Survey of sugar intake among children in Scotland

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EXECUTIVE SUMMARY

Diet is an important determinant of health. Dietary targets for the Scottish population were published in *Eating for Health: a Diet Action Plan for Scotland*[1] in 1996. A working group set up to monitor progress in reaching these targets recommended that '*where data is currently lacking, as for non-milk extrinsic sugars in children, interim studies may need to be set up'.*[2]

The 'Survey of sugar intake among children in Scotland' was commissioned by the Food Standards Agency Scotland (FSAS) in 2005 to provide robust information on the diet of Scottish children, with a particular focus on the intake of non-milk extrinsic sugars and sugar-containing foods. The survey was carried out by a consortium of four organisations: the Scottish Centre for Social Research, the University of Aberdeen, the Rowett Research Institute and King's College London. Fieldwork for the survey was conducted between May and September 2006.

Using the Department of Work and Pensions Child Benefit records, a named sample of 2800 Scottish children aged between 3 and 16 years on 1st May 2006 was drawn from 80 postcode sectors across Scotland. One child per household was selected. After exclusions and an initial opt out period, a Food Frequency Questionnaire (FFQ) was sent to the remaining 2498 children in the sample. This was collected by an interviewer when they called to conduct an interview. Information on household composition and sociodemographic data was collected and the child's height and weight were measured.

Two randomly selected sub-samples were drawn from the whole sample. One sub-sample was asked to complete a four day diet diary, the other, drawn from only 40 of the postcode sectors, was asked to complete a single 24-hour recall.

Face to face interviews were conducted with 1700 respondents and 1512 FFQs were returned giving a combined response rate for these two items of 66%. A total of 186 diaries (60%) were completed and returned and 424 24-hour recalls (99%) were completed. Response rates for combined FFQ and interview were highest amongst those in the 8-11 year age group for both sexes (71% for both).

Nutrient intake as recorded by the FFQ and either the diet diary or 24-hour recall were compared for 153 and 350 children respectively. Energy intake from the FFQ was 10.5% higher that that for the diet diary and 5.5% higher than that for the 24-hour recall, with the difference being greater in children aged 3-11 years than those aged 12-17 years.

There was no significant difference in the intake of NMES (% food energy) as recorded by the FFQ (16.0%) or the diet diary (14.9%). The intake of NMES (% food energy) was also very similar by the FFQ (17.4%) and the 24-hour recall (16.6%) though in this case the difference was statistically significant. There was no significant difference in intake of total fat or saturated fatty acids (% food energy) between the FFQ and either the diet diary or the 24-hour recall. Absolute intakes of iron, calcium and all macronutrients apart from protein were all significantly higher as recorded in the FFQ than in the diet diaries or the 24-hour recall.

Intake of food groups

Over 95% of children reported consuming: pasta, rice and pizza; bread excluding wholemeal; biscuits, cakes and pastries; milk and cream; yoghurt and fromage frais; meat and meat dishes; processed meat; vegetables; chips; crisps and savoury snacks; fruit; confectionery and soups and sauces at least once a month: 59% of children reported consuming wholemeal bread and 39% oily fish and dishes at least once a month.

Younger children were more likely to consume wholemeal bread, unsweetened breakfast cereals, yoghurt and fromage frais, ice-cream, fats and oils and white fish, shell fish and fish dishes. Older children were more likely to consume chips, fried and roast potatoes and potato products, nuts and seeds, non-diet soft drinks and beverages.

Those living in less deprived areas (as defined by quintile of the Scottish Index of Multiple Deprivation or SIMD) were more likely to consume wholemeal bread, cheese, oily fish and dishes and fruit juice and less likely to consume diet soft drinks than those living in more deprived areas.

Intake of energy and sugars

Energy intake was significantly higher in boys than girls overall and increased with age in boys but not in girls. The median intake of NMES as percentage food energy was 17.4% and sucrose 13.4%. NMES and sucrose as percentage food energy intake both increased with age group.

Higher energy intake was associated with increasing deprivation. NMES and sucrose contributed a higher proportion of food energy and, intrinsic and milk sugars contributed a lower proportion of food energy in the more deprived quintiles.

Contribution of food groups to intake of energy and sugars

The food groups contributing the highest proportion of total energy intake were biscuits, cakes and pastries (9%) and bread excluding wholemeal (8%). Non-diet soft drinks were the major contributors to NMES (17%), along with confectionery (12%) and biscuits, cakes and pastries (12%).

There were highly significant overall and linear associations between the SIMD quintiles and the percentage contribution of several food groups to both energy and sugars. Children in the more deprived areas derived a lower proportion of energy from pasta, rice and other cereals and a higher proportion from crisps and savoury snacks than children in the less deprived quintiles. These children also obtained a lower proportion of total sugars from fruit, and a higher proportion from confectionery and non-diet soft drinks.

There was a more marked pattern for the contribution of food groups to NMES intake, particularly for drinks. Children in the more deprived areas obtained a higher percentage of NMES from non-diet soft drinks (23% in the most deprived quintile vs. 14% in the least deprived quintile) and a lower percentage from fruit juice (3% in the most deprived quintile vs. 9% in the least deprived quintile).

NMES intake as a percentage of food energy was considerably higher than the UK recommended population average for adults (≤10% of total energy or ≤11% of food energy) and the Scottish Dietary Target for children (≤10% of total energy), with the values reaching 19.8% in boys and 18.7% in girls aged 15-17 years.

Intake of fat and saturated fatty acids

The total intake of total fat and saturated fatty acids as percentage food energy were 32.9% and 13.8% respectively. There was no significant association between total fat or saturated fatty acids as percentage food energy and SIMD.

There were significant differences and a linear association between deprivation and the contribution of processed meats, crisps and savoury snacks to the intake of total fat and saturated fatty acids.

The mean intake of total fat as percentage of food energy was lower than the DRV population average and that recommended in the Scottish Dietary Targets (35% and ≤35% respectively) in all age and sex groups. The mean intake of saturated fatty acids was above the recommended levels of 11% food energy in all age and sex groups.

Overweight and Obesity

Overall the prevalence of overweight and obesity was 14% and 17% respectively. There were no significant differences between the sexes in the prevalence of overweight and obesity overall, 13% of boys and 15% of girls were overweight and 16% of boys and 18% of girls were obese.

There was no evidence of a linear association between BMI and deprivation although children in the least deprived (1st) quintile had the lowest mean BMI (17.9 kg/m^2) while those in the 2nd quintile had the highest (18.6 kg/m^2).

There was an overall association but no linear association between prevalence of the combined category of *overweight including obese* and SIMD. The highest proportion of children in the *overweight including obese* category appeared in the middle (3rd) quintile, (33% boys and 38% for girls). The lowest proportion of children in this category was in the least deprived (1st) quintile (25% for both sexes).

Physical Activity

Children's physical activity levels were categorised as:

- High: active for 60 minutes on 7 days in the last week.
- Medium: active for 30-59 minutes on 7 days in the last week.
- Low: active at a lower level or not active at all.

Any activity during school lessons was not included in these estimates.

Overall, 86% of children reached the 'high' activity level – the current recommended level for children, though it should be noted that fieldwork for this survey was conducted over the summer months including over the school summer holidays when activity levels may have been higher than at other times of year.

More boys reached the high level of physical activity than girls (89% vs. 83%). A further 5% of boys and 9% of girls reached the medium activity level. There was a decline in activity levels in the 12-17 year age group in both sexes but the decline was greater for girls than boys.

There was no clear pattern in the relationship between those meeting the physical activity recommendations and deprivation.

Time spent at a screen

Boys spent an average of 2.2 hours a day and girls 2.0 hours a day sitting in front of a screen (TV, computer or video game). The time spent in front of a screen increased linearly with age group for both sexes, 14 % of both boys and girls, aged 12-17 years, spending on average 4 hours a day in front of a screen compared to 5% of boys and 4% of girls in the youngest age group (aged 3-7 years).

Physical Activity and BMI

To examine the levels of physical activity by BMI, children were classified into one of two BMI groups; *neither overweight nor obese* or *overweight including obese.*

A higher proportion of children in the *neither overweight nor obese* category reached the recommended level compared with those in the *overweight including obese* category (88% vs. 81%). The differences were not significant for the oldest age group (12-17 year olds).

For all children and for boys alone there was a significant association between BMI category and time spent sitting in front of a screen. A higher proportion of children in the *overweight including obese* category spent more than 3 hours in front of a screen than those in the *neither overweight nor obese* category (25% vs. 20%). For boys the proportions were 28% vs. 21%.

Dental Health

Over half (56%) of all children had received treatment for decay (either fillings or teeth taken out), and the likelihood of receiving treatment for decay increased with age. The proportion of children receiving treatment for decay rose from 26% amongst 3-7 year olds to 74% amongst 12-17 year olds.

Treatment for decay was associated with increasing deprivation in both sexes. Boys in the most deprived quintile were twice as likely to have had treatment for decay as boys in the least deprived quintile (71% vs. 35% respectively). For girls the difference between the highest and lowest quintiles was not as great (65% vs. 43%).

Association between diet and dental disease

NMES intake was significantly higher in children who had received treatment for decay (mean 18.5% food energy) than in children who had not (mean 16.1% food energy). This difference was significant in boys and in girls, and was more evident in older children than in younger children. Children who had received treatment for decay had significantly higher intakes of biscuits, cakes and pastries, confectionery, crisps and savoury snacks, and non-diet soft drinks than children who had never received treatment for decay.

Conclusions and Recommendations

The intake of NMES in Scottish schoolchildren is considerably higher than recommended levels, particularly in older children and those living in more deprived areas, due to high consumption of non-diet soft drinks, confectionery and biscuits, cakes and pastries. The high intake is likely to be contributing to dental disease. While there was no evidence from this survey that diet was associated with overweight or obesity, reducing intake of energy intake by reducing NMES intake would make a positive contribution to prevention of overweight and obesity. Initiatives such as 'Hungry for Success'[3] and the Schools (Food and Nutrition) Act[4] which focus on improving the provision of food in schools should have beneficial effects on NMES intake within schools but wider initiatives may be needed to reduce the intake of foods high in NMES outside school to alter this pattern in future generations.

Recommendations

Use of the Child Benefit records as the sampling frame should be considered in any future study monitoring children's diets.

The FFQ as used in this study proved to be a cost effective and robust method for measuring intake of NMES and fat and saturated fatty acid as percentage food energy. It is recommended that this method be considered in monitoring the intake of these nutrients.

Measures need to be taken to reduce the high intake of the main sources of NMES identified in this survey, namely non-diet soft drinks, biscuits, cakes and pastries and confectionery. Such measures should be directed at all children.

Consideration should be given to repeating this survey at regular intervals to provide data on ongoing progress made towards Scottish Dietary targets for NMES and fat intake. Such a survey would also serve to evaluate the impact of policy initiatives directed at improving children's diet.

Research is needed to develop interventions to reduce intake of NMES and saturated fatty acids in children's diets to reach the Scottish Dietary Targets. In addition, measures need to be taken to ensure that a reduction in NMES and saturated fatty acids is complemented by an increase in foods rich in complex carbohydrate to provide a healthy, balanced diet.

References

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3 Hungry for Success: A Whole School Approach to School Meals in Scotland 2003. http://www.scotland.gov.uk/Publications/2003/02/16273/17566
4 Scottish Parliament Schools (Food and Nutrition) (Scotland) Act 2007. Edinburgh, TSO (The Stationery Office), 2007

NOTES TO TABLES

The following conventions have been used in tables:

1. [ ] are used to warn of small sample sizes i.e. if the unweighted base is less than 50. Statistical tests of significance were not carried out if figure in cell was based on unweighted base of less than 50.

2. A p-value for the overall association of <0.05 indicates that at least one group differs significantly from at least one other.

3. Row or column percentages may not add exactly to 100% due to rounding.

4. Both weighted and unweighted base numbers are presented. Weighted base numbers reflect the relative size of each group in the population whereas unweighted bases represent the actual number of respondents in any specified group.

5. When the p-value for linear association is statistically significant (p<0.05), the direction of the association is indicated in the footnote to the table.

6. Due to the transformations which were carried out for skewed data, the sum of NMES and instrinsic and milk sugars does not equal the value for total sugars. For the same reason, percentage contribution from all food groups to nutrient intake does not equal 100%

1 INTRODUCTION

1.1 Background

The importance of diet for the health of the Scottish population was highlighted in 1993 in a report published by the Scottish Office[1]. Following this report, dietary targets for the Scottish population were published as part of the Scottish Diet Action Plan[2]. These targets were based on the UK Dietary Reference Values[3] for selected nutrients and on patterns of food consumption in Scotland derived from the National Food Survey[4]. The targets are shown in Table 1.1.

Table 1.1 Scottish Dietary Targets

Food or nutrient	Target
Fruit and vegetables	Average intake to double to more than 400g per day.
Bread	Intake to increase by 45% from present daily intake of 106g, mainly using wholemeal and brown breads.
Breakfast cereal	Average intake to double from the present intake of 17g per day.
Fats	Average intake of total fat to reduce from 40.7% to no more than 35% of food energy. Average intake of saturated fatty acids to reduce from 16.6% to no more than 11% of food energy.
Sodium	Average intake to reduce from 163 mmol per day to 100 mmol per day (the equivalent of 6g salt).
Sugar	Average intake of non-milk extrinsic sugars in adults not to increase. Average intake of non-milk extrinsic sugars in children to reduce by half to less than 10% of total energy.
Total complex carbohydrates	Increase average non-sugar carbohydrates intake by 25% from 124g per day through increased consumption of fruit and vegetables, bread, breakfast cereals, rice and pasta and through an increase of 25% in potato consumption.
Fish	White fish consumption to be maintained at current levels. Oil-rich fish consumption to double from 44g per week to 88g per week.
Breastfeeding	The proportion of mothers breast-feeding their babies for the first 6 weeks of life to increase to more than 50% from the present level of around 30%.

