food consumption at the level of the individual which enables FSA to carry out food chemical exposure assessments which form an essential part of the risk assessment process.

In the past, the NDNS programme comprised a series of cross-sectional surveys, each covering a different age group: pre-school children (aged 1.5 to 4.5 years)[4]; young people (aged four to 18 years)[5]; adults (aged 19 to 64 years)[6]; and older adults (aged 65 and over)[7]. The programme was set up in 1992 following the 1986/87 Dietary and Nutritional Survey of British Adults[8], the first survey of this type in Britain. The first survey of the NDNS programme was carried out in 1992/93, and since then there has been a survey about every three years, with the most recent, of adults aged 19 to 64 years, carried out in 2000/01. Each was conducted as a stand-alone survey. Following a review of the dietary survey programme in 2003, FSA's Board agreed in principle that future surveys should be carried out on a rolling basis in order to strengthen the ability to track changes in diet and nutrition over time. The new rolling programme format of continuous fieldwork provides a more responsive

framework for dietary surveys, giving more ability to identify emerging policy issues, responding more rapidly to changing data needs and giving better opportunities to identify and analyse trends. This will enable FSA to develop, implement and monitor effective policies to improve the nation's diet and nutritional status and will also support risk assessment for food chemicals.

Prior to the launch of mainstage fieldwork, a comparison study of two alternative dietary assessment methods (randomly allocated to sampled addresses) was carried out in 2007. Over 1,100 adults and children took part with around half participating in interviewer-administered 24-hour dietary recalls (repeated on four non-consecutive days) and the others keeping a four-day estimated (un-weighed) food diary on consecutive days. The NDNS Project Board considered the findings and decided that the four-day estimated diary (hereafter referred to as the “four-day food diary”) should be used for the rolling programme[9].

The specific aims of the NDNS rolling programme are to:

- provide quantitative data on the food and nutrient intakes, sources of nutrients and nutritional status of the UK population aged 1.5 years and above;
- provide information on trends in food consumption, nutrient intake and nutritional status in different age groups;
- describe the characteristics of individuals with intakes of specific nutrients above or below the national average;
- produce a database of food consumption which will be used to calculate intakes of natural toxicants, contaminants, additives and other food chemicals;
- measure blood and urine indices that provide evidence of nutritional status or dietary biomarkers, and to relate these to dietary, physiological and socio-demographic data;
- provide height, weight and other anthropometric measurements and examine their relationship to socio-demographic, dietary, biochemical and health data;

- monitor the diet of the population to establish the extent to which it is adequately nutritious and varied;
- monitor the extent to which the diets of population sub-groups vary from expert recommendations;
- assess total energy expenditure and physical activity levels and patterns in the study population; and
- provide information on oral health status in relation to diet and nutritional status.

The rolling programme will provide the detailed food consumption data essential to support risk assessments for food chemicals and will also benefit a wide range of Government activities related to diet and health. It is the primary method for monitoring progress against nutrition targets in the Agency's Strategic Plan 2005-2010[10], for example on salt and saturated fat intakes, and is also key to monitoring progress on diet and nutrition objectives of UK Health Departments, for example those set out in the 'Choosing Health' White Paper for England[11].

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[1] Boosted samples in Scotland and Northern Ireland were included from Year 1. A Wales boost was included from Year 2 (starting April 2009).

[2] Fieldwork for year 1 began in April 2008 and was completed in June 2009. It was preceded by a short run-in period from February to March 2008 to test procedures. Data from the run-in are included in the year 1 results.

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[10] Food Standards Agency Putting Consumers First Strategic Plan 2005-2010. [Online]. Available: www.food.gov.uk.

[11] Department of Health Choosing Health White paper [Online] Available http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor 2004

2. Methodology and response

Sarah Pigott

2.1. Overview of methodology

In order to meet the aims of the survey (see section 1.2) a sample of people representative of the UK population aged 1.5 years and over was required. This sample was drawn from the Postcode Address File (PAF)[1], a list of all the addresses in the UK. In order to improve cost effectiveness the addresses were clustered into Primary Sampling Units (PSUs), small geographical areas, based on postcode sectors, randomly selected from across the UK. A list of addresses was randomly selected from each PSU.

Information describing the purpose of the survey was sent to all selected addresses by post. This was followed by a face-to-face visit by an interviewer to each address to recruit participants in the eligible age range. The survey aimed to collect data from a UK representative sample of 1000 people per year, 500 adults (aged 19 years and older) and 500 children (aged 1.5 to 18 years). In order to achieve (as far as possible) equal numbers of adults and children in the sample, at some addresses only children were selected to take part. In addition extra addresses were selected in Scotland and Northern Ireland to boost the sample size in these countries and enable comparisons to be made between the UK countries.

At each address, the interviewer enumerated the number of households and randomly selected one for NDNS. From each selected household an interviewer randomly selected up to one adult and one child to take part in the survey. These are known as *participants*. The first stage of the survey comprised a face-to-face Computer Assisted Personal Interview (CAPI) with each participant (or in the case of a young child, their parent or guardian[2]), completion of a four-day food diary and measurements of height and weight. The interviewer also collected information on shopping and food preparation practices, cooking skills and facilities in the household by additionally interviewing the *Main Food Provider* (MFP)[3] of the household where this was not a selected participant. The MFP was the person who was best placed to answer questions about food purchased and prepared for the

participant(s). The interview also identified the *Household Reference Person* (HRP)[4] in each household and asked questions about housing tenure, as well as his or her employment, to determine the socio-economic classification of the household[5].

Participants who took part in the CAPI interview and completed a diet diary for at least three days were classified as *'fully productive'* and were invited to take part in the second stage of the survey. This involved a visit from a nurse to take physical measurements, a blood sample and a 24-hour urine collection.

2.2. Sample design

The sample was drawn from the (smaller users) PAF. A core UK sample of 3,510 addresses was selected from 130 PSUs. Twenty seven addresses were randomly selected in each selected PSU. At each address, the interviewer established the number of households and, in cases where there were two or more, selected one household at random.

The 27 addresses were randomly allocated to one of two groups to determine whether an adult and a child, or a child only, were selected for interview. At nine of the selected addresses the interviewer selected one adult (aged 19 years and over) and, where present, one child (aged 1.5 to 18 years) for inclusion in the survey. The remaining 18 addresses were for a "child boost" and the interviewer only carried out interviews in households with children (aged 1.5 to 18 years). In households containing more than one eligible person (adult and/or child), interviewers selected the participant(s) using a random selection procedure.

2.3. Ethical approval

Ethical approval for the study was obtained from the Oxfordshire A Research Ethics Committee. The letters of approval for the original submission and subsequent substantial amendments, together with approved documents, were sent to all Local Research Ethics Committees (LRECs) covering areas where fieldwork was being conducted. Research governance[6] approval was sought for all participating NHS

laboratories and obtained where required by the Research and Development (R&D) Committee.

2.4. Fieldwork

2.4.1. Fieldwork waves

Fieldwork was issued monthly in the following waves:

Run In	February-March 2008
Quarter 1	April-June 2008
Quarter 2	July-September 2008
Quarter 3	October-December 2008
Quarter 4	January-March 2009

The Run In was the final test of procedures and protocols before the main study launched in April 2008. It consisted of ten PSUs issued over two months and was carried out in all four UK countries. The Run In sample was drawn in the same way as the NDNS Year 1 core sample and fieldworkers followed the same protocols and procedures as in the mainstage (quarters one to four). The Run In results have therefore been combined with the mainstage data and included in this report.

Fieldwork commenced on the first weekday of the month, and interviewers were given six weeks in which to complete their assignment. Nurses started fieldwork two weeks after the interviewer fieldwork start date and had up to seven weeks to complete their work.

2.5. Overview of survey components and fieldwork procedures

There were two main stages to the survey:

Stage 1: Interviewer visit:	Four-day food diary
	Detailed background interview
	Interview with MFP
	Height and weight measurements
	Physical activity monitor
	Doubly labelled water sub-study

Stage 2: Nurse visit:	Blood sample
	24-hour urine collection
	Physical measurements
	Blood pressure

2.5.1. Stage 1: The interviewer visits

A letter and leaflet describing the purpose of the survey was sent to all sampled addresses before the fieldwork start date. A few days later, interviewers visited the addresses to determine whether the address was private, residential and occupied. They then carried out the selection process and, for children aged under 16 years, sought both the child's and their parent's consent to interview.

Interviewers carried out three main visits to households who agreed to participate:

- **Visit 1:** Four-day food diary explained to the participant and left with them to complete; interviewer-administered CAPI; height and weight measurements; and self-completion booklets in which to record the smoking and drinking habits of children and young people. Participants aged four to ten years were asked whether they would be willing to wear a physical activity monitor (an ActiGraph) for seven consecutive days (the monitor was explained and left with those who agreed to wear it).
- **Visit 2:** The diary check up visit, where the interviewer reviewed the completion of the four-day food diary so far and highlighted any missing information to the participant.
- **Visit 3:** Collection of four-day food diary and ActiGraph and further CAPI questionnaire administration. .