The Scottish Dietary Targets were originally intended to be achieved in 2005 though the timescale has since been extended to 2010. In 2003 a working group was established to monitor progress towards the Scottish Dietary Targets. The suitability of existing data sets for monitoring progress were reviewed. The best source of information on progress over the period was found to be the National Food Survey, which was replaced by the Expenditure and Food Survey in 2001. These surveys have been carried out annually since 1940 and collect information on food consumption and expenditure which is converted to nutrient intake. However, the data in these surveys is collected at a household level so cannot provide information on the intake of sub-groups such as children. A key recommendation of the report of the working group on monitoring was that '*where data is currently lacking, as for non-milk extrinsic sugars in children, interim studies may need to be set up'* [5].

The diet of schoolchildren in Scotland has been the focus of several policy initiatives, notably 'Hungry for Success',[6] launched in 2003, which aims to improve the nutritional content and uptake of school meals. The survey described in this report was commissioned by the Food Standards Agency Scotland (FSAS) in 2005 to provide robust information on the diet of Scottish children, with a particular focus on the intake of non-milk extrinsic sugars and sugar-containing foods. As the risk of dental caries has been positively related to the amount and frequency of consumption of non-milk extrinsic sugars, and dietary sugars may also contribute to the general excess food energy consumption responsible for the development of obesity,[7] the survey included questions on dental health and physical activity. Height and weight measurements were also taken.

1.2 Classification of sugars

Sugars are soluble carbohydrates which are oxidised in the body to provide energy, water and carbon dioxide. Free sugars in food include monosaccharides, and disaccharides which are polymers of two monosaccharides. The most common monosaccharides in foods are glucose, which is found in small amounts in some fruits and vegetables, and fructose which is found in fruits, honey and invert sugar syrups which are widely used in processed foods. The most common disaccharide in foods is sucrose, a polymer of glucose and fructose, which is found in sugar cane and sugar beet and used to produce table sugar. Other disaccharides in foods are lactose, a polymer of glucose and galactose which is found in milk and milk products, and maltose, a polymer of two glucose molecules, which is found in sprouted grains.

The Department of Health report on Dietary Sugars and Human Disease[7] proposed a classification of sugars based on their physical location within a food (which influences the availability for bacterial metabolism in the mouth and the speed of absorption) and the type of food in which they are found. For example, the sugar in milk is almost all lactose, which is thought to make a negligible contribution to dental caries. The proposed classification, which is used in this report, is:

- Intrinsic sugars: sugars forming an integral part of certain unprocessed foodstuffs, i.e. enclosed in the cell, the most important being whole fruits and vegetables
- Extrinsic sugars, which are not located within the cellular structure of a food can be further divided into
    - Milk sugars, occurring naturally in milk and milk products
    - Non-milk extrinsic sugars, which includes fruit juices, honey, and 'added sugars' which comprise both recipe sugars and table sugars.

It should be noted that non-milk extrinsic sugars (NMES) are not chemically distinct from intrinsic sugars and that there is therefore no laboratory test capable of measuring the NMES content of foods directly. The data in this report are based on nutritional information from the National Diet and Nutrition Survey (NDNS) nutrient databank (see Appendix A, Section 1.6.3) which uses the following criteria to estimate the NMES content of foods.[8]

- All sugars in fruit juices as well as table sugar, honey and the sucrose, glucose and glucose syrups added to foods are classified as extrinsic

- All sugars in fresh fruit and vegetables are classified as intrinsic
- Sugars naturally present in foods that are canned, stewed, dried or used in preserves are classified to be half extrinsic and half intrinsic. Added sugars or syrup in preserves are classified as extrinsic
- Lactose, whether in a milk product or not, is considered as milk sugar. The group of 'intrinsic and milk sugars' is the sum of intrinsic sugars and lactose
- The proportions of intrinsic and extrinsic sugars in other mixed and prepared foods are calculated according to the above principles.

1.3 Aims of the survey

The principal aim of the survey was to estimate intake of NMES and other macronutrients and foods in a nationally representative sample of Scottish children aged 3-16 years.

Additional objectives were:
- To compare the intake of NMES and other macronutrients and micronutrients between sub-groups divided by age, sex, deprivation category and rural-urban residence
- To estimate the prevalence of overweight and obesity in all children and in sub-groups divided by age, sex, deprivation category and rural-urban residence
- To investigate associations between energy, NMES and fat intake and overweight and obesity in all children and in sub-groups divided by age and sex
- To determine the levels of physical activity in all children and in sub-groups divided by age, sex, deprivation category and rural-urban residence
- To assess associations between physical activity and inactivity and overweight and obesity in all children and in sub-groups divided by age and sex
- To assess dental health in all children and in sub-groups divided by age, sex, deprivation category and rural-urban residence
- To assess associations between NMES intake and dental health in all children and in sub-groups divided by age and sex.

The survey was carried out by a consortium of four organisations: The Scottish Centre for Social Research (part of the National Centre for Social Research); the Department of Environmental and Occupational Medicine and the Department of Public Health, University of Aberdeen; the Rowett Research Institute, Aberdeen and the Nutritional Sciences Division, King's College London.

The fieldwork for the survey was conducted between May and September 2006.

1.4 Plan of report

Chapter 2 gives an overview of how the survey was conducted and the rationale for the dietary assessment methods used in the survey. A description of each dietary method and how the data collected was analysed is also presented.

The achieved response to each component of the survey by age and sex and Scottish Index of Multiple Deprivation (SIMD) is provided in Chapter 3. The results of the use of two different levels of incentive for completion of one of the dietary assessment methods, the Food Frequency Questionnaire (FFQ), are also given in Chapter 3.

Chapter 4 compares the nutrient and energy intakes assessed using the different dietary assessment methods. Nutrient and energy intakes for those participants who completed both the FFQ and diet diary were compared and similarly comparisons were made for those who completed the FFQ and 24 hour recall. There is also a discussion of the response to the different methods.

Chapters 5, 6 and 7 report on nutrient intakes as reported in the FFQ. Chapter 5 focuses on intake of food groups and supplements, Chapter 6 on intake of energy and sugars and Chapter 7 on intake of other nutrients.

Chapter 8 presents the anthropometric measures and provides estimates of the prevalence of overweight and obesity in children. The association between high energy food groups, energy intake, and total fat, saturated fat, total sugars and NMES as % energy and overweight and obesity is explored.

Children's participation in physical activity and an estimate of the proportion who meet the Scottish Executive's recommended levels of physical activity are presented in Chapter 9. The association between physical activity and overweight and obesity is explored.

Chapter 10 reports on dental treatment received, particularly treatment for dental decay. The association between treatment for dental decay and selected food groups and nutrients is investigated.

The report concludes in Chapter 11 with a discussion of findings of the survey and implications for practice.

Appendices to the report are available separately as pdf files.

1.5 References

1 Scottish Office Home and Health Department. The Scottish Diet. Edinburgh, 1993.
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2 METHODOLOGY

This chapter gives an overview of the sample design and survey methodology and describes each of the dietary assessment methods used. Details of how the dietary data was analysed is also provided. Further details of the methodology can be found in Appendix A.

2.1 The sample

The sample for this study was drawn from The Department of Work and Pensions (DWP) Child Benefit records. A multi-stage stratified probability sample design was used to provide a sample of 2498 named children which was expected to yield an achieved sample of approximately 1600 respondents. The sample was selected from 80 sampling points across Scotland, including the larger island groupings with sampling points selected with probability proportionate to the number of eligible children within them.

All children aged between 3 and 16 years on 1st May 2006 were included in the sample frame. Only one child per household was randomly selected to take part in the study.

Two randomly selected sub-samples were drawn from the whole sample. One of these sub-samples was asked to complete a four day diet diary. The second sub-sample which was selected exclusively from 40 of the 80 sampling points was asked to complete one 24-hour recall interview. The two sub-samples were mutually exclusive - a child selected for one group was excluded from the other.

2.2 Overview of survey methodology

The adult claiming child benefit on behalf of the named child in the sample was contacted by letter on behalf of the HM Customs and Revenue holders of the DWP Child Benefit records. The letter informed them that they had been selected to take part in the survey and gave details of what the survey was about and how to opt out if they did not want to participate (copies of letters can be found in Appendix B).

All those remaining in the sample after opt out were sent a second letter on behalf of the research team and the FSAS. This asked recipients to complete the accompanying Food Frequency Questionnaire (FFQ) and also invited them to take part in a face to face interview. The interviewer collected the completed FFQ when they called to conduct the interview. An initial check of the completed FFQ was made to ensure that there were no obvious gaps or errors. If the FFQ had not been completed when the interviewer called the respondent was asked to post it back. A second copy of the FFQ was left with participants who reported that they had not received or had mislaid the original copy.

The face to face interview collected information on the household composition and sociodemographic data relating to the household and main food provider. The main food provider was defined as the person in the household with the main responsibility for shopping and preparing food for the child. Data were also collected on the named child's physical activity levels over the previous week and dental health. The child's height and weight were also measured and used to calculate body mass index (BMI). (See Appendix C)

There were two versions of the FFQ: one for children aged 3-11 years and the other for children aged 12 -16 years. A parent or guardian was asked to complete the FFQ and the interview on behalf of the children under 12 years with help from the child where appropriate.

Those aged 12 years and over in the sample were asked to complete the FFQ and the questions in the interview relating to dental health and physical activity with help from a parent or guardian as necessary. A parent or guardian was asked to respond to the sociodemographic questions in the interview.

A high street shopping voucher was included with the letter of invitation and FFQ as an incentive to take part in the survey. Two levels of incentive were used to determine whether a higher level of incentive had an effect on response rate. Approximately half of the sample were sent a £1 high street shopping voucher and the other half a £5 voucher. Interviewers were not aware who had received which level of incentive.

Following the face to face interview, one sub-sample was asked to complete a prospective four day diet diary in which they were asked to record all they had eaten and drunk over a four day period. The four day period included at least one weekend day. Participants were offered a £10 high street shopping voucher if they agreed to complete and return the diet diary. The voucher was given to the respondent in the course of the interview when they agreed to complete the diary.

Two reminders were sent out to those who had not returned the FFQ at 2 weeks and 4 weeks after the interview was conducted. Those who had not returned the diaries were contacted by telephone to remind them to return the diet diary. A postal reminder was sent if the initial telephone reminder did not result in the return of the diet diary.

The second sub-sample was asked to complete a single 24-hour multiple pass recall in which details of everything the respondent had eaten and drunk over the previous 24 hours were collected. To ensure that different eating patterns over the weekdays and weekend days were captured, interviewers were asked to conduct interviews which included a 24-hour recall on a range of different days of the week. Section 3.1.2 gives details of the distribution of the days reported. Twenty four hour recalls were carried out during the same interview as the face to face questionnaire. No additional financial incentive was offered to this sub-sample.

2.3 Dietary assessment methods

2.3.1 Overview of methods

The methodology for assessing intake in dietary surveys needs to be carefully chosen to be fit for purpose according to the population group and the nutrients of interest. Epidemiological surveys often use FFQs which consist of a list of foods and drinks containing the food(s) and/or the nutrient(s) of interest for which the respondent reports their frequency of consumption. FFQs have many advantages for large-scale surveys of habitual diet, notably that respondents are asked to estimate their food consumption over several months rather than several days and that responses can be pre-coded which also facilitates data entry and analysis. However, the method relies on the respondents' ability to classify foods into the categories listed in the questionnaire and on their ability to estimate their habitual intake of each food. In addition, average values for nutrient content of food and portion size are applied to all respondents, so that the nutrient intake results are more likely to be valid for groups than for individuals. To evaluate the possible impact of these limitations of FFQs, comparison with other methods of assessing the intake of the nutrients of interest in the study population is necessary, with diet diaries considered to be the method of choice for comparison.[1]

For the present study, FFQs were considered to be the most appropriate method due to the ability to estimate intake over several months and the cost-efficiency for a large-scale survey. To assess the relative validity of the FFQ, a 4 day diet diary was used in a sub-sample of the study population.

A single 24-hour multiple pass recall was collected for a further sub-sample of the study population. The primary aim of this data was to provide comparability of the results of the present study with those obtained in other UK-wide dietary surveys which use the 24-hour multiple pass recall method, such as the Low Income Diet and Nutrition Survey (LIDNS)[2]. It should be noted that in the LIDNS 24-hour recall, data was collected for four days, unlike the present study which collected data for a single day. This was because in the present study the aim was to provide an estimate of the population mean rather than to assess individual values. The comparison of the median nutrient intake by the 24-hour multiple pass recall method with the data obtained from the FFQ in this sub-group was also used to provide further insight into the relative validity of the nutrient intake estimates derived from the FFQ.

Interviewers were trained in checking the FFQs for completeness and in instructing children and parents or guardians on how to complete the diet diaries. Those interviewers who carried out the 24-hour recall were given appropriate training on how to conduct the recalls (see Appendix A for further details on the methodology of the dietary assessment methods).

2.3.2 Food frequency questionnaires (FFQs)

The FFQs used in this survey were based on the Scottish Collaborative Group FFQ (SCG FFQ), which has been widely used in epidemiological studies in Scotland.[3] The versions used in this survey were modified from a FFQ developed for use in pre-school children (version C1) for which validity in comparison with 4-day non-weighed diet diaries has been reported[4]. Two new versions were developed:

- version C2 for children aged 3-11 years which included instructions for completion by a parent or guardian with help from the child
- version C3 for young people aged 12-16 years with instructions for completion by a young person with help from their parent or guardian

Examples of the two FFQs can be found in Appendix D (i) and Appendix D (ii).

Version C2 lists 140 foods or drinks each with a measure representing a small portion for each item. Examples of food measures were shown in a photograph on the front cover of the FFQ. Participants were asked to estimate the frequency and amount of each food or drink consumed in a typical week by selecting one of nine options, ranging from '*rarely or never*' to '*7 or more measures per day*'. Additional information was obtained on the brand of spreads and cooking oils used, use of dietary supplements and of any foods consumed not listed in the FFQ.

Version C3 was very similar to version C2 apart from the addition of another six items in the beverages section to include coffee and a range of alcoholic drinks. The measures given on the FFQ for each food were the same as those in C2 as participants were able to increase the number of measures consumed to describe larger portions. However, for a few foods for which the measure was poorly defined (e.g. one serving) the weight used in calculation of the nutrient intake was higher in version C3.

A pilot study of both versions of the FFQ was carried out with 84 children aged 5-16 years in Aberdeen. The majority of parents and children in the pilot reported that they found the questionnaires *'fairly easy'* or '*very easy'* to complete. A few additional foods (e.g. smoothies) which were reported by the participants in the pilot study were added to the FFQ food lists. A report on the FFQ pilot study is provided in Appendix E.

The completed questionnaires were checked by the interviewers for missing or ambiguous data (e.g. on supplements or cooking oil brand). Data from the completed questionnaires were entered into an ACCESS database file. The quality of data entry of a random 10% sub-sample of the questionnaires was checked by a second researcher and the error rate in data entry was found to be 0.4%. Nutrient intakes were calculated from the FFQs using an in-house calculation programme, developed by the University of Aberdeen. This incorporates information on the weight of each food measure, the frequency of consumption of each food and the nutrient composition of each food. For this survey nutrient composition was derived from the National Diet and Nutrition Survey[5] (NDNS) nutrient databank (see Section 2.3.5).

2.3.3 Diet diaries

The diet diaries used in this survey were based on children's diet diaries previously developed by the University of Aberdeen. The diet diaries were non-weighed, i.e. participants were asked to estimate the weight or volume of each food or drink using household measures, weights provided on the packaging, or colour food photographs reproduced in the back of the diaries. These photographs were reproduced from a *Photographic Atlas of Food Portion Sizes*.[6] Participants were asked to include one weekend day in the four days for which they kept the diary.

Two versions of the diet diaries were used; one for children aged 3-11 years and the other for those aged 12-16 years (see Appendix F for examples of the diaries). The format of the diet diaries was the same for the two groups but the photographs in the diet diaries for those aged 12-16 years had larger portion sizes for some foods than those used in the diaries for children aged 3-11 years. Again the diet diary for younger children was designed for completion by the parent or guardian while the diet diary for older children was designed for self-completion.

The diet diaries contained written instructions which were reinforced by the interviewers when the method was introduced. Participants who later had questions about the completion of the diet diary were able to contact researchers in Aberdeen on a Freephone telephone number.

The diet diaries had also been tested in the same pilot study as the FFQs (see Section 2.3.2). The majority of parents or children in the pilot found the diet diary '*fairly easy*' or '*very easy*' to complete (see Appendix E).

Interviewers sought written consent from those agreeing to complete the diary to allow their contact details to be sent to researchers in Aberdeen. This enabled researchers to enquire about any missing information in the diet diaries if necessary and to telephone any participants who had agreed to complete a diet diary but for whom no diary had been received.

The foods and drinks listed in the diet diaries were coded by a single researcher in Aberdeen using the NDNS nutrient databank and data entered using the Rec24 programme (see Section 2.3.5). To ensure consistency of coding, a single researcher estimated the weights of all foods and drinks using the information provided by the participants and published weights of food portions[6,7]. For staple foods where the description of the food type was incomplete (e.g. the type of milk or bread) details were sought from the respondent's FFQ. If the FFQ did not provide the required information a default food type was used based on those used in LIDNS[2]. For other queries the participant was contacted by telephone, for example, one common error was to report consumption of breakfast cereals with no milk. Diaries which contained information for fewer than 4 days were rejected. A second researcher checked all the entered data before calculation of the nutrient intake using the NDNS nutrient databank[5] (see Section 2.3.5).

2.3.4 24-hour multiple pass recall

The 24-hour recall method used was the 'multiple pass' method, based on that used by the US Department of Agriculture,[8] modified for use in the Low Income Diet Methods Study[9] (LIDMS) and the Low Income Diet and Nutrition Survey[2] (LIDNS). Information was collected in three phases in a single interview, allowing the respondent three opportunities to recall what they ate and drank over the previous 24 hour period (see Appendix G for examples of the 24-hour recall fieldwork documents).

In the first instance participants were asked to provide a 'quick list' (first pass) of all the items that they had eaten or drunk on the previous day, from midnight to midnight. Second, the interviewer went through the 'quick list' gathering further details to identify fully each item and to quantify the amount consumed. The 'third pass' involved the interviewer going through the list of food and drink recalled and probing for additional items consumed at each occasion, as well as between occasions. Finally participants were asked a series of questions on drinking water, dietary supplements and whether or not the day's intake had been typical. Further details are given in Appendix A.

A telephone query line was set up at King's College London (KCL) for the interviewers to contact researchers to ask questions about any aspect of carrying out the 24-hour recall during the fieldwork period.

Food coding and data entry of the 24-hour recalls were generally carried out in line with LIDNS.[2] Trained coders entered the data and researchers based at KCL checked any queries flagged up by the coders. All foods and drinks were coded using the NDNS nutrient databank and data were entered using the Rec24 program (see Section 2.3.5).

The Rec24 program incorporates checks such as identifying missing codes and food items where the weight of food calculated exceeded a maximum value or where inappropriate portion codes had been used (for the 24-hour recall only).

A random 10% of all of the 24-hour recalls were checked for food and portion code entries. The aim of this task was to identify any problems with coding. At the end of the data entry for the 24-hour recall, age and sex specific histograms showing the distribution of intake for energy and 23 nutrients were produced and cut-offs specific to each age and sex group identified high/extreme values in the distribution. This resulted in data for approximately 110 respondents being checked against the original paper 24h recall record sheet which identified a small number of incorrect food or portion codes (about 3% of outliers).

Since only 1 day of data was collected for the 24-hour recall, respondents were excluded from the survey if a large part of the day's intake was recorded as missing.

2.3.5 NDNS databank, data entry and food coding

Data from the diet diaries and the 24-hour recall were entered into the Rec24 program developed by NatCen using Blaise software. The program was modified for the diet diaries to accept data for four consecutive days.

The NDNS databank was used for the nutrient analysis of all three dietary assessment methods. The nutrient databank was originally developed for the then Ministry of Agriculture, Fisheries and Food (MAFF)[10] for the Dietary and Nutritional Survey of British Adults.[11] It was updated for the National Diet and Nutrition Surveys (NDNS) of children aged 1½-4½ years,[12] people aged 65 years and over,[13] and young people aged 4-18 years.[14] Further revisions and updates were carried out by the Food Standards Agency (FSA) for the NDNS of adults aged 19 to 64 years.[15] It was revised again by nutritionists at KCL for LIDNS[2]. See Appendix A for further details.

2.4 Data handling

2.4.1 Defining age for data collection

Children were selected for inclusion in this survey based on their age on 1st May 2006. All those aged between 3 and 16 years on this date were eligible for selection. Interviews were conducted over a period of three and a half months, from mid May until early September 2006. At the time of interview a number of children had reached their next birthday. Analysis of response rates (Chapter 3) uses the age of the children at sampling. However, due to the need to compare information on diet and height and weight with age-specific reference data, all other analyses in the report use the age at the interview.

Twenty-one FFQs were returned for which there was no corresponding face to face interview. For these 21 respondents, it was possible to determine their age group at interview (3-7, 8-11 or 12-17) from their date of birth and assuming that FFQs were completed during the period of interview (May to September 2006).

2.4.2 Exclusions based on dietary data

Current standard operating procedures for the SCG FFQ recommend that nutrient data is not produced for FFQs containing more than 10 missed lines. For all FFQs for which nutrient data was not produced, the FFQ was checked to ensure that it contained more than 10 blank lines, and that the FFQ was not excluded due to a data entry error. Of 1512 respondents who returned an FFQ, 51 (3%) had missed more than 10 lines, and were therefore excluded from the dietary analysis.

It is recognised that food frequency questionnaire data is likely to include some results with implausibly high or low nutrient intakes and has been suggested that total energy intake may be used as the primary criterion for exclusion[16]. There are no agreed cut-offs for exclusion of FFQs on the basis of energy intake so for this survey the Standard Operating Procedure for the Scottish Collaborative Group of removing the participants with energy above the 97.5th centile or below the 2.5th centile of the distribution of energy in the three age-groups was used.

Of the 1461 respondents who had not missed more than 10 lines on the FFQ, 70 (5%) with extreme total energy intakes (<2.5th centile or >97.5th centile for each age group (3-7, 8-11 or 12-17 years at the interview)) were further excluded from the dietary analysis. These exclusions are also in line with current standard operating procedures for the FFQ.

Of 195 diet diaries that were returned, 42 (22%) were excluded from the comparison with the FFQ: nine diet diaries (5%) were incomplete; nine (5%) contained no identification number and therefore could not be matched with the corresponding FFQ; there was no FFQ with a corresponding ID for eight diet diaries (4%); 11 (6%) corresponding FFQs had more than 10 blank lines; and five (3%) FFQs had extreme total energy intakes. Of the 424 24-hour recalls that were completed, only one (0.2%) was excluded from the comparison with the FFQ as no foods had been consumed.

2.5 Data analysis

Data analysis was carried out using SPSS version 12[17] and Stata/SE9.2[18].

2.5.1 Weighting

The data was weighted so that the estimates generated from the responding sample more accurately reflect the characteristics of the population of children aged 3-16 on 1st May, 2006 in Scotland. Weights were calculated to take account of selection and non-response bias and then these composite weights were adjusted to create a calibration weight (Appendix A).

2.5.2 Food energy versus total energy

Intakes of macronutrients are expressed as a percentage of food energy. In this survey, the percentage of food energy is likely to be very similar to the percentage of total energy, since alcohol (which accounts for the difference between food and total energy), contributed less than 1% of energy intake in all children. Food energy was calculated as [total energy (kJ) - (alcohol (g) x 29kJ)]. Intakes of macronutrients expressed as a percentage of food energy were calculated using the factors of 16kJ per gram for total sugars, NMES, intrinsic and milk sugars and carbohydrate; 37kJ per gram for total fat and saturated fatty acids; and 17kJ per gram for protein.

2.5.3 Comparison of methods of dietary assessment

Weightings were not applied in the comparison of methods as the purpose of this analysis was to compare nutrient intakes obtained by different methods in the same subjects.

Differences in characteristics (age group, sex and SIMD quintile) between respondents who completed an FFQ only, both a diet diary and FFQ, or both a 24h recall and FFQ were assessed using a Pearson chi-square test.

Differences in nutrient intakes between the FFQ and diet diary and between the FFQ and 24h recall were assessed using the Wilcoxon signed-rank test when the nutrient intake from either dietary assessment method was not normally distributed. A paired t-test was used to test for differences between methods when nutrient intakes from both methods were normally distributed.

For each nutrient, the log percent difference between methods was calculated as a measure of difference in the estimates of nutrient intake between two methods: log percent difference = [ln(nutrient intake from FFQ) - ln(nutrient intake from diet diary or 24h recall)] x 100. The log percent difference does not presume that one or the other measure is the standard, as opposed to methods which may use the diary or FFQ as the reference method.

2.5.4 Classification of overweight and obese

Body mass index (BMI) and BMI z-score were determined using the ImsGrowth program version 2.09[19]. BMI was calculated as weight (kg) divided by height (m^2). Respondents were classified as follows:

- underweight: BMI ≤5th centile of the UK 1990 reference data (z-score ≤ -1.64)
- overweight but not obese: BMI ≥85th centile and <95th centile (z-score ≥1.04 and <1.64)
- obese: BMI ≥95th centile (z-score ≥1.64)

2.5.5 Deviations from the normal distribution

All continuous variables were tested for deviations from the normal distribution, and variables which were significantly skewed were transformed as described below. Therefore, the means presented in this report are not influenced by skewed data. In addition, transformation of data to achieve normality was necessary to allow statistical testing of associations between diet and demographic and health variables.

Intakes of food groups and nutrients, the percentage contribution of food groups to nutrient intake, height, weight, BMI and BMI z-scores were tested for normality based on tests for skewness and kurtosis which were then combined into an overall test statistic. Variables which were significantly skewed were transformed into a new variable ln(+/-(old variable) - k), choosing k and the sign of (old variable) so that the skewness of the new variable was zero. Means and 95% confidence limits of the transformed variables were then converted back to the original scale.