At the end of the third main interviewer visit, interviewers gave each participant completing at least three food diary recording days a token of appreciation (£40 in high street vouchers, which was reduced to £30 from October onwards in order to help fund a new token of appreciation for participants providing a blood sample). Interviewers then introduced the second stage of the survey, asking for permission for the nurse to visit. In addition, a sub-sample of participants were recruited for a

Doubly Labelled Water (DLW) sub-study to measure energy expenditure. The interviewer fieldwork documents can be found in Appendices C to G.

Further details about information collected during the interviewer stage is provided in Appendix D.

2.5.1.1. Computer Assisted Personal Interview (CAPI) questionnaire

CAPI interviewing involves the interviewer reading questions from a laptop screen and entering the participants' responses into designated fields. The CAPI questionnaire had three main elements: household composition/structure interview, MFP interview and individual interview. The individual questionnaire, asked of each selected participant had two parts: Part I, which was asked at the first main interviewer visit; and Part II, which was asked at the third main visit after the interviewer collected the food diary.

The content of the CAPI questionnaires is shown in Appendix D.

2.5.1.2. Collection of dietary data: The four day food and drink diary

Based on the day of the first individual CAPI interview, the interviewer's laptop program selected four consecutive days (including both weekend days) as the food diary recording period. Participants were provided with a diary and asked to keep a record of everything they ate and drank over these four days, both in and outside the home. Interviewers carried out a food diary check visit with participants on the second day of recording either in person or over the telephone, with the aim of improving recording for the remaining days and also providing encouragement to participants to continue recording. Interviewers then returned to collect the diary and check the remaining days no later than three days after the final day of recording.

As participants were not expected to weigh their food and drink, portion sizes were estimated using household measures (e.g. two thick slices of bread, four tablespoons of peas) or using weights from labels (e.g. 420g tin of baked beans, 330ml can of lemonade). Those aged 16 years and over were also able to describe their portion size using photographs of 15 frequently consumed foods reproduced in the diary.

A parent was asked to keep the food diary on behalf of participants aged 11 and younger, with the child contributing information where possible and with help from other carers.

Appendix A provides full details of the dietary data collection and processing protocols.

2.5.2. Stage 2: The nurse visits

Stage 2 of the survey was carried out by a qualified nurse and took place as soon as possible after the final interviewer visit. All individuals completing three or four food diary days were eligible for a nurse visit.

At the end of Stage 1, interviewers provided participants with information leaflets giving details of the nurse visit. Nurses could provide these again if necessary. The nurse asked questions about prescribed medications before taking, with agreement, a number of physical measurements. Appendix G provides a summary of the information collected during the nurse stage as well as the nurse fieldwork documents.

After providing the physical measurements, participants were asked whether they were willing to give a small blood sample by venepuncture after an overnight fast (those aged 1.5 to 3 years and diabetics not willing to fast were asked whether they were willing to provide a non-fasting blood sample). The nurse obtained written consent from the participants aged 16 years and older before the sample was taken. For children aged 1.5 to 15 years, written consent of a parent or guardian was required and nurses additionally obtained the assent of the child where possible. For those aged 11 years or younger, blood was taken by a paediatric phlebotomist who accompanied the nurse on the visit. Nurses also sought written agreement to store part of the blood sample for additional analyses at a future date. From October fieldwork onwards, participants who provided a blood sample were given £15 in high street vouchers as a token of appreciation for agreeing to this part of the study as one of a range of measures to increase response.

Nurses also sought agreement from adult participants, and child participants aged four years and over who were fully out of nappies (and their parent or guardian), to provide a 24-hour urine collection. If participants agreed, they were asked to take three para-aminobenzoic acid (PABA) tablets evenly throughout the waking hours of the day on which the urine collection was made[7]. Written consent was sought for the taking of PABA tablets, laboratory analysis of the 24-hour urine sample and storage of any remaining urine for future analyses. In fieldwork months February-September 2008, participants who provided a 24-hour urine sample were given £20 in high street vouchers as a token of appreciation for taking part in this part of the study. This was reduced to £15 from October onwards in order to release funds for a new token of appreciation for participants providing a blood sample.

2.5.3. Feedback to participants and General Practitioners (GPs)

Participants who completed three or four food diary recording days were asked whether they would like to be sent feedback on the analysis of their diary and how this compared to recommendations. The feedback also included general information on sources of healthy eating advice. (See Appendix J for an example of the feedback.)

Each participant was also given a 'Measurement Record Card' on which the interviewer and nurse recorded the person's height, weight, body mass index (BMI) (if aged 16 years and over), blood pressure (if aged four years and over) and other age-dependent anthropometric measurements (waist and hip circumferences (ages 11 years and older); mid upper arm circumference (MUAC) (aged two to 15 years); demispan measurement (aged 65 years and older) and infant length (aged 18-23 months)). Participants who provided a blood sample were additionally asked whether they wished to be sent results of the blood sample analyses most related to their health. Participants were asked if they wanted details of these analyses, their BMI and their blood pressure readings to be sent to their GP. If they did, written consent was obtained from the individual (or from the parent in the case of a child). See Appendix J for examples of feedback to GPs[8].

2.6. Fieldwork quality control

2.6.1. Project specific training for interviewers and nurses

Fieldwork in England, Scotland and Wales was carried out by NatCen's panel of interviewers and nurses. In Northern Ireland, fieldwork was carried out by interviewers and nurses working for NISRA.

All interviewers and nurses working on NDNS were briefed and trained before undertaking an assignment and were monitored during their assignment. Fieldworkers were also issued with comprehensive written instructions covering survey procedures and measurement protocols.

2.6.2. Training for interviewers

All NDNS interviewers attended a three-day training course where they were fully briefed on the protocols and administration of the survey. The briefing sessions covered background and content, doorstep approach, questionnaire administration (including practice sessions), physical activity monitor placement and collection, DLW administration, and the placement, checking and collection of the four-day food diaries. Interviewers were also trained in taking height and weight measurements.

After the briefing, "early work" checks were carried out on the first two or three food diaries returned by each interviewer with timely feedback provided on any areas of concern. All interviewers working on a second or subsequent assignment received feedback on the diaries from their previous assignment. Further, any interviewer who had more than three months gap between assignments completed another two-day diary which was reviewed and comments fed back.

2.6.3. Briefing sessions for nurses

Nurse briefings lasted one and a half days and covered equipment training, blood sampling and 24-hour urine training and questionnaire administration (including practice sessions). Most nurses who worked on NDNS were very experienced in taking all other anthropometric measurements collected on NDNS. Any newer nurses also attended a general NatCen nurse training session which covered standard protocols for all other anthropometric measurements.

2.7. Response rates

2.7.1. Household level response

- Overall, of the 3510 addresses issued to interviewers (including 270 addresses in 10 points for the Run In), 48% were eligible for household selection and 52% were ineligible. Ineligible addresses include vacant or derelict properties/institutions. Child boost addresses that were screened out were also included in the ineligible category, which explains the higher than average proportion of ineligible addresses.

- Household selection was carried out at 89% of eligible addresses. The remaining 11% of addresses refused before the household selection could be carried out. Of those selected households, 64% were productive – i.e. at least one selected participant completed three or four dietary recording days.

(Table 2.1)

2.7.2. Individual level response

- The overall response rate for fully productive individuals (i.e. those completing three or four dietary recording days) was 55%, giving a sample size of 1131 fully productive individuals[9]. Analyses in this report (including response rates for subsequent stages/components of the survey) are based on these 1131 individuals.

- Valid height and weight measurements were obtained for almost all fully productive participants (height 95%; weight 94%).

(Table not shown)

- Seventy seven percent of all fully productive participants were successfully visited by a nurse[10].

- Nurses obtained a blood pressure measurement from three quarters of fully productive adults (77% of men and 74% of women) and children (71% of boys and 78% of girls). Waist and hip circumference measurements were successfully obtained from 76% of participants aged 11 years and over.

Nurses measured the MUAC of three quarters of children (75%) aged two to 15 years.

- Participants were asked by the nurse whether they would be willing to provide a small sample of blood. Fifty four percent of fully productive adults and 31% of children agreed to provide a sample.

- Fifty eight per cent of participants aged four years and over provided a 24-hour urine collection for analysis. **(Table 2.2)**

2.7.3. Weighting the survey data

It is necessary to apply weighting factors to the data collected in this survey for two reasons: to remove any bias in the observed results which may be due to differences in the probability of households and individuals being selected to take part; and to attempt to reduce non-response bias.

The survey was designed so that no more than one adult and one child were selected from any one household to take part. This meant that adults living in households with one or more other adults and children in households with one or more other children were less likely to be selected than were adults or children in single adult/child households.

In addition, the multi-stage design means there were a number of stages in the survey where it was possible for participants to drop out. If the people who refused to participate at a particular stage are systematically different from those who took part then the sample will be biased.

Weighting factors were used to correct for both these cases. There were two stages to the weighting scheme: the first was to generate a set of design weights to correct the unequal selection probabilities; and the second was to create a set of weights to adjust for non-response. The final weights were a product of the selection weights and the non-response weights. Full detail of the NDNS weighting scheme is provided in Appendix B.

[1] The sample was drawn from the 'small users' sub-file of the Postcode Address File (PAF) is a computer list, prepared by the Post Office, of all the addresses (delivery points) which receive fewer than 25 articles of mail a day.

[2] A guardian is defined as a person with legal responsibility for the child.

[3] The Main Food Provider (MFP) is the person in the household with the main responsibility for shopping and preparing food. If these tasks are shared equally between two people, for example if one person does all the shopping and another person does all the cooking, then either resident could be classified as the MFP.

[4] The 'Household Reference Person' (HRP) was defined as the householder (a person in whose name the property is owned or rented) with the highest income. If there was more than one householder and they had equal income, then the eldest was chosen as the HRP.

[5] Questions were asked to ascertain whether the HRP was in paid work at the time of the interview and, if not, whether they had ever had a paid job. If the HRP had ever worked, there were further questions about their current or most recent job in order to classify HRPs into the National Statistics Socio-economic Classification (NS-SEC) groupings.

[6] The Research Governance Framework is intended to define the broad principles of good research practice, and to ensure that health and social care research is conducted to high scientific and ethical standards.

[7] PABA tablets were given to assess completeness of the urine collections.

[8] Appendix J does not include an equivalent example of participant feedback as this contains blood sample results only. Blood sampling is not covered in this report.

[9] A further six individuals completed one or two diary days and 31 refused before or during the CAPI interview. Of the 1131 fully productive individuals, 1119 (99%) completed four dietary days and 12 (1%) completed three days.

[10] The remainder of fully productive respondents either refused to progress to stage 2 or, in a small number of cases, could not be visited during the nurse fieldwork period.

3. Socio-demographic characteristics of the NDNS sample

Sarah Pigott, Beverley Bates

This chapter describes the socio-demographic characteristics of the NDNS sample, using data collected during the Computer Assisted Personal Interviews (CAPI) and additionally from self-completion questionnaires in the case of Smoking and Drinking analysis.

3.1. Sex

- Forty two per cent of adult participants in the NDNS unweighted sample were men and 58% were women. There was a slightly smaller proportion of girls than boys aged 1.5 to 18 years (boys 51%, girls 49%) in the unweighted sample. The sample was weighted to reflect the distribution of males and females in the general population within the UK[1]. **(Table 3.1)**

3.2. Age

- Among adults, 79% of the unweighted sample were aged 19 to 64 years and 21% were aged 65 years and over. Among children in the unweighted sample, 21% were aged 1.5 to three years, 41% were aged four to 10 years and 38% were aged 11 to 18 years. The sample was weighted to bring the proportions broadly in line with the age profile of the UK general population[1]. **(Table 3.2 and 3.3)**

All text and tables in the remainder of the report use weighted data.

3.3. National Statistics Socio-economic Classification (NS-SEC), housing tenure, education and qualifications

- Each participant's household was assigned a socio-economic classification based on the employment of the Household Reference Person (HRP) for that household (see section 2.1).

- In terms of the HRP's current or most recent job, the proportion of participants' households[2] classified to the main NS-SEC occupational groupings were broadly in line with those reported in the General Household Survey, 2007 (GHS 2007)[3] [4]. **(Table 3.4)**

- More than two-thirds of participants (71% of adults, 67% of children) lived in owner-occupied accommodation and around one-fifth (18% adults, 23% children) lived in social housing and one-tenth (11% of adults, 10% of children) lived in privately rented accommodation. These proportions are broadly in line with those found in the general GB population[4]. **(Table 3.4)**

- Participants aged 16 years and over were asked the age at which they had left full-time education. A quarter had left school by the age of 16.

- If participants had finished full-time education, they were asked the *highest* qualification (if any) they had achieved. 21% of those aged 16 years or older had a degree and 23% had no qualifications. The proportion of participants with no qualifications was higher among older adults. Six per cent of those aged 19 to 34 years had obtained no qualifications compared with 56% of those aged 65 years and over. **(Table 3.5)**

3.4. Vegetarian diets

- Two percent of both adults and children reported that they were vegetarian[5]. **(Table 3.6)**

3.5. Smoking

- Of those aged 16 and over, 23% of men and 19% of women reported that they were current smokers. These proportions are very similar to those reported in GHS 2007[6] (where 22% of men and 20% of women were categorised as current smokers) and slightly lower than those reported in Northern Ireland's Continuous Household Survey of

2008/09[7] (where 26% of men and 23% of women reported being current smokers). **(Table 3.7)**

- Those who reported that they were current smokers were asked how many cigarettes they smoked on an average week and weekend day. Eight per cent of men and 3% of women were classed as heavy smokers (i.e. they smoked 20 or more cigarettes per day). Again, these proportions are similar to those reported in GHS 2007 (where 7% of men and 5% of women were classed as heavy smokers)[6].

  (Table 3.8)

- A higher proportion of younger boys (aged eight to 12 years) than girls of the same age had ever smoked a cigarette. However, amongst older children, this was reversed with 29% of girls compared with 16% of boys reporting having ever smoked a cigarette. **(Table 3.9)**

3.6. Alcohol consumption

3.6.1. Drinking behaviour amongst adults aged 16 years and older

- The recommended sensible drinking guidelines for England are that men should not regularly drink more than three to four units of alcohol per day, and women should not regularly drink more than two to three units of alcohol per day[8]. Similar guidance exists for the other UK countries. Men who regularly drink more than eight units a day (or 50 units a week) and women who regularly drink more than six units a day (or 35 units a week) are considered to be at particular risk of harm[9].

- Alcohol consumption is reported in terms of units of alcohol; one unit of alcohol is 10ml by volume of pure alcohol. Daily consumption is calculated by recording the amounts drunk using the day in the past week when the participant drank most[10].

- The majority of adults (73% of men, 57% of women) had drunk alcohol in the last week, including 28% of men and 15% of women who had drunk more than twice the recommended levels on one of these days. **(Table 3.10)**

- On average among those who drank in the last week, men consumed 8.5 units on the day they drank most in the last week, and women consumed 5.4 units. **(Table 3.11)**

- Alcohol consumption levels amongst NDNS adults are very similar to those reported in GHS 2007[11].

3.6.2. Drinking behaviour amongst children aged 8 to 15 years

- In 2009, the Department for Children, Schools and Families published a draft guidance document from the Chief Medical Officers of England, Wales and Northern Ireland[12] which formed part of a consultation on children, young people and alcohol. The guidance includes a recommendation that children do not drink any alcohol at all.

- The proportion of children who reported ever having had a proper alcoholic drink (not just a taste) increased with age, from 9% of boys and 10% of girls aged eight to 10 years to 57% of boys and 52% of girls aged 13 to15 years[13]. **(Table 3.12)**

- Four per cent of boys aged 13 to 15 years and 12% of girls of the same age reported usually drinking once a week or more. **(Table 3.13)**

- Results are not directly comparable with Health Survey for England (HSE) 2007 as age groupings differ in the two surveys. However, the proportions of children drinking, and the frequency of their drinking, appear to be broadly in line with HSE results[14].

[1] Office for National Statistics. *Mid 2008 Population Estimates*. [Online] Available: http://www.statistics.gov.uk/statbase/Product.asp?vlnk=15106

[2] Some households contained both an adult and a child participant. Such households and their HRP will be represented in both the adult and child figures.

[3] The General Household Survey (GHS) is a multi-purpose continuous survey which collects information on a range of topics from people living in private households in Great Britain.

[4] Ali R et al. General Household Survey 2007. Overview Report, 2007. Online at http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=5756.

[5] Self-reported assessment via question in the CAPI interview.

[6] Robinson S, Lader D. General Household Survey 2007. Smoking and drinking among adults, 2007. Online at http://www.statistics.gov.uk/downloads/theme_compendia/GHS07/GHSSmokingandDrinkingAmongAdults2007.pdf

[7] http://www.csu.nisra.gov.uk/Prevalence_of_cigarete_smoking_by_sex_Trend.htm

[8] http://www.dh.gov.uk/en/Publichealth/Healthimprovement/Alcoholmisuse/DH_085385

[9] Department of Health et al (2007), cited above. Drinking at this level has been described in surveys, including the HSE, as 'binge drinking'. 'Binge drinking' is also used to define a pattern of drinking a large quantity of alcohol in a short period of time with the aim of getting drunk. In practice, this may involve considerably more than twice the recommended daily limits. To avoid confusion, the term 'binge drinking' is not used in this report.