2.5.6 Tests of association

Associations between the percentages of children with a specified characteristic (consumers of foods groups, taking supplements, responding to height and weight measures, classified as overweight/obese, time spent participating in physical activity, time spent sitting at a screen, meeting current physical activity recommendations, ever attended a dentist, reason for first attendance, type of dental treatment), and sex, age group, SIMD quintile, urban/rural classification, or BMI classification were assessed using the Pearson chi-squared statistic which was then corrected for the survey design using the second-order correction of Rao and Scott[20] and converted into an F-statistic.

Differences between sexes in means of continuous variables (intakes of food groups or nutrients, the percentage contribution of food groups to nutrient intake, height, weight, BMI, BMI z-score, time spent participating in physical activities, time spent sitting at a screen, age of first attendance at a dentist) were assessed by t-test. Similarly, differences in mean intakes of nutrients and food groups between children who had never been treated for decay and children who had been treated for decay were also assessed by t-test.

Overall associations between continuous variables and age group, SIMD quintile, urban/rural classification, or BMI classification were assessed by an adjusted Wald test. The adjusted Wald test was used within regression analyses using the Stata *testparm* command which tests whether the value for all levels of the categorical variable (i.e. age group, SIMD etc.) are equal in a single test, and produces a single p-value.

Linear associations between continuous variables and age group, SIMD quintile or BMI classification were assessed by linear regression.

2.5.7 Scottish Index of Multiple Deprivation

Data in this survey was also analysed by the Scottish Index of Multiple Deprivation[21] (SIMD). This index identifies small area concentrations of multiple deprivation across all of Scotland in a fair way.

The SIMD is made up of a series of different domains each consisting of a number of indicators chosen to efficiently capture deprivation for that domain area. The domains for the 2006 SIMD, used in this survey, are: Current Income, Employment, Housing, Health, Education, Geographic Access to Services and Crime. Also included in the 2006 SIMD is a new public transport sub-domain in the Geographic Access to Services domain

The SIMD is presented at Data Zone level, enabling small pockets of deprivation to be identified. The data zones, which have a median population size of 769, are ranked from most deprived (1) to least deprived (6,505) on the overall SIMD and on each of the individual domains. The result is a comprehensive picture of relative area deprivation across Scotland.

For the purposes of this report, the full index has been separated into quintiles and each case has been assigned a quintile based on the residential postcode. Quintiles are percentiles which divide a distribution into fifths, i.e., the 20th, 40th, 60th, and 80th percentiles. For example, those respondents whose postcode falls into the first quintile are said to live in one of the 20% least deprived areas in Scotland. Those whose postcode falls into the fifth quintile are said to live in one of the 20% most deprived areas in Scotland.

2.5.8 Scottish Executive Urban Rural Classification

Data was also analysed using the Scottish Executive Urban Rural Classification[22]. The classification distinguishes between urban, rural and remote areas within Scotland. It is consistent with the Executive's core definition of rurality which defines settlements of 3,000 or less people to be rural. It also classifies areas as remote based on drive times from settlements of 10,000 or more people.

The classification used in this report includes the following categories:

Table 2.1. Scottish Executive Urban Rural Classification

Scottish Executive Urban Rural Classification	
1. Large Urban Areas	Settlements of over 125,000 people
2. Other Urban Areas	Settlements of 10,000 to 125,000 people
3. Accessible Small Towns	Settlements of between 3,000 and 10,000 people and within 30 minutes drive of a settlement of 10,000 or more
4. Remote Small Towns	Settlements of between 3,000 and 10,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more
5. Accessible Rural	Settlements of less than 3,000 people and within 30 minutes drive of a settlement of 10,000 or more
6. Remote Rural	Settlements of less than 3,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more

2.6 Ethical Approval

This study did not require access to health records or any data held by the National Health Service, therefore ethical approval was not required. The secretary of the Multi Centre

Research Ethics Committee in Edinburgh confirmed that ethical approval was not required for this study.

2.7 References

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3 RESPONSE

The survey comprised two components; a self completion FFQ and a face to face interview. In addition two different sub-samples of the main sample were asked to take part in further elements of the study: completion of a 4 day diet diary or completion of the 24-hour recall.

This section looks firstly at the response to the FFQ and face to face interview for the main sample and secondly examines the response to the 4 day diet diary and 24-hour recall by the two sub-samples. Finally, the effect of using the two different levels of incentive on response rate is presented.

The age of the child at sampling, as opposed to age at interview, is used throughout this chapter.

3.1 Response rates

3.1.1 Whole sample

Interviews were carried out with a total of 1700 children or parents/guardians of children for those under 12 years of age. Of those completing a face to face interview, 1491 also completed and returned an FFQ. A further 21 FFQs were returned for which there was no corresponding face to face interview.

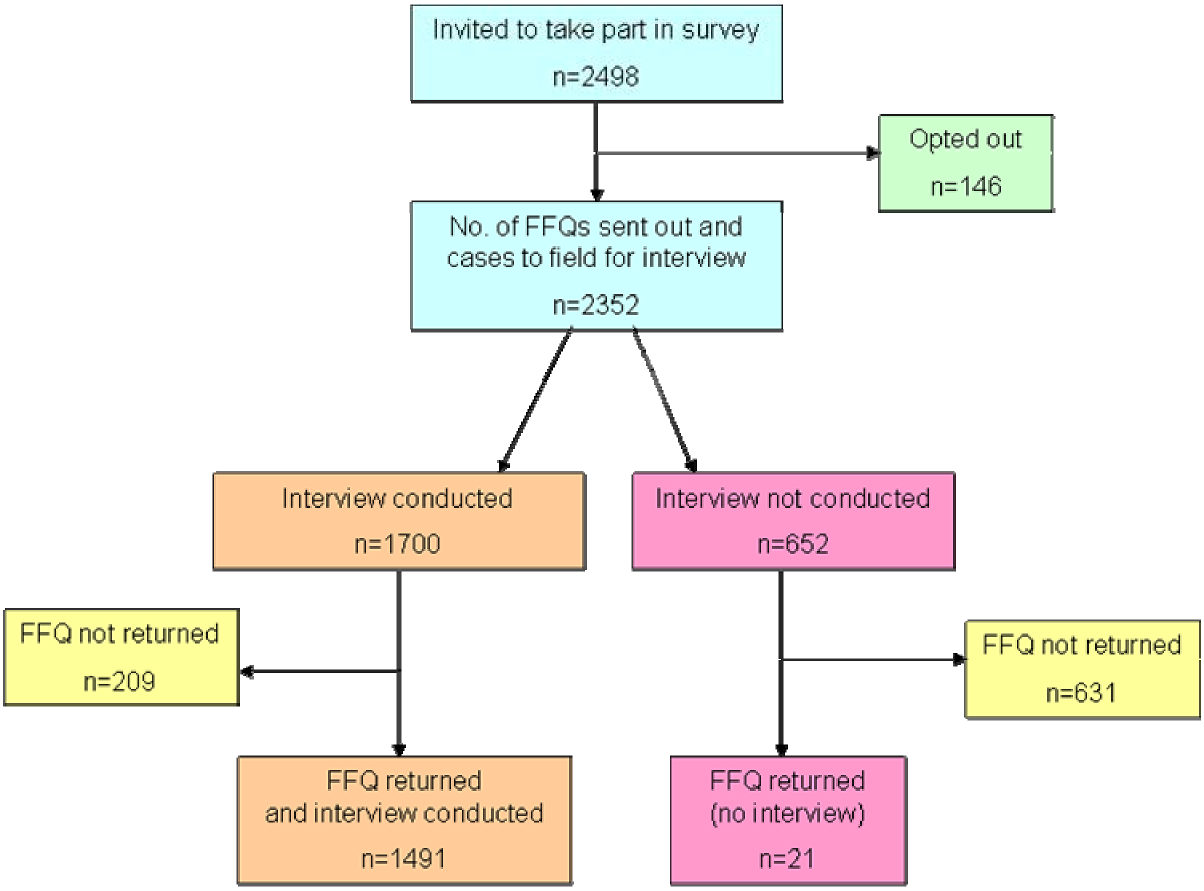
In addition, 9 FFQs were returned with no serial number to identify the respondent which would allow matching with the interview data and another was returned outside the data collection period. The data from these interviews could not be used in the analysis.

As there were several possible outcomes for this survey (see Fig 3.1), a range of response rates are presented. This includes separate response rates for interviews achieved and for FFQs returned, in addition to a response rate for those who completed both these components of the survey.

Table 3.1, Figure 3.1

The response rates presented in Table 3.1 assume that all those who could not be contacted were not eligible to be included in the survey. The response rates were therefore calculated on a base of 2245 i.e. all those considered ‘in scope’. It is likely that a proportion of these potential respondents who could not be contacted would have been eligible, but there is no way of estimating how many. If all are assumed to be eligible to take part in the study the base on which response rates are calculated would be 2464. Using this as the base a more conservative estimate of the response rate for those responding to both components of the survey would be 60%. Similarly more conservative response rates for completion of the FFQ alone and for the interview alone would be 61% and 69% respectively. It is likely that the true response rates for each component of the study lies somewhere between these two extremes.

Figure 3.1 Possible response outcomes



Response by age and sex

It is important to note that as outlined in Section 2.2, a parent or guardian was asked to respond for those children in the sample under 12 years of age. Those aged 12 years and over were asked to complete the FFQ themselves with help from parents and respond to questions on physical activity and dental health in the face to face interview. A parent or guardian was asked to respond to the socioeconomic questions. Completion of the interview for those aged 12-16 years therefore required input from both adult and child.

There was a significant overall association between response rate for all components of the survey and age group. The highest response rates for all components of the main survey were achieved for the middle age group, 8-11 year olds. This was true for both sexes. Response to the combined interview and FFQ was significantly associated with age group in boys but not girls. Boys in the oldest age group were less likely to respond than those in the youngest age group. However, response rates were similar for the oldest and youngest girls.

There were no significant differences in response rates between the sexes.

Table 3.2

Age and sex profile of the whole sample

Table 3.3 compares the age and sex profile of participants responding to the different components of the survey to the mid year 2005 population estimates for Scotland.[1]

The proportion of boys aged 3-7 years responding to each component was comparable to the population estimates for the same age group. Girls in this age group were slightly under represented.

The middle age group, 8-11 year olds, is over represented in the sample whilst the oldest age group is under represented relative to their proportions in the population estimates. This is true for both sexes and all components of the survey.

Overall the proportions of boys to girls in the sample are the same as in the population estimates: 51% boys and 49% girls in both responding sample and population estimate.

Table 3.3

Response by Scottish Index of Multiple Deprivation (SIMD)

There was a significant association between SIMD and the response rate to the combined interview and FFQ and the FFQ alone . Those in the 1st quintile (least deprived) were most likely to take part in the survey; those in the 5th quintile (most deprived) were least likely to take part. There was a difference of 13 percentage points for those responding to the FFQ (71% vs.58%) and the combined FFQ and interview (71% vs.58%). Those in the 5th quintile were much less likely to complete and return the FFQ than those in the 1st quintile. There was no significant difference in response rates to the interview component of the survey by SIMD.

Table 3.4

Response to physical measurements

All those taking part in a face to face interview were invited to have their height and weight measured. There was a high level of co-operation from respondents to this element of the survey. Height measurements were taken for 96% of respondents and weight measurements for 96% of respondents.

Table 3.5

There was a significant association between the agreement to height and weight measurements and SIMD. Those in the most deprived quintile were least likely to have provided height and weight measurements compared with those in other SIMD quintiles.

Table 3.6

3.1.2 Sub-samples

During the course of the face to face interview, randomly selected respondents were asked to complete a 4 day diet diary or to complete a single 24-hour recall.

In the first sub-sample, respondents were asked if they would be willing to complete the 4 day diet diary and post it back to the researchers. An incentive was offered to those who agreed to complete this additional component. Of the 311 respondents asked, 309 (99%) agreed to complete the diet diary. A total of 186 diaries (60%) were returned. In addition another 9 diaries were returned with no means of identification so could not be included as valid returns.

Of the 429 respondents who were asked to complete the 24-hour recall, 424 (99%) did so. There were very few refusals in this additional component once the respondent had begun the interview.

The table below shows the distribution of days of the week for the 423 respondents for which complete 24-hour recall data were available. The ratio of weekend days to weekdays is 0.33 (the ideal balance is 0.4 or 2:5). Fewer 24-hour recalls were carried out for Fridays and Saturdays (i.e. there were fewer interviews carried out at the weekend) and a higher proportion for Sundays and Mondays.

Proportion of 24-hour recalls conducted by day of week

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
%	%	%	%	%	%	%
23	18	18	14	2	3	22

Table 3.7, Table 3.8

Response by age and sex for sub-samples

The response rate to completing the 24-hour recall was similar to that of completing the main interview and FFQ. This is not surprising as the 24-hour recall followed immediately after the main interview, thus having agreed to the first part of the interview respondents were likely to respond positively to the second part.

There was a significant association between completing the 24-hour recall and age group overall and for girls. The 24-hour recall was more likely to be completed for the middle age group than for the youngest and oldest age groups overall and for girls.

Returns of the completed diet diary showed a similar pattern of response although overall response rates were lower. No significant association was found between age group and completion of the diet diary.

Table 3.9

Response by SIMD for sub-samples

Response to completing the 24-hour recall and returning the 4 day diet diary showed a similar pattern of response to the whole sample. Those in the 1st quintile (least deprived) were more likely to respond than those in the 5th quintile (most deprived). However only the response to completing the diary was significantly related to SIMD. Over a half of those (56%) in the 1st quintile returned a completed diet diary compared to less than a third (31%) of those in the 5th quintile.