[10] Adults (i.e. those aged 16 and older) who drank bottled or canned beer, lager, stout or cider were asked in detail about what they drank, and this information was used to estimate the amount in pints (one pint is equivalent to 0.568 litres). Adults were also asked to quantify the amount of wine drunk in terms of large (250ml), standard (175ml) and small (125ml) glasses, and were also given the option of specifying the quantity of wine drunk in bottles or fractions of a bottle; a bottle was treated as the equivalent of six small (125ml) glasses.

[11] Comparable data is not available for Northern Ireland.

[12] Chief Medical Officer, *Draft Guidance on the Consumption of Alcohol by Children and Young People, 2009.* www.dcsf.gov.uk/consultations/downloadableDocs/CMO%20Guidance.pdf

[13] Children are likely to under-report their alcohol consumption (frequency and amount drunk) in home-based surveys because they may be worried about parents seeing their answers. This should be borne in mind when interpreting the findings presented in this section.

[14] Comparable data is not available for Scotland, Wales and Northern Ireland.

4. Physical measurements

Jennifer Mindell & Vasant Hirani

4.1. Introduction

This chapter presents physical measurements taken during Stage 1 (the interviewer visit): height and weight, from which body mass index (BMI) is calculated and Stage 2 (the nurse visit): mid upper-arm circumference (MUAC) in children aged two to 15 years; waist and hip circumferences from age 11 years; and blood pressure, measured in those aged four years and over. Comparisons are made, where possible, with the most recent surveys from the UK countries[1, 2, 3]. Detailed descriptions of measurement protocols are available in Appendix I but a brief description is provided within each section below.

4.2. Anthropometry

4.2.1. Measurements

- Height and weight were measured at the first interviewer visit, using a portable stadiometer and weighing scales. BMI (weight (kg) / height (m^2)) was calculated by the interviewer's laptop program. For children aged 1.5 to two years, the interviewer measured length instead of height. Length has been used in place of height when calculating BMI for these youngest children. The nurse measured waist and hip circumferences and MUAC[4] using tape measures[5].

4.2.2. Obesity

4.2.2.1. Adults

- Table 4.1a shows mean BMI and BMI status, by age group and sex (according to the World Health Organisation (WHO)[6] and National Institute for Health and Clinical Excellence (NICE) classification[7] as shown in the table below):

BMI (kg/m^2)	**Description**
Less than18.5	Underweight
18.5 to less than 25	Normal
25 to less than 30	Overweight
30 or more	Obese
40 or more	Morbidly obese

- A higher percentage of men than women were overweight, or were overweight including obese. There were no significant differences in mean BMI by sex or age group. **(Table 4.1a)**

4.2.2.2. Children

- New UK-World Health Organisation (WHO) growth charts for birth to four years have recently been introduced in England for all new births from May 2009 and in Scotland from January 2010. These are based on the growth of infants exclusively or predominantly breastfed[8 9]. For clinical purposes, the charts define overweight as above the 91st but on or below the 98th centile for BMI and obesity as above the 98th centile. However, this report uses the 85th and 95th centiles to define overweight and obesity, as is standard UK government practice for population monitoring[10].

- Mean BMI was higher in participants aged 11 to 18 years than in the younger children. Prevalence of overweight including obesity and of obesity were greater in older than younger boys and girls. A higher proportion of boys than girls were overweight but a higher proportion of girls than boys were obese. Similar proportions of boys and girls were overweight, including obese. **(Table 4.1b)**

4.3. Comparisons with other surveys

- Comparisons of results for adults participating in NDNS with adults measured recently in England and Scotland showed that mean height, weight, BMI, and waist: hip ratio (WHR) were broadly similar between NDNS, Health Survey for England 2007 (HSE 2007)[2], and Scottish Health Survey 2008 (SHeS 2008)[1] for both sexes[11]. For example, mean weight in men was 84.4kg in NDNS, 84.2kg in HSE 2007 and 83.9kg in SHeS 2008; mean BMI in women was 28.0kg/m^2, 27.0 kg/m^2, and 27.4kg/m^2 respectively in the three surveys.

- The proportion of overweight women was higher in HSE 2007 (33%)[2] and SHeS 2008 (34%)[1] than in NDNS (27%), but the proportion of women who were obese was lower in HSE 2007 (25%) than in NDNS (32%), with Scotland between the two in 2008 (27.5%). Mean waist circumference was also

significantly lower in women in HSE 2007 (87.2cm) than in NDNS (90.7cm).There were no differences among men.

- When comparing children's anthropometric results for NDNS with the devolved countries, analyses were limited to children aged two to 15 years because HSE and SHeS deem participants aged 16 years and over as adults.

- Participants aged two to 15 years in NDNS were very similar to those in HSE 2007 regarding mean height, weight, and BMI. For example, mean BMI in boys was 18.2kg/m^2 in NDNS, 18.4kg/m^2 in HSE 2007[2], and 18.6kg/m^2 in SHeS 2003[12 13]. However, more boys in HSE 2007 (17%) and SHeS 2008[1] (17%) were obese than in NDNS (13%) and more girls in HSE 2007 (16%) and NDNS (18%) were obese than in SHeS 2008 (13%).

4.4. Blood pressure

4.4.1. Measurement of blood pressure

- Blood pressure was measured in a sitting position using an automated, validated machine, the Omron HEM907, after a five minute rest. Results presented in this chapter are based on the mean of the second and third readings, taken at a minute's interval, in participants with valid readings, who had not eaten, drunk alcohol, exercised, or smoked in the preceding 30 minutes. Full details are available in Appendix I.

4.4.2. Comparisons with other surveys

- Mean systolic and diastolic blood pressure and prevalence of raised blood pressure among participants in NDNS were very similar to the data from HSE 2007[2] and similar to older data from Scotland (SHeS 2003)[12 14]. Among men mean systolic pressure was 127.4mmHg in NDNS (aged 19 to 64 years), 128.9mmHg in HSE 2007 (aged 19 to 64 years) and129.9mmHg in SHeS 2003 (aged 16 to 64 years). For women it was 121.0mmHg in NDNS (aged 19 to 64 years), 120.2mmHg in HSE 2007 (aged 19 to 64 years) and121.4mmHg in SHeS 2003 (aged 16 to 64 years). Mean diastolic pressure was 74.0mmHg for

male NDNS participants aged 19 to 64 years, 75.1mmHg in HSE 2007, and (aged 16 to 64 years) 74.6mmHg in SHeS 2003. The equivalent figures for women were 74.4mmHg in NDNS, 73.1mmHg in HSE 2007, and 73.5mmHg in SHeS 2003.

- Seven per cent of men and 5% of women aged 16 to 64 years in both NDNS and in HSE 2007[2] had a raised blood pressure (systolic ≥ 140mmHg and/or diastolic ≥ 90mmHg)[14].

- Similarly, blood pressure levels among children participating in NDNS did not differ significantly from those measured in HSE 2007[15] and SHeS 2003[12]. For example, mean systolic blood pressure in boys aged five to 10 years was 103.5mmHg in NDNS and 104.4mmHg in HSE 2007, (104.4mmHg in boys aged five to nine years in SHeS 2003). Among girls aged 11 to 18 years, diastolic pressure was 63.1mmHg in NDNS and 63.9mmHg in HSE 2007 (63.7mmHg in girls aged 10 to 15 years in SHeS 2003).

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[1] Bromley C, Bradshaw P, Given L. (eds.) *The Scottish Health Survey 2008.* Edinburgh: Scottish Executive, 2009.

[2] Craig R, Shelton N (eds). *Health Survey for England 2007.* Leeds: Information Centre, 2008.

[3] Comparisons of NDNS with Wales and Northern Ireland could not be made due to the data not being comparable. The Welsh Health Survey uses self-report, not measured weight and height. The 2005/06 Northern Ireland survey did not include a measurement module, so measurements of height and weight and calculations of BMI are based on 1997 data, since when both mean weight and BMI have increased considerably in countries which have monitored this.

[4] MUAC (mid-upper arm circumference) is used as an indicator of malnutrition in children, providing a simple, almost age-independent, anthropometric measure of wasting. It is not measured in HSE, so comparisons could not be made. The cut offs are described as: normal, >13.5cm, mild/moderate malnutrition ≥12.5cm and ≤13.5cm and severe malnutrition <12.5cm. See: Gibson RS. *Anthropometric assessment of body composition. Principles of Nutritional Assessment,* 2nd ed. New York: Oxford University Press, 2005. Results will be presented in future NDNS reports.

[5] All field staff were trained carefully to observe the standard measurement protocols. Each measurement was taken twice. Where the discrepancy between the measurements was at or above a given value (height ≥ 0.5cm, weight ≥ 0.2kg, waist and hip circumferences ≥ 3cm, MUAC ≥ 1.5cm), a third measurement was taken. The mean of the two closest measurements was used. If only one measurement was available, it was excluded from the analysis.

[6] *World Health Organisation body mass index (BMI) classification*. [On-line] www.who.int/bmi/index.jsp?introPage=intro_3.html (accessed 05/10/2009).