Table 3.10

3.2 Incentives

The survey incorporated an incentive experiment to examine the effect of two different levels of incentives on the response rate for those completing the FFQ and taking part in the face to face interview. This section presents the findings of this experiment.

Participants were split at random into two groups: one group received a £1 high street voucher while the other received a £5 voucher. The incentives were unconditional and were sent out with the letter and FFQ in advance of the interviewer calling to conduct the interview.

To control for interviewer effect, interviewers were not told how the incentives were being distributed among participants so they were not aware, in advance, of who received which value of incentive. Each interviewer had participants receiving different levels of incentive.

Overall, the higher level of incentive was associated with an increase in the response rate of 5-7 percentage points to each component of the main survey. The increase was statistically significant for all components of the survey.

Amongst boys, response rates of those receiving the higher incentive were 6-7 percentage points higher for all components of the survey compared to those receiving the lower level. These differences were all significant. Amongst girls the differences in response rates were significant only for those completing the FFQ alone and the combined interview and FFQ. Response rates for those completing the FFQ alone and FFQ plus interview were 7 and 8 percentage points higher respectively for girls receiving the higher level incentive than those receiving the lower level.

Examination of response rates by level of incentive and age group indicates that response rates were higher for the higher level of incentive for all components of the survey in all age groups. The differences in response were either statistically significant or of borderline significance.

Table 3.11, Table 3.12

3.3 References

1 http://www.gro-scotland.gov.uk/statistics/publications-and-data/population-estimates/mid-2005-population-estimates/index.html

Table 3.1 Response to survey for whole sample

		N	Response rate (as % all children selected by DWP)	Response rate (as % of all 'in scope*')
		N	%	%
Cases selected by DWP		2800	100	
Cases removed by DWP*	302			
Cases invited to take part		2498	89	
Opted out	146			
Cases to field		2352	84	
Late opt outs	65			
Out of scope**	253			
Cases achievable or 'in scope'		2245	80	100
Cases achieved :	Interviews	1700	61	76
	FFQs	1512	54	67
	Interview + FFQ	1491	53	66

* Cases removed by DWP include cases which the DWP consider 'sensitive' and children that have been sampled for research by the DWP in the last 3 years.

**Cases which were considered out of scope or unachievable included incorrect or ineligible addresses.

Table 3.2 Response by age and sex for whole sample (based on cases in scope)

	Age				
	3-7	8-11	12-16	All	*P-value**
	%	%	%	%	
Boys					
Interviews	78	79	71	76	***0.010***
FFQs	69	72	64	68	*0.051*
Interview + FFQ	69	71	62	67	***0.014***
Girls					
Interviews	77	82	71	76	***0.002***
FFQs	65	72	63	67	***0.039***
Interview + FFQ	64	71	63	66	*0.079*
Both boys & girls					
Interviews	77	80	71	76	***<0.001***
FFQs	67	72	64	67	***0.004***
Interview + FFQ	67	71	63	66	***0.003***
P-values**					
Interviews	*0.723*	*0.386*	*0.966*	*0.901*	
FFQs	*0.210*	*0.855*	*0.868*	*0.454*	
Interview + FFQ	*0.196*	*0.951*	*0.733*	*0.507*	
Bases (unweighted)					
Boys	*365*	*358*	*412*	*1135*	
Girls	*353*	*324*	*431*	*1108*	
Both boys & girls	*718*	*683*	*844*	*2245*	

*P-values for associations between age group and response

**P-values for differences between sexes in response

Table 3.3 Age distribution of responding sample compared with 2005 mid-year population estimates for Scotland by sex

	Responding sample			
Age	Interview	FFQ	Interview + FFQ	Mid year 2005 estimates*
	%	%	%	%
Boys				
3-7	33	33	33	33
8-11	33	33	33	29
12-16	34	34	34	39
All boys	**51**	**51**	**51**	**51**
Girls				
3-7	32	31	31	33
8-11	31	32	32	29
12-16	37	37	37	39
All girls	**49**	**49**	**49**	**49**
Bases (unweighted):				
Boys	*859*	*774*	*762*	*425*
Girls	*841*	*737*	*728*	*406*

* 2005 mid-year estimates for Scotland (Source: GRO Scotland).
Base shown in thousands.

Table 3.4 Response by Scottish Index of Multiple Deprivation quintile for whole sample (based on cases in scope)

	Scottish Index of Multiple Deprivation quintile					
	1st (Least deprived)	2nd	3rd	4th	5th (Most deprived)	*P-value**
	%	%	%	%	%	
Interviews	76	76	75	79	74	*0.518*
FFQs	71	70	69	70	58	***<0.001***
Interview + FFQ	71	69	67	69	58	***<0.001***
Bases (unweighted):	*474*	*423*	*420*	*413*	*515*	

*P-values for associations between SIMD and response

Table 3.5 Response to anthropometric measurements (height and weight)

Responding sample

	Age				
	3-7	8-11	12-16	All	*P-value**
	%	%	%	%	
Height					
Measurement taken	96	97	97	96	*0.770*
Weight					
Measurement taken	96	96	95	96	*0.501*
Bases (unweighted)	*553*	*548*	*599*	*1700*	

*P-values for associations between age group and response

Table 3.6 Response to anthropometric measurements, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile					
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**
	%	%	%	%	%	
Height						
Measurement taken	97	98	97	97	94	***0.030***
Weight						
Measurement taken	96	97	97	95	93	***0.026***
Base (unweighted)	*360*	*322*	*315*	*324*	*379*	

*P-values for associations between SIMD and response

Table 3.7 Agreement to complete 4 day diet diary and returns by age and sex

	Age			
	3-7	8-11	12-16	All
	N	N	N	N
Boys				
Agreement to complete diet diary	42	60	63	165
Refusals	2	-	-	2
Completed diaries returned	24	33	38	95
Return rate (%)	57%	55%	60%	58%
Girls				
Agreement to complete diet diary	54	42	48	144
Refusals	-	-	-	-
Completed diaries returned	30	29	32	91
Return rate (%)	55%	67%	67%	63%

Table 3.8 Number of 24-hour recalls completed by age and sex

	Age			
	3-7	8-11	12-16	All
	N	N	N	N
Boys				
Number of 24-hour recalls completed	83	57	77	217
Refusals	1	2	-	3
Girls				
Number of 24-hour recalls completed	59	73	75	207
Refusals	2	-	-	2

Table 3.9 Response by age and sex for sub samples (based on cases in scope)

	Age				
	3-7	8-11	12-16	All	*P-value**
	%	%	%	%	
Boys					
24-hour recall	76	76	66	72	*0.202*
4 day diet diary	42	48	49	47	*0.690*
Girls					
24-hour recall	72	86	71	76	***0.028***
4 day diet diary	43	55	45	47	*0.497*
Both boys & girls					
24-hour recall	74	81	68	74	***0.019***
4 day diet diary	43	51	47	47	*0.440*
P-values**					
24-hour recall	*0.503*	*0.139*	*0.407*	*0.269*	
4 day diet diary	*0.875*	*0.542*	*0.652*	*0.913*	
Bases (unweighted)					
Boys					
24-hour recall	*110*	*75*	*117*	*302*	
4 day diet diary	*57*	*69*	*78*	*204*	
Girls					
24-hour recall	*82*	*85*	*106*	*273*	
4 day diet diary	*69*	*53*	*71*	*193*	
Both boys & girls					
24-hour recall	*192*	*160*	*224*	*576*	
4 day diet diary	*126*	*122*	*149*	*397*	

*P-values for associations between age group and response
**P-values for differences between sexes in response

**

Table 3.10 Response by Scottish Index of Multiple Deprivation (sub samples, (based on cases in scope))

	Scottish Index of Multiple Deprivation quintile					
	1st	2nd	3rd	4th	5th	*P-value**
	(Least deprived)				(Most deprived)	
	%	%	%	%	%	
24-hour recall	73	74	76	78	70	*0.522*
4 day diet diary	56	50	48	53	31	***0.006***
Base (unweighted)						
24-hour recall	*103*	*104*	*93*	*88*	*188*	
4 day diet diary	*77*	*76*	*71*	*79*	*94*	

*P-values for associations between SIMD and response

Table 3.11 Response by sex and level of incentive

	Incentive		
	£1	£5	*P-value**
	%	%	
Boys			
Interviews	72	79	***0.015***
FFQ	65	71	***0.023***
Interviews + FFQ	64	70	***0.041***
Girls			
Interviews	74	78	*0.112*
FFQ	63	70	***0.016***
Interviews + FFQ	62	70	***0.014***
Both boys & girls			
Interviews	73	78	***0.004***
FFQ	64	71	***<0.001***
Interviews + FFQ	63	70	***<0.001***
Bases (unweighted)			
Boys	*573*	*562*	
Girls	*557*	*551*	
Both boys & girls	*1131*	*1114*	

*P-values for differences between level of incentive in response

Table 3.12 Response by age and level of incentive

	Incentive		
	£1	£5	*P-value**
	%	%	
3-7 years			
Interviews	75	80	*0.070*
FFQ	64	71	***0.027***
Interviews + FFQ	63	70	***0.022***
8-11 years			
Interviews	77	83	***0.037***
FFQ	69	75	***0.028***
Interviews + FFQ	68	74	***0.022***
12-16 years			
Interviews	68	74	*0.090*
FFQ	60	67	***0.021***
Interviews + FFQ	59	66	*0.056*
Bases (unweighted)			
3-7 years	*366*	*352*	
8-11 years	*351*	*332*	
12-16 years	*414*	*430*	

*P-values for differences between level of incentive in response

4 COMPARISON OF METHODS OF DIETARY ASSESSMENT

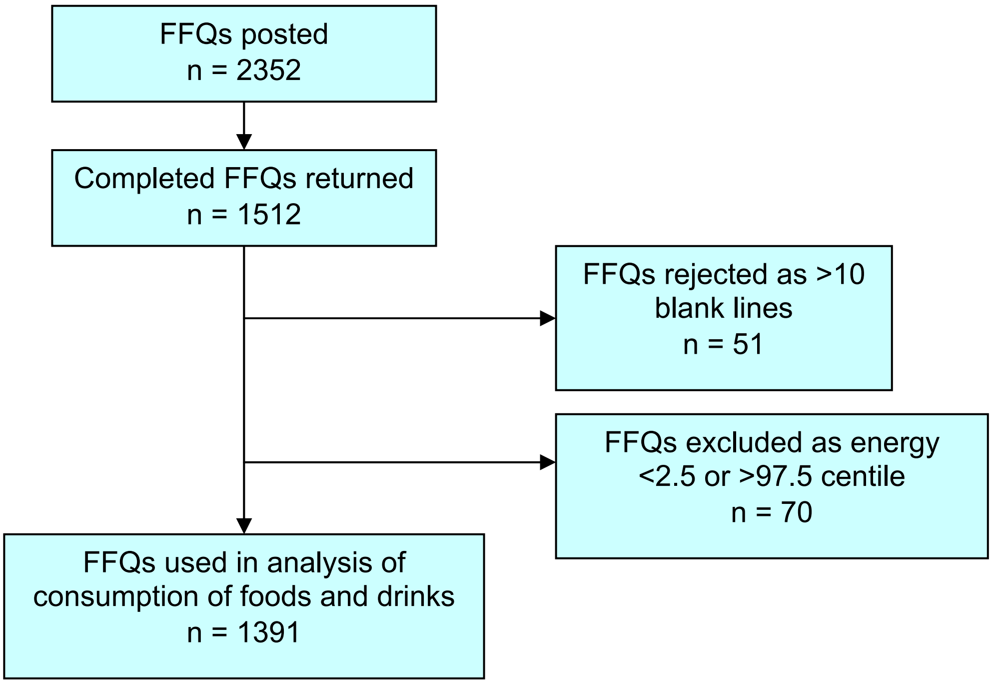
The methods used in the assessment of diet by FFQ, diet diary and 24-hour recall were described in Section 2.3 which also outlined the rationale for the choice of these methods. Completion of the different methods was discussed in Section 2.3. This chapter presents a comparison of the characteristics of the participants who completed the different dietary assessment methods and compares the nutrient intake for those participants who provided data by the FFQ and either the diet diary or the 24-hour recall.

4.1 Characteristics of participants who provided data by the different dietary assessment methods

A total of 1512 FFQs were returned. After exclusion of outliers and incomplete questionnaires, (see Section 2.4.2 for further details) 1,391 FFQs were available for analysis of nutrient intake (see Figure 4.1)

Figure 4.1

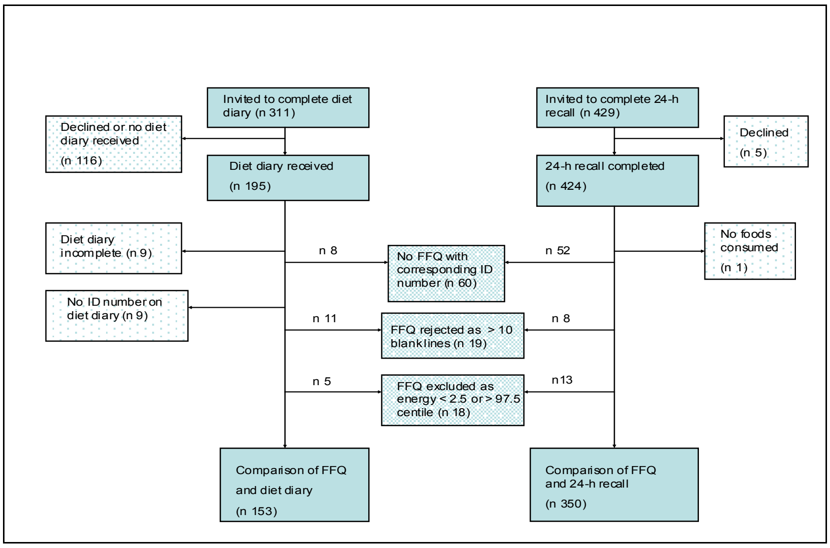
Figure 4.1 Number of FFQs used in the analysis of consumption of food and drinks



Details of the process by which the final samples for comparison of FFQ with diet diary or FFQ with 24-hour recall were derived are shown in Figure 4.2. (See Section 2.4.2 for further details). Comparison of nutrient intake as recorded by FFQ and diet diary was carried out for 153 participants while comparison of nutrient intake by FFQ and 24-hour recall was carried out for 350 participants.