[7] National Institute of Health and Clinical Excellence. *Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children.* [On-line] www.nice.org.uk/guidance/index.jsp?action=download&o=38295. page 221 (accessed 05/10/2009).

[8] Royal College of Paediatrics and Child Health / World Health Organisation. *The UK_WHO Growth Charts: Early Years.* London: RCPCH, 2009. www.rcpch.ac.uk/Research/UK-WHO-Growth-Charts

[9] The new UK-WHO 0-4 years growth charts were introduced in the UK because they represent an international standard of growth for healthy infants and young children. Breastfed infants depict a healthier pattern of growth. The new charts were constructed using the WHO Growth Standards for infants aged 2 weeks to 4 years, which used data from healthy children from around the world with no known health or environmental constraints to growth. WHO found that infants worldwide have very similar patterns of linear growth, whatever their ethnic origin. The new charts provide a description of optimal growth, describing the ideal patterns of growth for all UK children, whatever their ethnic origin and however they are fed in infancy. The WHO data is combined with birth data for gestations 23 to 42 weeks from the UK1990 growth reference, as the WHO dataset did not include preterm infants. The UK1990 reference is still to be used for children aged four years and over.

[10] Cole T, Freeman JV, Preece MA. *Body mass index reference curves for the UK, 1990.* Arch Dis Child 1995; 73: 25-29.

[11] The age at which a participant is considered an adult are slightly different between the surveys: in the NDNS aged 19 years and over is an adult whereas for HSE and SHeS it is aged 16 and over.

[12] Bromley C, Sproston K, Shelton N. (eds). Scottish Health Survey 2003. Edinburgh: Scottish Executive, 2005.

[13] Mean BMI values for children have not been published from SHeS 2008.

[14] No population-level blood pressure data are available from Wales or Northern Ireland.

[15] New analyses of HSE 2007 data have been performed for this report. HSE 2007 data are available to researchers from the UK Data Archive.

5. Dietary intakes

Alison Lennox, Celia Prynne, Gillian Swan

5.1. Introduction

The results presented in this section derive from the first year of the NDNS rolling programme, fieldwork for which was carried out between February 2008 and June 2009 with a core UK sample (Run-In and main study) of 1131 individuals aged 1.5 years upwards. Numbers for all age groups are therefore small and examination of results should take this into account. Older people (aged 65 years and over) have not been included because of small sample size and toddlers aged 1.5 to three years have been included as both sexes together (rather than boys and girls separately). Young people have been subdivided only into two major groups of four to 10 years and 11 to 18 years, and adults have not been subdivided and are presented as 19 to 64 years only for the same reason. Comments on differences in results from past NDNS surveys are observed differences, not statistically significant differences. Given the wide spread in intakes, differences in intake over time are unlikely to be significantly different, but trends can be observed and described. However small changes should be interpreted with caution as they may occur at random given the small sample size. Most comments have been made where different age and sex groups show similar trends in direction of change in intake.

The results in this report are based on a dietary assessment using a four day estimated diary. The four days assessed in each case included two weekend days[1] and have been reported in this manner. The inclusion of both weekend days in the Year 1 data should be noted when interpreting results, since it has been shown that there are systematic differences in intake of some foods and nutrients, associated with day of the week, particularly in certain age groups, such as older teenagers and young adults[2]. Alcohol and food bought at takeaways or eaten out are consumed more frequently by these groups on Fridays and Saturdays. For all age groups, Sundays remain a day with a high meat and vegetable intake, most likely due to Sunday lunch, resulting in higher fibre and vitamin A intakes, for example, on this day.

In comparing the NDNS rolling programme data to past NDNS surveys, the differences in duration of assessment must also be taken into account. Dietary assessment over a four day period will provide similar mean intakes to assessment over a seven day period, but the variation in intakes will be different as will the percentage of participants consuming any given

food over the recording period (percentage consumers), especially for foods that are consumed infrequently. Moreover, estimates of proportions of individuals above or below certain cut-off values, such as Lower Reference Nutrient Intakes (LRNIs) will be affected by assessments of different duration. In order to enable comparison of the rolling programme data to past NDNS surveys, the past surveys of seven days duration, specifically the NDNS survey of adults aged 19 to 64 years conducted in 2000-01[3] and the survey of young people aged four to 18 years conducted in 1997[4], have been recalculated for four days of assessment. The results of this recalculation for nutrient intakes are provided in tables 5.23-5.28 of this chapter and results for food consumption are provided in Appendix K, along with further details of the background and methods used to derive the four-day values from the past surveys. Any comparisons between intakes in this and previous surveys should be made using the recalculated intakes and not the seven-day data from the published reports because incorrect conclusions may be drawn if the original published data are used for comparisons, especially data on the proportions of individuals above or below cut-off values or the percentage consumers of a food group. It should be noted that the NDNS survey of toddlers aged 1.5 to 4.5 years[5] has not been recalculated. This survey was of four days duration but intakes were corrected to seven days for reporting. Recalculation of the toddler survey data is more complex and it is planned to report these data with the report of year two of the rolling programme. For this reason, comparison of the rolling programme data for those aged 1.5 to three years is limited to mean intakes from the previous survey. Since the age group reported here is not directly comparable with those in the past report, where results were subdivided into three groups 1.5 to 2.5 years, 2.5 to 3.5 years and 3.5 to 4.5 years, comparisons will be limited in number. Where reference is made to a change in the proportion of consumers of a food or food group, this does not include toddlers.

Results from the first year of the rolling programme showed that diet and nutrient intakes of the UK population were largely similar to findings from previous assessments of diet in Great Britain, for all age groups studied. However, there were some indications of trends in intake in a direction towards recommendations and guidelines for healthy eating. For example results showed some reduction in intake of saturated fatty acids, although mean intakes were still higher than recommended. *Trans* fatty acid intakes were also lower than in the past and fell within recommended levels. Non-milk extrinsic sugars (NMES) intakes were reduced from past surveys for all groups except adult women. NMES intakes on average remained considerably higher than recommended. There was some evidence of an increase in consumption of fruit, and to a lesser extent vegetables, in children, but there was little change in adults.

5.2. Foods consumed

Comparison of mean consumption data and the percentage of consumers of each food group from the new and previous surveys indicated changes in consumption of some foods. The commentary in this section refers to mean intakes for the total population (i.e. including non-consumers) and the percentage consumers over four days.

5.2.1 Cereals and cereal products

Average consumption of pasta, rice and other miscellaneous cereals, which includes pizza, was higher than seen previously; with average daily consumption of 129g per day for boys aged 11 to 18 years and over 80g per day for younger boys and men. White bread remained the major type of bread consumed, but average consumption was reduced from past surveys in all age groups except toddlers. There was an increase in the percentage of four to 10 year olds consuming wholegrain and high fibre breakfast cereals but little change in other age groups and little change in average consumption. There were also reductions in the average consumption of 'other' breakfast cereals in children.

5.2.2 Milk and milk products

Semi-skimmed milk was the most commonly consumed type of milk for all age groups except those aged 1.5 to three years, for whom whole milk continued to dominate. Consumption of milk overall was reduced compared with past surveys for all age groups; for example, consumption for girls aged 11 to 18 years was 136g per day on average in 1997 and 107g per day in the current survey; consumption for boys of the same age was 208g per day in 1997 and 172g per day in the current survey. For adults, larger decreases were seen, for women from 195g per day in 2000/01 to 120g per day in the current data and for men, from 225g per day to 165 g per day.

5.2.3 Fat spreads

Reduced fat spread was the most common type of fat spread used by all age and sex groups and showed an increased percentage consumers compared to past surveys while the percentage consumers of margarines and other cooking fats fell markedly. It should be noted that many margarines have been reformulated in recent years to reduce the fat content and are now classified as reduced or low fat spreads.

5.2.4 Meat and meat products and dishes

In the meat and meat products and dishes group, chicken, turkey and dishes and beef, veal and dishes were the types with the highest average consumption per day while chicken, turkey and

dishes had the highest percentage consumers over the four days, followed by bacon and ham, beef, veal and dishes and sausages, the order varying with age group. Total consumption of meat and meat dishes increased in all age and sex groups compared. For example, in boys aged four to 10 years, average consumption of beef, veal and dishes was 29g per day, compared to 14g per day in 1997, and percentage consumers was 53% in this survey compared with 34% in 1997; similar changes were seen in girls of the same age. In other age groups, the changes were less marked but in the same direction. Results for total meat consumption, excluding non-meat components of meat dishes and products are presented in table 5.3.

5.2.5 Fish and fish dishes

Coated or fried white fish was the most commonly consumed type in toddlers and younger children while white fish and canned tuna was the most commonly consumed type in adults. Mean consumption of fish and fish dishes overall was slightly higher in toddlers, younger children and adults compared with previous surveys but there was little change in older children[6]. Results for total fish consumption excluding non-fish components of fish products and dishes are presented in table 5.3.