Figure 4.2

Figure 4.2 Development of samples for comparison of FFQ with diet diary or 24-hour recall



The characteristics of the participants who completed the FFQ only, those who were included in the comparison of the FFQ and diet diary and those who were included in the comparison of the FFQ and 24-hour recall are shown in Table 4.1. The age and sex distribution was similar in all three groups.

Among the participants who completed the FFQ and diet diaries those in the most deprived quintile were under-represented but among the participants who completed the FFQ and 24-hour recall those in the most deprived quintile were over-represented.

Comparison with the age and sex distribution for the estimated mid year population for 2005 shows that the sample completing the various combinations of the survey components closely resembled the sex and age breakdown of the population as a whole. The youngest age group was slightly under represented for the FFQ only and the combined FFQ and diet diary but were very close to the population for the combined FFQ and 24-hour recall, whilst the middle age group were over represented and the oldest age group under represented.

Table 4.1

4.2 Comparison of nutrient intake by FFQ and diet diary

There is no established level of acceptable agreement between two dietary methods but perfect agreement is not expected when the time period covered differs between the methods, as the comparison will be affected by intra-individual variation in diet with time. For this survey an arbitrary value of 5% or less was used for good agreement between the methods while 20% or more was considered to show poor agreement.

Table 4.2 shows the energy and nutrient intakes for the 153 participants who completed the FFQ and diet diary. For participants overall, the energy intake was reported to be significantly higher using the FFQ than using the diet diary. The reported energy intake using the FFQ was also significantly higher than that reported using the diet diary for those aged 3-11 years but there was no significant difference in the energy intake by the two methods for those aged 12-17 years.

Table 4.2

For all participants the nutrient intakes expressed as a percentage of food energy were significantly higher as recorded by the FFQ than the diet diary for total sugars, intrinsic and milk sugars, sucrose and carbohydrate and significantly lower for protein. There was no significant difference in the percentage of food energy between the two methods for NMES, total fat and saturated fatty acids.

The pattern was very similar in those aged 3-11 years and those aged 12-17 years with no significant difference between the intake of NMES as a percentage of food energy between the FFQ and diet diary for either age group.

For all participants the absolute intakes of all macronutrients apart from protein and of iron and calcium were significantly higher as recorded by the FFQ than the diet diary with the median log percentage differences ranging from 7.5% for saturated fatty acids to 37.3% for intrinsic and milk sugars.

For those aged 3-11 years the absolute macronutrient intakes were significantly higher as recorded by the FFQ than the diet diary for all reported nutrients. In the 12-17 year olds the absolute nutrient intakes were significantly higher as recorded by the FFQ than the diet diary for total sugars, intrinsic and milk sugars, sucrose and non-starch polysaccharides but were not significantly different for NMES, total fat, saturated fatty acids, carbohydrate, protein, iron and calcium.

In all participants the absolute intakes of folate, vitamin C and retinol equivalents were 30.9%, 49.6% and 27.8% higher respectively as recorded by the FFQ than the diet diary (all $p<0.001$). This was consistent with the fact that the weight of vegetables and fruit consumed per day by consumers in the FFQ was more than 60% higher than the weight recorded per day in the diet diary. As a result, the intakes of folate, vitamin C and retinol equivalents from the FFQ were considered to be unreliable and are not presented in this report. Over-estimation of the amount of fruit and vegetables in the FFQ could explain the fact that the NSP intake recorded on the FFQ was 27.2% higher than in the diet diary (see Table 4.2).

Figure 4.3 and Figure 4.4 show 'Bland and Altman'[1] plots of the values for energy intake and NMES as a % of food energy, respectively for the 153 participants who completed the FFQ and diet diary. These plots illustrate the wide range of individual differences within 95% confidence limits with agreements for individual values being approximately ±6 MJ/d for energy intake and ±14% NMES as a percentage of food energy.

Figure 4.3, Figure 4.4

Figure 4.3 **Bland and Altman plot for energy intake by FFQ and diet diary**

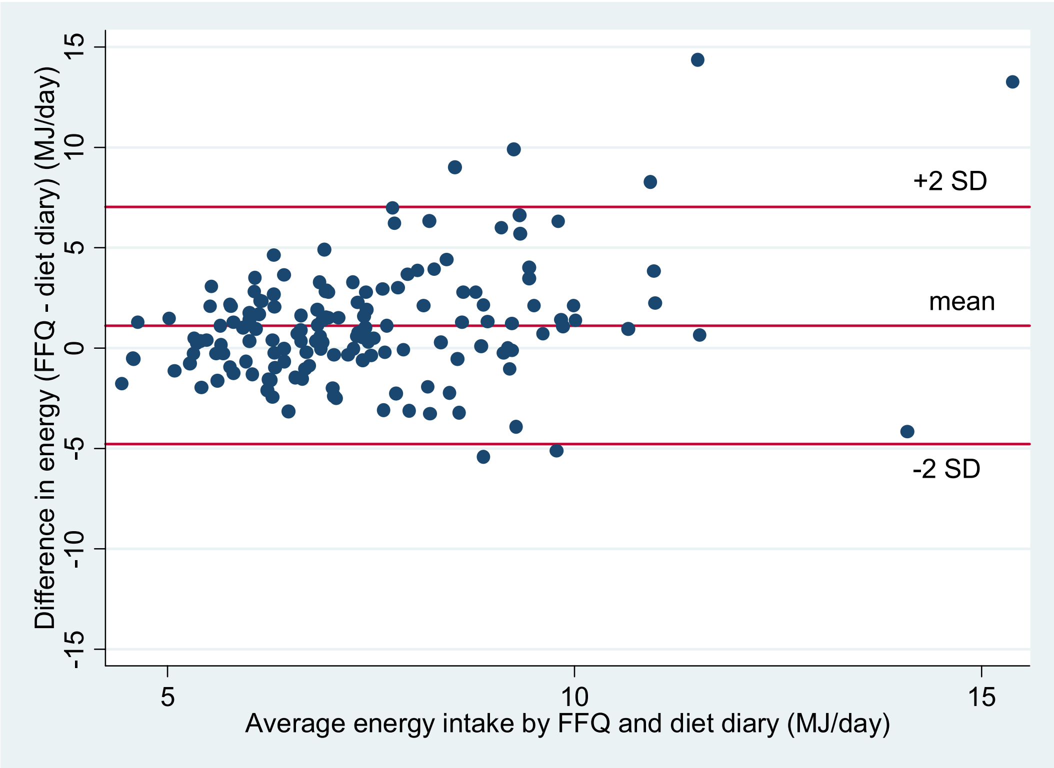
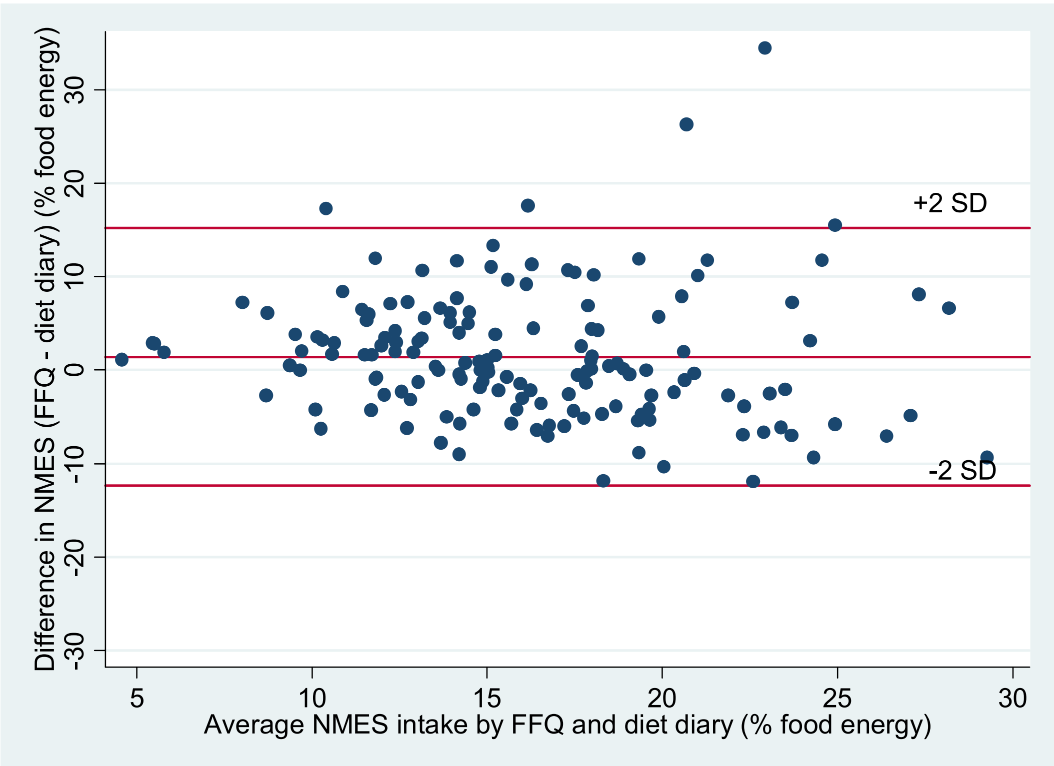


Figure 4.4 **Bland and Altman plot for NMES (% food energy) by FFQ and diet diary**



4.3 Comparison of nutrient intake by FFQ and 24-hour recall

The energy and nutrient intakes in the 350 participants who completed both the FFQ and 24-hour recall are shown in Table 4.3. Overall, the energy intake was significantly higher as recorded with the FFQ than with the 24-hour recall.

In those aged 3-11 years the energy intake was significantly higher as recorded with the FFQ than with the 24-hour recall. In contrast amongst the 12-17 year olds the energy intake was lower with the FFQ than the 24-hour recall though the difference was not statistically significant. The median log percentage difference in energy intake between the FFQ and 24-hour recall was 4.5% in boys and 7.8% in girls (table not shown).

Table 4.3

For all participants, the nutrient intake expressed as a percentage of food energy was significantly higher by the FFQ than the 24-hour recall for total sugars, NMES, intrinsic and milk sugars, sucrose and carbohydrate and significantly lower for protein. There were no significant differences for intake of total fat or saturated fatty acids as a percentage of food energy between the two methods.

In 3-11 year olds the intakes of total sugars, intrinsic and milk sugars and sucrose as a percentage of food energy were significantly higher by the FFQ than the 24-hour recall but the intake of protein was significantly lower. There was no significant difference between the two methods in the intake of NMES, total fat or saturated fatty acids as a percentage of food energy. In the 12-17 year olds the intakes of total sugars, NMES, intrinsic and milk sugars, sucrose and carbohydrate as a percentage of food energy were significantly higher by the FFQ than the 24-hour recall but the intake of total fat and protein were significantly lower. There was no significant difference in the intake of saturated fatty acids as a percentage of food energy between the two methods.

In all participants the absolute intake of all reported nutrients apart from total fat, protein and iron were significantly higher as recorded by the FFQ than the 24-hour recall with the median log percentage differences ranging from 9.6% for carbohydrate to 34.7% for intrinsic and milk sugars.

In those aged 3-11 years the absolute intakes of all reported nutrients were significantly higher as recorded by the FFQ than the 24-hour recall. Absolute nutrient intakes recorded by the FFQ were significantly higher for those aged 12-17 years than those recorded by the 24-hour recall for total sugars, NMES, intrinsic and milk sugars, sucrose and calcium and significantly lower for protein. The differences between the two methods were not statistically significant for total fat, saturated fatty acids, carbohydrate and iron.

4.4 Discussion

In the comparison of different methods of dietary assessment, perfect agreement is unlikely for a variety of reasons. The three methods used here present different challenges for the respondents which may each introduce error. The FFQ requires respondents to categorise foods and to estimate the frequency of consumption of a large list of foods. This may be difficult particularly for foods which are eaten infrequently. The diet diary is labour-intensive and may, as a result, encourage under-eating and/or under-recording of food eaten. The 24-hour recall is less time-consuming for the respondents but relies on the accuracy of recall of the variety and amount of foods consumed. In addition the three methods collect information for different time periods: the FFQ enquires about usual diet while the diet diary and 24-hour recall give more precise information on a smaller number of days. Since energy and nutrient intake varies from day to day within individuals, if the days selected for measurement are not representative of long-term dietary habits the short-term methods may not reflect habitual diet.