5.2.6 Fruit and vegetables

This section refers to fruit and vegetables consumed as discrete items and excludes those consumed as part of composite dishes, such as meat and fish dishes. See section 5.3 for estimated consumption figures including the contribution from composite dishes.

Consumption of vegetables was higher in toddlers, in the four to 10 year age group and in adult women compared with previous surveys but not in other age groups. Consumption of fruit was higher in younger children and toddlers and also in older boys compared with the previous survey, but not in older girls or adults. Total consumption of fruit and vegetables in men was 234g per day, unchanged from the previous survey, and in women was 253g per day, similar to the previous survey (238g per day).

5.2.7 Sugar, confectionery and snacks

Consumption of crisps and savoury snacks in children aged four to 10 years was lower than in the previous survey but little changed in older children and adults.

The consumption of sugar, preserves and confectionery was reduced from past surveys for all age groups. For boys, consumption was reduced from 42g per day to 28g per day and for girls from 34g per day to 26g per day, with lesser decreases for adults.

For adults, the consumption of sugars, preserves and sweet spreads, which includes table sugar, was reduced from the previous survey, with no change in chocolate or sugar confectionery, whereas children in all age groups had lower average consumption of chocolate confectionery than in the previous survey of this group.

5.2.8 Beverages

Fruit juice consumption was increased from past surveys in all groups except women and older girls, while there was a substantial drop in consumption of both non low calorie and low calorie soft drinks in children aged four to 10 years and in toddlers but little change in older children. In adults the trend was in the opposite direction with a small increase in consumption of non low calorie soft drinks compared with the previous survey. All age and sex groups of children showed an increase in tea, coffee and water compared to past surveys, while adult consumption was little changed. **(Tables 5.1a-5.2c)**

5.3. Vegetable, fruit, meat and fish consumption, including from composite dishes

This section reports consumption of fruit and vegetables, and meat and fish, including the contribution from composite dishes but excluding other components of composite dishes. These data are reported for the first time in NDNS, as a result of a project to disaggregate all composite dishes in the NDNS food composition databank. The methodology for the disaggregation of composite dishes is provided in Appendix A.

Table 5.3 shows intakes for vegetables based on disaggregated data, of 113g per day for boys and 101g per day for girls, and 189g per day for men and 200g per day for women. These are considerably higher than the figures obtained using the traditional approach for NDNS as reported in section 5.2, where vegetables in mixed dishes were retained in those dishes and reported in the food group based on the main component of the dish, while the vegetables group comprised salad and cooked vegetables consumed and reported as discrete items. Consumption of the traditional vegetable descriptors was 78g per day for boys and 76g per day

for girls, and 140g per day for men and 159g per day for women (Tables 5.1a, b). Taking vegetables from composite dishes into account, vegetable intakes were underestimated by previous methods by 25-35g per day for children and 40-50g for adults. By comparison, fruit intakes including those from composite dishes were only 2-6g higher (3-6%) than assessed by previous methods, since there are far fewer composite dishes containing fruit. Total fruit and vegetables consumption (without fruit juice) was calculated from the vegetable and fruit totals, giving intakes, on average, ranging from 164g per day for girls aged 11 to 18 years to 300g per day for women.

The number of portions of fruit and vegetables consumed per day have been calculated from the disaggregated data, in line with the “5-a-day” criteria including up to one portion each of fruit juice and baked beans and pulses per day. Results have not been reported for children aged under 11 years since the standard 80g portion used in the analysis is likely to be too large for young children and a smaller portion size has yet to be set for this age group. Adult men and women consumed 4.4 “5-a-day” portions per day, with a range from 2.5 portions per day (lower 2.5 percentile) to 10.2 portions per day (upper 2.5 percentile) for men and 2.3 to 8.3 portions per day for women. For those aged 11 to 18 years, mean consumption was 3.4 portions per day for boys and 2.8 portions per day for girls. The proportion of participants meeting the “5-a-day” guideline was 7% of girls and 22% of boys aged 11 to 18 years, 33% of women and 37% of men. It is not possible to compare these findings with those from previous surveys. Numbers of portions of fruit and vegetables were calculated in the NDNS survey of adults but the methodology differed from that used here.

Estimates of intakes of meat from all sources including composite dishes indicated much lower consumption levels than when consumption of meat and meat dishes was described by the traditional NDNS approach as reported in section 5.2. The difference is due to the inclusion of non-meat components of meat dishes in the estimates using the traditional approach. Total meat consumption was 39g per day for toddlers, 78g per day for girls, 98g per day for boys, 91g per day for women and 134g per day for men. This compares with intakes of meat and meat dishes of 64g per day for toddlers, 132g per day for girls, 159g per day for boys, 161g per day for women and 217g per day for men, representing an approximate 40% reduction in reported consumption for all age/sex groups. Thus estimates of consumption of meat itself are quite different from estimates of meat and meat dishes consumption. Each type of meat consumed was categorised as red meat or white meat. The proportion of red meat consumed ranged from

63% of the total for women to 72% for toddlers and men, with children aged four to 18 years at 65%.

Consumption of fish from all sources including composite dishes showed very similar patterns to meat consumption, with consumption figures for fish itself 35-50% lower than for fish and dishes, depending on the age/sex group. Oily fish consumption was low, at 8g per day for adults and 2g per day for children, equivalent to 56g and 14g per week for adults and children respectively, well below the recommendation of one portion per week[7]. **(Table 5.3)**

5.4 Energy and macronutrient intake and percentage contribution of food groups to macronutrient and sodium intakes

This section presents intakes of energy and macronutrients estimated from the food consumption data and shows the percentage contribution of the major food types to intake of each nutrient. This analysis has been carried out using the traditional NDNS food groups presented in section 5.2 and not the disaggregated food groups presented in section 5.3.

5.4.1 Energy

Energy intakes for adults and children were similar to previous NDNS surveys of adults (aged 19 to 64 years) and young people (aged four to 18 years), with means of 9.48 MJ (2255 kcal) for men; 6.92 MJ (1645 kcal) for women; 8.03MJ (1906 kcal) for boys aged four to 18 years, 6.75 MJ (1604 kcal) for girls aged four to 18 years and 4.79MJ (1136 kcal) for toddlers aged 1.5 to three years.

The cereals and cereal products group was the main source of energy for all age groups, contributing 33-35% energy intake for children aged four to 18 years, 29% for toddlers and 28% for adults. These contributions were similar to previous surveys. Bread was the main contributor in this group.

The contribution to energy intake from milk and milk products was lower with increasing age, from 26% energy intake for toddlers (aged 1.5 to three years), 15% for children aged four to 10 years to 9% energy for older children (aged 11 to 18 years) and adults. There was little change in the contribution of this group to energy intake compared with past surveys.

Meat and meat products and dishes contributed increasing proportions of energy with age, from 10% for toddlers, 14% for those aged four to 10 years to 17-18% for those aged 11 to 18 years and adults, with both sexes having similar proportions. The contribution of meat and meat products to energy intake was slightly higher than in previous surveys for all age groups except toddlers due to higher consumption of this food group.

The contribution of vegetables and potatoes to energy intake was largely unchanged for all age groups compared with previous surveys.

5.4.2 Protein

Protein intakes were somewhat higher than in the past, for all age and sex groups, although more so for children, both in absolute terms and expressed as a percentage of food energy. For adults, protein provided 17.6% food energy, compared to 16.5-16.6% in the previous survey; for children, both for toddlers aged 1.5 to three years and children aged four to 18 years, intakes provided 14.5-15.4% energy, compared to 13% food energy in the previous surveys. Mean protein intakes were well above the Reference Nutrient Intake[8] (RNI) in both adults and children.

Meat and meat products and dishes was the largest contributor to protein intake for all ages except toddlers, with contribution increasing with age from 21% for toddlers, 30% for children aged four to 10 years, and 38% for children aged 11 to 18 years and adults. The contribution of meat and meat products had increased compared with past surveys for all age groups except toddlers. Milk and milk products was the major contributor to protein intake for toddlers at 35% of intake; the contribution decreased with age to 21% for children aged four to 10 years, 14% for those aged 11 to 18 years and 13% for adults; these contributions were lower than in past surveys for all but toddlers. Cereal and cereal products was the third main contributor at 22% protein for toddlers, 26-27% for children four to 18 years and 22% for adults.

5.4.3 Carbohydrate

Intakes of total carbohydrate were little changed from past surveys, and provided 47% food energy for adults, and 50-51% food energy for children aged four to 18 years and toddlers.

The major contributor to carbohydrate intake was cereals and cereal products, with the contribution ranging from 40% for toddlers, 42% for adults and 43-46 % for children aged four to

18 years. There was little change in contribution to carbohydrate intake from this group from past surveys.