One possible explanation for the difference in energy and absolute nutrient intakes between the FFQ and diet diary is under-reporting of energy intake in diet diaries. This is well-documented in adults and has also been reported in children.[2] This is supported by the fact that the median log percentage difference for energy intake between the FFQ and 24-hour recall was less than that for the FFQ and diet diaries. However, over-estimation when using FFQs is also common, particularly in those FFQs with longer food lists[3], which could also have contributed to the differences observed between the methods. The overestimation of energy and absolute nutrient intakes by the FFQ relative to both the diet diary and the 24-hour recall was seen more clearly in the 3-11 year olds than in the 12-17 year olds, which suggests a difference in reporting behaviour for the FFQ between parents or guardians and young people.

In the present study, the agreement between the FFQ and diet diaries for all participants was better for nutrient intakes expressed as a percentage of food energy than for absolute nutrient intakes for all the nutrients reported. As the median log percentage differences between the intake of NMES, total fat, saturated fatty acids and carbohydrate expressed as a percentage of food energy by the FFQ and diet diaries were under 5% in all participants it was concluded that the FFQ provided reasonable estimates of these variables. For other reported nutrients, particularly those in which the median log % difference between the FFQ and diet diaries and between the FFQ and 24-hour recall was 20% or more, such as intrinsic and milk sugars, intakes from the FFQ used in this survey should not be compared with data from other surveys using different methods.

4.5 References

1 Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. Lancet 1986;1:307-10.

2 Lillegaard IT, Andersen LF. Validation of a pre-coded food diary with energy expenditure, comparison of under-reporters v. acceptable reporters. Br J Nutr 2005; 94: 998-1003.

3 Krebs-Smith SM, Heimendinger J, Subar AF, Patterson BH, Pivonka E. Using FFQs to estimate fruit and vegetable intake: association between the number of questions and total intake. J Nutr Educ 1995;27:80-5.

Table 4.1 Characteristics of participants who completed either an FFQ only, both a diet diary and FFQ, or both a 24h recall and FFQ

	FFQ only	Diet diary & FFQ	24h recall & FFQ	Total	Mid year 2005 estimates*
	% (N)	% (N)	% (N)	% (N)	
Age					
3-7	31 (275)	31 (47)	33 (115)	31 (437)	33
8-11	32 (284)	32 (49)	30 (106)	32 (439)	29
12-17	37 (329)	37 (57)	37 (129)	37 (515)	39
		Pearson chi-square (4df)=0.56, p=0.968			
Sex					
Boys	52 (459)	52 (80)	51 (180)	52 (719)	51
Girls	48 (429)	48 (80)	49 (170)	48 (672)	49
		Pearson chi-square (2df)=0.03, p=0.984			
Base (unweighted)	*888*	*153*	*350*	*1391*	*832*
Scottish Index of Multiple Deprivation quintile					
1st (least deprived)	24 (210)	25 (38)	19 (67)	23 (315)	
2nd	20 (174)	21 (32)	21 (72)	20 (278)	
3rd	20 (171)	18 (28)	17 (60)	19 (259)	
4th	20 (176)	22 (34)	17 (58)	20 (268)	
5th (most deprived)	16 (139)	14 (21)	27 (93)	18 (253)	
		*Pearson chi-square (8df)=23.55, p=**0.003***			
Base (unweighted)	*870*	*153*	*350*	*1373*	

* 2005 mid-year estimates for Scotland (Source: GRO Scotland)
Base shown in thousands

Table 4.2 **Median daily nutrient intake from FFQ and diet diary in participants who completed both methods, by age**

	Age											
	3-11				12-17				All			
	FFQ	Diet diary	P-value for difference*	Median log % difference†	FFQ	Diet diary	P-value for difference*	Median log % difference†	FFQ	Diet diary	P-value for difference*	Median log % difference†
Energy (MJ)	7.30	6.22	***<0.001***	14.6	7.64	7.28	*0.315*	5.6	7.35	6.48	***<0.001***	10.5
Energy (kcal)	1733	1477	***<0.001***	14.7	1814	1727	*0.293*	5.5	1749	1532	***<0.001***	10.7
% of food energy												
Total sugars	28.7	25.0	***<0.001***	14.6	29.5	24.0	***<0.001***	13.6	28.9	24.8	***<0.001***	14.2
Non-milk extrinsic sugars	15.0	14.4	*0.121*	7.7	17.6	15.8	*0.296*	-0.03	16.0	14.9	*0.056*	4.0
Intrinsic & milk sugars	12.4	10.5	***<0.001***	22.8	9.7	7.1	***<0.001***	28.1	11.9	9.3	***<0.001***	24.4
Sucrose	13.1	10.8	***<0.001***	24.3	13.4	11.3	***<0.001***	22.1	13.3	11.1	***<0.001***	24.1
Total fat	32.4	34.0	***0.010***	-4.4	34.0	33.1	*0.607*	0.8	32.7	33.5	*0.141*	-1.0
Saturated fatty acids	13.4	14.3	***0.009***	-4.5	14.5	13.9	*0.199*	3.7	13.9	14.2	*0.243*	-1.5
Carbohydrate	53.8	50.8	***<0.001***	5.3	52.4	51.1	*0.248*	1.5	53.2	51.0	***<0.001***	3.2
Protein	13.7	15.1	***<0.001***	-10.8	12.9	14.5	***<0.001***	-8.0	13.3	14.8	***<0.001***	-10.2
Grams												
Total sugars	134	97	***<0.001***	29.4	141	112	***0.013***	16.6	134	98	***<0.001***	26.2
Non-milk extrinsic sugars	73	55	***<0.001***	19.7	86	68	*0.171*	7.0	77	57	***<0.001***	16.5
Intrinsic & milk sugars	57	40	***<0.001***	41.3	51	35	***<0.001***	27.4	55	39	***<0.001***	37.3
Sucrose	57	41	***<0.001***	33.2	65	52	***0.007***	20.8	61	44	***<0.001***	30.0
Total fat	62.9	55.4	***<0.001***	14.6	70.7	68.1	*0.132*	7.2	65.9	59.6	***<0.001***	11.0
Saturated fatty acids	26.1	24.0	***<0.001***	13.3	30.3	29.2	*0.178*	0.8	27.4	26.4	***<0.001***	7.5
Carbohydrate	244	194	***<0.001***	18.1	252	232	*0.202*	2.5	244	209	***<0.001***	14.7
Non-starch polysaccharide	13.2	9.5	***<0.001***	31.8	12.5	10.5	***0.004***	13.0	13.0	9.7	***<0.001***	27.2
Protein	58.7	56.6	***0.040***	5.2	60.0	62.6	*0.323*	-7.9	59.3	58.6	*0.372*	0.8
Milligrams												
Iron	9.5	7.7	***<0.001***	18.2	9.1	9.5	*0.748*	-4.3	9.2	8.2	***<0.001***	11.6
Calcium	999	837	***<0.001***	20.4	1054	919	*0.154*	4.9	1022	870	***<0.001***	13.8
Base (unweighted)		*96*				*57*				*153*		

*Wilcoxon signed-rank test, except for total sugars (% food energy), total fat (% food energy) and carbohydrate (% food energy) for which a paired t-test was used

†Log percent difference = [ln(FFQ) - ln(diet diary)] x 100

Table 4.3 Median daily nutrient intake from FFQ and 24h recall in participants who completed both methods, by age

	Age											
	3-11				12-17				All			
	FFQ	24h recall	P-value for difference*	Median log % difference[†]	FFQ	24h recall	P-value for difference*	Median log % difference[†]	FFQ	24h recall	P-value for difference*	Median log % difference[†]
Energy (MJ)	7.60	6.77	***<0.001***	14.1	7.71	7.96	*0.428*	-6.0	7.67	7.19	***0.002***	5.5
Energy (kcal)	1807	1606	***<0.001***	14.0	1832	1895	*0.432*	-5.9	1819	1709	***0.002***	5.6
% of food energy												
Total sugars	29.3	26.4	***<0.001***	9.9	30.0	24.0	***<0.001***	22.3	29.5	25.9	***<0.001***	14.7
Non-milk extrinsic sugars	16.7	16.4	*0.079*	4.5	20.1	17.2	***0.009***	15.6	17.4	16.6	***0.002***	8.8
Intrinsic & milk sugars	11.3	8.6	***<0.001***	20.4	9.5	5.2	***<0.001***	47.6	10.6	7.6	***<0.001***	29.3
Sucrose	13.0	11.0	***<0.001***	13.3	14.9	10.5	***<0.001***	31.3	13.5	10.8	***<0.001***	25.3
Total fat	33.0	33.2	*0.400*	0.1	33.0	34.2	***0.047***	-5.3	33.0	33.9	*0.060*	-1.7
Saturated fatty acids	14.0	14.1	*0.856*	3.2	13.7	13.7	*0.498*	1.6	13.9	14.0	*0.831*	2.5
Carbohydrate	53.3	52.8	*0.077*	3.1	54.2	52.3	***0.005***	3.2	53.7	52.5	***0.002***	3.2
Protein	13.4	13.6	***0.011***	-2.7	12.2	13.0	***<0.001***	-8.4	13.0	13.5	***<0.001***	-4.2
Grams												
Total sugars	136	112	***<0.001***	26.1	138	118	***<0.001***	15.6	137	113	***<0.001***	22.4
Non-milk extrinsic sugars	80	68	***<0.001***	21.0	91	83	***0.041***	13.6	83	72	***<0.001***	16.4
Intrinsic & milk sugars	56	37	***<0.001***	34.2	44	28	***<0.001***	34.7	52	34	***<0.001***	34.7
Sucrose	62	46	***<0.001***	37.1	68	53	***<0.001***	23.7	63	50	***<0.001***	33.1
Total fat	67.9	61.0	***0.002***	13.8	69.1	75.3	*0.160*	-10.6	68.5	65.8	*0.168*	6.9
Saturated fatty acids	29.7	25.5	***<0.001***	15.0	29.4	30.5	*0.865*	1.2	29.6	26.8	***0.015***	11.0
Carbohydrate	254	227	***<0.001***	16.3	258	263	*0.616*	-1.9	257	233	***<0.001***	9.6
Non-starch polysaccharide	13.0	10.1	***<0.001***	22.9	12.2	10.6	*0.192*	10.2	12.6	10.3	***<0.001***	17.9
Protein	59.6	56.6	***0.003***	9.4	56.6	63.7	***0.015***	-16.4	59.2	58.1	*0.585*	0.6
Milligrams												
Iron	9.5	8.6	***0.003***	9.3	8.6	9.3	*0.322*	-4.3	9.2	8.7	*0.090*	6.7
Calcium	1036	868	***<0.001***	20.2	884	750	***0.011***	20.9	1003	826	***<0.001***	20.3
Base (unweighted)	*221*				*129*				*350*			

* Wilcoxon signed-rank test, except for total sugars (% food energy) for which a paired t-test was used
[†] Log percent difference = [ln (FFQ)-ln(24-hour recall)] x100

5 INTAKE OF FOOD GROUPS AND SUPPLEMENTS

This chapter and the subsequent two chapters present data on food consumption, nutrient and energy intake and nutritional status based on information collected in the FFQs.

This chapter describes the consumption of foods and drinks for the 1,391 children for whom a valid FFQ was obtained (see Section 4.1) and the variation in consumption by age, sex, deprivation and urban/rural classification. The groupings of foods and drinks from the FFQ were based on that used in the Low Income Diet and Nutrition Survey[1] with some minor modifications required to allow for the grouping of foods in the FFQ. A full list of the food and drink groups as used for the FFQ is provided in Appendix A. The use of supplements is also described for all the 1512 children who returned an FFQ.

Notes on tables:

1. 'Consumers' are defined as children who reported consuming one or more items from the food and drink groups listed on the FFQ at least once a month. The amounts consumed are calculated as the average daily amount for consumers only. The average amount for all children (including non-consumers) can be estimated as [(amount consumed by consumers) x 100] / (percentage of consumers).

2. The actual values for the amounts of foods and drinks consumed are presented in this chapter to allow comparisons between subgroups, but must be interpreted in the light of possible over- or under-estimation by the FFQ, as discussed in Section 4.4. For this reason, the reported amounts of foods and drinks presented here should not be compared with those derived from other studies, or with food-based dietary recommendations such as the Scottish Dietary Targets for fruit and vegetables, bread, breakfast cereals, rice, pasta and fish (see Table 1.1).

3. Due to the transformations which were carried out for skewed data, the sum of the mean percentage contributions from all food groups to nutrient intake does not equal 100%. The percentage contribution of all food groups to energy, sugar and fat intake are presented as both transformed and untransformed data in appendix H.

5.1 Consumption of foods and drinks

Over 95% of children reported consuming the following foods at least once a month: pasta, rice and pizza; bread excluding wholemeal; biscuits, cakes and pastries; milk and cream; yoghurt and fromage frais; meat and meat dishes; processed meat; vegetables; chips; crisps and savoury snacks; fruit; confectionery and soups and sauces. 59% of children reported consuming wholemeal bread and 39% reported consuming oily fish and dishes at least once a month.

Table 5.1

5.1.1 Consumption of foods and drinks by age

The influence of age on the proportion of children consuming specific groups of food or drinks was significant for wholemeal bread, unsweetened breakfast cereals, yoghurt and fromage frais, ice-cream, fats and oils and white fish, shellfish and fish dishes. Younger children were more likely to consume these foods than older children. Chips and fried potatoes, other potatoes, nuts and seeds, non-diet soft drinks and powdered beverages were more likely to be consumed by older children than younger children.