Milk and milk products was the next largest contributor for toddlers, at 16% of intake, but contributed much less for older children and adults, at 5-9% of total carbohydrate intake. Vegetables and potatoes contributed 15% of carbohydrate intake for adults, the second largest group after cereals and cereal products. Contributions from vegetables and potatoes were smaller for children at 11-12 % carbohydrate intake and for toddlers, at 10%.

5.4.4 Non-milk extrinsic sugars

Intakes of non-milk extrinsic sugars (NMES) as a percentage of food energy were reduced from past surveys in all groups except women; for children aged four to 18 years the proportion of food energy from NMES was reduced from 16-17% energy in the previous survey to around 15% for those aged four to 18 years and for toddlers NMES intakes fell from 18% food energy in the previous survey to 11%. The Dietary Reference Value (DRV) for NMES is that the population average intake should provide no more than 11% of food energy intake[9]. Mean intakes of NMES as a percentage of food energy intake exceeded the DRV in all age groups except for toddlers which was very close to the DRV.

The major sources of NMES were beverages, cereals and cereal products and sugars, preserves and confectionery. Soft drinks contributed 16% of NMES intake for adults, 19% for children aged four to 10 years, 14% for toddlers and 32% for those aged 11 to 18 years. These contributions were similar to those in previous surveys, except for toddlers, which was much reduced compared with the previous survey, where the contribution was around 32%, due to the fall in consumption in this age group. The contribution of fruit juice was increased compared with previous surveys, particularly for younger children and toddlers; and provided 8-9% of NMES for adults and those aged 11 to 18 years, 12% for those aged four to 10 years and 17% for toddlers. Cereals and cereal products contributed 20% of NMES intake for adults and around a quarter for children. The contribution from sugars, preserves and confectionery was 25% for adults and slightly lower for children. These were smaller contributions than in previous surveys in which sugars, preserves and confectionery provided over 30% of NMES intake. This was largely due to the reductions in consumption of sugar, preserves and sweet spreads in adults and also of chocolate confectionery in children.

5.4.5 Non-starch polysaccharides

Intakes of non-starch polysaccharides (NSP) were 14g per day for adults, 11-12g per day for children and 8g per day for toddlers; NSP intake in children and toddlers was higher than in previous surveys but adult intakes were unchanged. The UK DRV for NSP is an average intake of 18g per day for adults[9]. Mean intakes were well below this level in all age groups.

Cereal and cereal products was the main contributor to NSP intakes at 37% for adults and over 40% for children. This contribution was slightly lower than in the previous survey of adults due to a reduction in the contribution from wholegrain and high fibre breakfast cereals.

Vegetables and potatoes were the second major contributor to NSP, with an increasing contribution with age, from 25% in toddlers, 27% in those aged four to 10 years, 29% for those aged 11 to 18 years, and 34% for adults. The contribution for children was lower than in past surveys for both toddlers and children aged four to 18 years.

5.4.6 Total fat

Total fat provided 34-36% of food energy across all age groups. Intakes were very similar to the previous survey for adults but lower than previous surveys for children and toddlers. The DRV for total fat is that the population average intake should provide no more than 35% of food energy intake[9]. This recommendation applies to adults and children from the age of five years. Mean intake for adult women, boys and younger girls met the DRV while mean intake for adult men and older girls was just above the DRV.

The major contributors to total fat intake were meat and meat products, milk and milk products and cereals and cereal products. The contribution from meat and meat products increased with age from 15% for toddlers, to 19% for those aged four to 10 years, 25% for those aged 11 to 18 years and 26% for adults. The contribution for adults was slightly higher than in the previous survey due to higher consumption of this food group.

The contribution from milk and milk products was in the opposite direction with age, at 36% for toddlers, 20% for those aged four to 10 years and 13% for those aged 11 to 18 years and adults.

The contribution of cereals and cereal products was 18% of total fat intake in adults, 16% in toddlers and 22-23% in children aged four to 18 years.

5.4.7 Saturated fatty acids

Saturated fatty acid intakes as a percentage of food energy were lower than in previous surveys for all age groups at 12.8% of food energy for adults, 12.9% for those aged 11 to 18 years, 13.6% for those aged four to 10 years and 15% for toddlers. The DRV for saturated fatty acids is that population average intakes should not exceed 11% of food energy intake[9]. This recommendation applies to adults and children from the age of five years. Mean intakes in this survey exceeded the DRV for all age groups.

Milk and milk products was the main source of saturated fatty acids for toddlers and younger children, providing 48% of intake for toddlers and 31% for children aged four to 10 years. For adults and older children milk and milk products provided 22% of saturated fatty acids intake. Cheese was the major contributor within this group.

The contribution of meat and meat products to saturated fatty acids intakes in adults and older children was higher than in the previous surveys and this food group was now the main source of saturated fatty acids for these age groups, providing about a quarter of intake.

Cereals and cereal products also made a substantial contribution to intake of saturated fatty acids, ranging from 15% for toddlers, and 18% for adults to 23% for children aged four to 18 years.

5.4.8 Trans fatty acids

Trans fatty acid intakes were lower than in previous NDNS and were less than 2g per day for all age groups, representing 0.8% of food energy. This level of intake for adults was also lower than the re-estimated value calculated in 2007 at 1.0% food energy based on consumption data from the 2000/01 NDNS and information from the food industry on then current levels of trans fats in processed foods[10]. The DRV for *trans* fatty acids is that population average intakes should provide no more than 2% of food energy[9]. Mean intakes at 0.8% food energy met the DRV for all groups.

Trans fatty acids derive from two sources in the diet, naturally occurring in the meat and dairy products of ruminant animals, and artificially through food processing practices. The levels of

trans fats from artificial sources have been reduced in recent years, resulting in a higher proportion of the lower intakes coming from the natural sources. Hence the percentage contribution to *trans* fatty acids from cereal and cereal products was reduced from past surveys, while that from meat and meat products and milk and milk products was increased.

5.4.9 Unsaturated fatty acids

Intake of *cis* n-6 polyunsaturated fatty acids (PUFA) were little changed from the past, although the direction of change was downwards, for all groups for both absolute intakes and as percentage food energy, which ranged from 3.9% food energy for toddlers to 5.3% for adult women.

The direction of change for *cis* n-3 PUFA was upwards for all groups compared with previous surveys, although the differences in absolute terms were very small. *Cis* n-3 PUFA represented 0.7-1.1% food energy.

Cis-monounsaturated fatty acids showed slight increases in absolute intakes and as percentage food energy for all groups, which are likely due to the increases in meat consumption noted above. The DRV for *cis* mono-unsaturated fatty acids is 13% of food energy as a population average[9]. Mean intakes were 12.5% food energy for adults and children aged four to 18 years and 11.2% for toddlers.

5.4.10 Sodium

Sodium intakes will be reported in the NDNS rolling programme using urinary excretion, derived from 24-hour urine collections, which are part of the survey protocol. The results from the urine analysis are not included in the current report as the sample size for year one is too small to report. Contributions of food groups to sodium intake are therefore based on the sodium intake calculated from the dietary intake which is incomplete because discretionary use of salt in cooking and at the table is not captured in the dietary record.

The largest contributors to sodium intake were cereals and cereal products and meat and meat products. Cereals and cereal products provided 30% of intake in adults and 34-37% in toddlers and children. Meat and meat products showed an increasing contribution with age, from 19% for toddlers, 25% for children aged four to 10 years, and 28% for those aged 11 to 18 years and adults. The contribution of cereals and cereal products was slightly lower and that of meat and meat products slightly higher compared to previous surveys.

Milk and milk products showed decreasing contributions to sodium intake with age, from 19% for toddlers, to 11 % for children aged four to 10 years and 8% for those aged 11 to 18 years and adults.

5.5 Vitamins and minerals

Intakes of vitamins and minerals reported in this first year of the NDNS rolling programme are from foods only and do not include supplements. The proportion of individuals taking supplements is reported below (Section 5.7), but the contribution of supplements to intake is not included. This will be reported in future years of the programme.

For those vitamins and minerals where UK Reference Nutrient Intakes (RNIs) and Lower Reference Nutrient Intakes (LRNIs) have been published, the proportion of respondents with intakes below the LRNIs are shown and mean daily intakes are compared with current RNIs[9]. The RNI for a vitamin or mineral is the amount of the nutrient that is sufficient for about 97% of people in the group. If the average intake of the group is at the RNI, then the risk of deficiency in the group is judged to be very small. However if the average intake is lower than the RNI then it is possible that some of the group will have an intake below their requirement. The adequacy of vitamin or mineral intake can be expressed as the proportion of individuals below the LRNI. The LRNI for a vitamin or mineral is set at the level of intake considered likely to be sufficient to meet the needs of only 2.5% of the population. However it should be noted that DRVs for some micronutrients[11] are based on very limited data so caution should be used when assessing adequacy of intake using the LRNI.

The proportion below the LRNI can be compared to past surveys to assess any change in this measure. However, as explained in the introduction to this chapter (section 5.1), such figures vary with the number of days of dietary intake assessed, and for this reason the seven-day records for the past surveys have been recalculated to derive four-day estimates (see Appendix K). This has not yet been carried out for the survey of toddlers aged 1.5 to three years and all comments on comparisons with past surveys exclude this age group.

5.5.1 Vitamins

Intakes of vitamins were all similar to intakes found in previous NDNS surveys except in two cases. Vitamin A intakes (as retinol equivalents) were considerably higher for both adults and children than when previously assessed. This is likely to be due to β carotene since retinol intakes were comparable to past surveys, except for adult men who had a lower mean retinol intake in this survey compared with the previous NDNS. This increase is likely to be a result of higher intakes of vegetables on Sundays which have been noted previously, since the current data comprises dietary records in which a Sunday is always included as one of the four days assessed. The second vitamin showing higher intakes compared with previous surveys is vitamin C, in all groups except older girls. Fruit juice consumption was found to be increased in this current survey compared to past NDNS in all groups except women and older girls. Additionally higher values for Vitamin C intakes may be explained by the inclusion of Sundays in all records, due to the increased consumption of vegetables on this day. Apart from these two nutrients, for which mean intakes as a percentage of RNI was higher than in the past, the majority of vitamins assessed had mean intakes very similar to earlier surveys.

For many vitamins, there was no change from the earlier surveys in the proportion of individuals below the LRNI, particularly where these proportions were extremely low in any case, at 1% or less. Reductions were seen in the proportion of individuals below the LRNI for vitamin A, for women and children though not for men. For example, for boys aged four to 10 years the proportion below the LRNI fell from 12% in the 1997 NDNS to 2% in the current survey. The proportion with riboflavin intakes below the LRNI fell in some groups, such as girls aged 11 to 18 years from 22% to 12%, and for boys aged 11 to 18 years from 8% to 4%, but there was little change in other groups and the proportion of women with riboflavin intakes below the LRNI increased slightly from 9% in 2000/01 to 11% in the current results.

5.5.2 Minerals

Intakes of minerals were largely similar to intakes from past surveys, and there were no consistent trends in intake across all age groups. Iron intakes were virtually identical to past surveys for all age and sex groups except toddlers where mean intake was higher in the current survey. Children of both sexes had higher intakes of zinc than in the previous NDNS survey, for boys aged four to 18 years increasing from 6.9mg per day on average to 7.9mg per day and for girls aged four to 18 years from 5.7mg per day to 6.6mg per day. Toddlers also showed a similar increase in mean intake. These increases may be explained by the higher meat

consumption in this survey as noted previously. Calcium intakes also appeared higher in children, with boys aged four to 18 years increasing from 790mg per day in the last survey to 871mg per day in the current results and for girls aged four to 18 years from 660mg per day to 729mg per day. Toddlers showed the changes in the same direction, but not adults, where the trend was in the opposite direction. Mean intakes fell below the RNI for a number of minerals, in particular, iron, magnesium, potassium and selenium. This was particularly the case for boys and girls aged 11 to 18 years. For girls aged 11 to 18 years, the mean iron intake was 58% of the RNI; the same proportion as in the previous survey of this age group. Mean intakes of magnesium and potassium also fell below the RNI for both boys and girls in this age group, as did zinc, calcium and iodine for girls. Substantial proportions of older girls had mineral intakes below the LRNI, for example 46% for iron and magnesium and 30% for potassium. Iron and potassium intakes fell below the LRNI in a fifth of adult women. In younger children intakes below the LRNI were found only for zinc (7% of those aged four to 10 years) and in toddlers only for iron (6%).

Intakes of selenium, which have not been reported before, fell below the RNI in older children and adults, for example at 72% RNI for women and 74% RNI for men. Around half of adult women and older girls and a fifth of men and older boys had intakes below the LRNI.

Compared to past surveys, the proportion of individuals below the LRNI was reduced for children for those minerals where mean intake was seen to increase, such as calcium and zinc. The proportion of boys aged 11 to 18 years below the LRNI for calcium fell from 13% in the past survey to 6% in the current results, and for girls of this age group, from 23% to 11%. For zinc, reductions were also seen in the proportion below the LRNI, for example in boys aged four to 10 years from 11% to 6%. The proportion of women who were below the LRNI for iron fell from 26% to 20%. All other changes were small and not in a consistent direction.

5.6 Alcohol[12]

Alcohol consumption described here is that recorded during the four days of diet diary recording and is presented as g per day and per cent total energy only, for both the total population (including non-consumers) and consumers only, those who recorded having alcohol during the four days of record. For the adult population overall, alcohol provided about 6% of energy intake, with men considerably higher than women at nearly 8% compared with 5%. For adult

consumers, alcohol provided nearly 10% of energy intake; the proportion of consumers was much higher for men, at 86% of the men surveyed, compared with 48% of women. For all participants aged 11 to 18 years, alcohol provided 1% of energy intake. Nineteen per cent of this age group were consumers of alcohol and for them, it provided on average 8% of energy intake for boys and 4.6% for girls. For boy consumers at the upper 2.5 percentile, alcohol provided 26.7% energy for the four days studied, while for men, intakes at the upper 2.5 percentile provided 46.3% energy from alcohol over the four day period. It should be noted that since the four days of record included both weekend days for all participants, these alcohol intakes are likely to be higher than would be expected if random days had been chosen. When the second year of the rolling programme is reported, a clearer picture representing all days of the week will be obtained.

5.7 Dietary supplements

Information on consumption of dietary supplements[13] was collected both in the food diary (recording consumption in the four-day recording period) and in the CAPI interview (which asks about consumption in the year before interview). Twenty four per cent of adults (18% of men, 30% of women) had taken at least one supplement during the four-day diary recording period. Supplement consumption was more common amongst toddlers and young children than older children; 19% of toddlers aged 1.5 to three years, 16% of children aged four to 10 years, 7% of those aged 11 to 18 years had taken a supplement during the four-day diary period.

A higher proportion of participants reporting having taken at least one supplement during the previous year than had done so in the four-day diary period. This may be because of infrequent, intermittent or seasonal use of supplements which may not have been captured in the diary period. Twenty three per cent of toddlers and young children aged four to 10 years, 18% of those aged 11 to 18 years and 35% of adults (27% of men, 41% of women) reported having taken supplements in the past year. These levels of supplement use are similar to those reported in previous surveys. In the 2000/01 NDNS 29% of men and 40% of women reported taking supplements; in the 1997 survey 19% of children aged four to 18 years reported taking supplements and in the 1992/3 survey of toddlers the figure was also 19%.

The two most common types of supplements consumed in all age groups were fish oils (including cod liver oil) and multivitamins and/or minerals. Cod liver oil and other fish oils were

consumed by 9% of toddlers, 7% of those aged four to 10 years and 3% of those aged 11 to 18 years 11% of men and 13% of women during the four diary days. Similar proportions had taken multivitamins with or without minerals.

The types of supplement reported as having been taken in the year before interview were similar to those recorded in the diary. **(Tables 5.29, 5.30)**

[1] Further consideration of the method has suggested that random start days are preferable and hence the second year of the rolling programme is being adjusted to compensate for the number of weekend days in the first year, such that by the end of year two, all days of the week will be equally represented. In subsequent years, the four days assessed will be randomly assigned.

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[5] Gregory JR, Collins DL, Davies PSW, Hughes JM, Clarke PC. National Diet and Nutrition Survey: children aged 1 ½ to 4 ½ years. Volume 1: Report of the diet and nutrition survey London: HMSO, 1995.
Hinds K, Gregory JR. National Diet and Nutrition Survey: children aged 1½ to 4½ years. Volume 2: Report of dental survey. London: HMSO, 1995.

[6] Apparent increases in the consumption of other white fish and fish dishes and decreases in oily fish compared with previous surveys are partly due to reclassification of canned tuna. This was included with oily fish in previous NDNS but is now reported with other white fish and dishes.

[7] A portion of oily fish is defined as 140 grams.

[8] The Reference Nutrient Intake (RNI) is the level of intake considered to be sufficient to meet the requirements of 97.5% of the population.

[9] Department of Health (1991): Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. Report on Health and Social Subjects No. 41. HMSO, London.

[10] http://www.food.gov.uk/multimedia/pdfs/reestimatetransfats.pdf

[11] DRVs for magnesium, potassium, selenium and zinc in particular are based on limited data.

[12] Questions about alcohol consumption are also asked in the CAPI interview and via self-completion for children and young adults. This is reported in section 3.6. The time period recalled in the CAPI/self-completions is the seven days before interview. This will not overlap with the diary recording period.

[13] Dietary supplements were defined for participants as products intended to provide additional nutrients or give health benefits and taken liquid, powder, tablet or capsule form. In the CAPI participants were asked to list any vitamins, minerals, fish oils, fibre or other dietary supplements taken over the past year. The instructions for the diary asked participants to write down the details of any vitamins, minerals or other supplements they took on each diary recording day