Tables 5.1, 5.1a

The influence of age on the amounts of foods and drinks consumed was significant for many food or drink groups. Children in the youngest age group, 3-7 year olds, reported consuming more wholemeal bread, unsweetened breakfast cereals, milk and cream, cheese; yoghurt and fromage frais, fats and oils and fruit than older children. Consumption of crisps and savoury snacks was higher amongst the 8-11 year olds than either younger or older children. Those in the oldest age group, 12-17 year olds, consumed more confectionery, non-diet soft drinks and tea, coffee and water than younger children.

Tables 5.1, 5.1b

5.1.2 Consumption of foods and drinks by sex

Differences between the sexes in the proportions of children consuming specific groups of foods or drinks was generally small. When the differences between sexes was statistically significant the proportion of girls consuming the food or drink was higher than the proportion of boys. The exception to this was sweetened cereals. The proportion of 12-17 year old boys consuming the food was significantly higher than the proportion of girls of the same age (71% vs. 58%).

Tables 5.1, 5.1c

The amounts of foods and drinks consumed by the consumers, , expressed as grams per day (g/d), were significantly higher in boys than girls for many food groups but particularly for unsweetened breakfast cereals, milk and cream and processed meat. However the consumption of vegetables and fruit was significantly higher in girls than boys (55 vs. 49 g/d and 141 vs.125 g/d respectively).

Tables 5.1, 5.1d

5.1.3 Consumption of foods and drinks by Scottish Index of Multiple Deprivation

There were significant associations between SIMD quintile and the proportion of children who consumed several groups of food or drink. The proportion consuming wholemeal bread, cheese, oily fish and fish dishes and fruit juice was lower among those living in more deprived areas. The proportion consuming diet soft drinks was higher among those living in more deprived areas.

There were more significant associations between SIMD quintile and the amounts of different foods and drink groups consumed by the consumers. The average daily amounts of pasta, rice and pizza, vegetables, fruit and fruit juice consumed were lower among those living in more deprived areas. The amounts of ice-cream, eggs, processed meat, chips, crisps, confectionery, non-diet and diet soft drinks were higher among those living in more deprived areas.

Table 5.2

5.1.4 Consumption of foods and drink by urban/rural classification

The only significant association between urban/rural classification and the proportion of children consuming specific food groups was for the consumption of oily fish and dishes. A higher proportion of those living in remote small towns and remote rural areas reported they consumed oily fish and dishes than those living in other areas, though data for those living in remote rural areas should be interpreted with care because of small bases.

There was a significant association between urban/rural classification and the intake of bread excluding wholemeal, milk and cream, vegetables, and crisps and savoury snacks among consumers. The intake of milk and cream and vegetables was highest among those living in remote small towns and remote rural areas whilst intake of bread excluding wholemeal and crisps and savoury snacks was lowest among those living in remote rural areas. As above, care must be used in interpreting these findings due to the small bases.

Table 5.3

5.2 Consumption of alcoholic drinks

Information on the consumption of alcoholic drinks was only available for children aged 12-17 years who completed the C3 FFQ as the C2 FFQ for children aged 11 and under did not include alcoholic drinks.

16% of those children who completed the C3 FFQ reported consuming alcoholic drinks at least once a month.

Table 5.4

5.2.1 Consumption of alcoholic drinks by sex

Girls were significantly more likely to report consuming alcohol than boys (20% vs. 12%). However, reported mean intake of alcoholic drinks was higher amongst boys than girls (45 g/d vs.27 g/d) although a statistical test for the difference was not carried out due to the small bases..

Table 5.4

5.2.2 Consumption of alcoholic drinks by Scottish Index of Multiple Deprivation and urban/rural classification

There was no significant association between SIMD quintile and the proportion of children who reported consuming alcohol. The reported amount of alcohol consumed among consumers was highest in the most deprived (5^{th}) quintile (61 grams/day) although some bases were small.

The proportion of children who reported consuming alcohol was highest in the remote rural areas (33%), however the bases were small for accessible and remote small towns and remote rural areas, therefore caution must be exercised when interpreting this data and the reported mean intakes.

Table 5.5, Table 5.6

5.3 Use of supplements

In this section all 1512 FFQs returned (including 51 rejected as having more than 10 blank lines and 70 with very high or very low energy intake: see Figure 4.1) were used in the analysis of the use of supplements since neither of these factors were thought likely to affect reporting of supplement use.

Almost a quarter (23%) of those children for whom an FFQ was returned reported taking one or more supplements. Multivitamins and cod-liver oil were the most common types of supplements taken and were taken by 12% and 9% of children respectively.

Table 5.7

5.3.1 Use of supplements by age and sex

There was a significant influence of age on the proportion of children who were reported to be taking supplements. Those aged 3-7 years were the most likely to be taking ‘any supplement’ (29%), cod-liver oil and other fish based supplement (12%) or multivitamins (18%). Those aged 12-17 years were least likely to report taking any supplements apart from mulitivitamins and minerals.

Boys were significantly more likely than girls to report taking ‘any supplement’ (26% vs.20%) or cod-liver and other fish based oil (11% vs.7%).

Tables 5.7, 5.7a, 5.7b

5.3.2 Use of supplements by Scottish Index of Multiple Deprivation

There was a significant association between SIMD quintile and the proportions of children taking supplements. Those in more deprived areas were less likely to report taking ‘any supplement’ than those in less deprived areas. The proportion of children who reported taking vitamins with minerals was also significantly different between the SIMD quintiles. Those in both the least and the most deprived quintiles were less likely to report taking this type of supplement than those in the other quintiles.

Table 5.8

5.3.3 Use of supplements by urban/rural classification

There was no significant relationship between urban/rural classification and the likelihood of taking ‘any supplement’ but there was a significant relationship between urban/rural classification and the likelihood of taking vitamins with minerals. Those living in remote rural areas were more likely to report taking these supplements than those in other areas, particularly the large urban areas.

Table 5.9

5.4 Reference

1 Nelson M, Erens B, Bates B, Church S, Boshier T (eds). Low Income diet and nutrition survey. London, TSO (The Stationery Office), 2007.

Table 5.1 Consumption of foods and drinks by sex and age

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Pasta, rice, pizza & other cereals												
Consumers (%)*	99	98	100	99	99	99	100	99	99	99	100	99
Mean intake in consumers (g/d)	47	45	50	48	45	49	48	48	46	47	49	48
Lower 95% confidence limit	43	42	45	45	42	45	44	45	43	44	46	46
Upper 95% confidence limit	51	49	55	50	49	54	52	50	49	50	52	49
Bread excluding wholemeal												
Consumers (%)*	98	98	99	98	99	99	99	99	99	98	99	99
Mean intake in consumers (g/d)	51	58	56	55	50	49	46	48	50	54	51	52
Lower 95% confidence limit	46	52	51	52	45	44	43	45	47	49	48	49
Upper 95% confidence limit	56	64	62	58	55	55	51	51	54	58	54	54
Wholemeal bread												
Consumers (%)*	66	50	56	57	64	57	58	60	65	54	57	59
Mean intake in consumers (g/d)	13	11	9	11	12	9	8	9	13	10	8	10
Lower 95% confidence limit	11	9	7	10	9	7	6	8	11	8	7	9
Upper 95% confidence limit	16	15	11	13	15	11	10	11	15	12	10	11
Unsweetened breakfast cereals including muesli												
Consumers (%)*	90	85	83	86	94	90	81	87	92	87	82	87
Mean intake in consumers (g/d)	20	16	16	17	16	14	12	14	18	15	14	16
Lower 95% confidence limit	18	14	13	16	14	12	10	12	16	13	12	14
Upper 95% confidence limit	23	19	19	19	18	16	14	15	20	17	16	17
Sweetened breakfast cereals												
Consumers (%)*	61	74	71	69	69	68	58	64	65	71	65	67
Mean intake in consumers (g/d)	7	8	7	7	6	7	5	6	6	7	6	7
Lower 95% confidence limit	6	7	6	7	5	6	4	5	6	7	5	6
Upper 95% confidence limit	8	9	9	8	7	8	7	7	7	8	7	7
Biscuits, cakes & pastries												
Consumers (%)*	99	99	100	99	100	98	99	99	99	99	99	99
Mean intake in consumers (g/d)	35	38	41	38	33	35	32	33	34	36	36	36
Lower 95% confidence limit	32	34	36	36	30	31	28	31	32	33	33	34
Upper 95% confidence limit	39	42	46	41	36	39	35	35	36	40	40	37
Puddings												
Consumers (%)*	82	87	82	84	82	88	83	84	82	88	83	84
Mean intake in consumers (g/d)	11	9	9	10	10	10	8	9	10	9	8	9
Lower 95% confidence limit	10	7	8	9	8	8	7	8	9	8	8	9
Upper 95% confidence limit	13	10	11	11	11	11	9	9	12	10	9	10
Milk & cream												
Consumers (%)*	96	97	96	96	99	99	98	99	97	98	97	97
Mean intake in consumers (g/d)	309	255	267	276	262	213	179	212	286	234	220	243
Lower 95% confidence limit	284	232	237	260	233	192	159	199	267	218	202	232
Upper 95% confidence limit	337	279	299	294	293	236	200	226	306	251	238	255
Cheese												
Consumers (%)*	92	84	83	86	89	94	90	91	91	89	87	89
Mean intake in consumers (g/d)	13	11	9	11	12	10	8	9	12	11	8	10
Lower 95% confidence limit	11	10	8	10	10	9	7	9	11	10	7	10
Upper 95% confidence limit	14	14	11	12	14	12	9	10	14	12	9	11
Yoghurt & fromage frais												
Consumers (%)*	98	97	91	95	98	97	95	97	98	97	93	96
Mean intake in consumers (g/d)	102	89	60	81	95	84	52	72	98	86	56	76
Lower 95% confidence limit	89	80	51	74	85	74	46	67	91	80	50	72
Upper 95% confidence limit	115	99	70	88	105	95	59	78	107	93	62	81

Table 5.1 continued **Consumption of foods and drinks, by sex and age**

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Ice cream												
Consumers (%)*	90	92	89	90	94	91	84	89	92	92	87	90
Mean intake in consumers (g/d)	12	12	15	13	12	13	13	13	12	12	14	13
Lower 95% confidence limit	10	10	13	12	11	11	11	12	11	11	13	12
Upper 95% confidence limit	14	13	17	14	14	15	15	14	13	14	15	14
Eggs & egg dishes												
Consumers (%)*	74	73	80	76	76	77	78	77	75	75	79	77
Mean intake in consumers (g/d)	11	10	10	10	10	10	8	9	10	10	9	10
Lower 95% confidence limit	9	8	9	9	9	8	7	8	9	9	8	9
Upper 95% confidence limit	12	12	12	11	12	11	9	10	12	11	10	10
Fats & oils												
Consumers (%)*	92	88	85	89	95	91	91	92	93	90	88	90
Mean intake in consumers (g/d)	5	5	5	5	6	5	4	5	6	5	4	5
Lower 95% confidence limit	5	5	4	5	5	4	4	5	5	5	4	5
Upper 95% confidence limit	6	6	5	5	7	5	5	5	6	5	5	5
Meats & meat dishes, excluding processed meat												
Consumers (%)*	94	95	96	95	99	96	97	97	96	95	97	96
Mean intake in consumers (g/d)	28	30	31	30	27	29	26	27	28	30	28	29
Lower 95% confidence limit	25	28	29	28	25	26	24	25	26	28	27	27
Upper 95% confidence limit	30	33	34	32	30	32	28	29	30	32	30	30
Processed meat including sausages, burgers, coated chicken												
Consumers (%)*	97	98	96	97	98	96	96	96	97	97	96	97
Mean intake in consumers (g/d)	28	27	29	28	27	23	22	24	28	25	26	26
Lower 95% confidence limit	25	24	26	26	24	21	20	23	25	23	24	25
Upper 95% confidence limit	31	30	32	30	31	26	25	26	30	27	28	28
White fish, shellfish & fish dishes												
Consumers (%)*	92	85	86	88	98	90	83	89	95	88	84	89
Mean intake in consumers (g/d)	13	12	11	12	13	12	11	12	13	12	11	12
Lower 95% confidence limit	12	11	10	12	11	11	10	11	12	11	11	12
Upper 95% confidence limit	15	14	13	13	15	13	13	13	14	13	12	13
Oily fish & dishes												
Consumers (%)*	42	34	39	38	39	39	42	40	40	36	40	39
Mean intake in consumers (g/d)	5	5	6	5	5	5	6	5	5	5	6	5
Lower 95% confidence limit	4	4	5	5	4	4	5	5	5	4	5	5
Upper 95% confidence limit	6	6	7	6	6	6	7	6	6	5	7	6
Vegetables excluding potatoes & baked beans												
Consumers (%)*	94	94	95	94	98	97	99	98	96	95	97	96
Mean intake in consumers (g/d)	57	44	47	49	56	55	56	55	56	49	51	52
Lower 95% confidence limit	50	37	40	45	49	48	49	51	51	44	46	49
Upper 95% confidence limit	65	52	55	54	63	62	63	60	62	55	57	56
Baked beans												
Consumers (%)*	75	70	78	75	74	70	72	72	74	70	75	73
Mean intake in consumers (g/d)	8	7	7	7	8	7	6	7	8	7	6	7
Lower 95% confidence limit	7	6	6	7	7	6	5	6	7	7	6	7
Upper 95% confidence limit	9	8	7	8	9	8	7	8	9	8	7	7

Table 5.1 continued Consumption of foods and drinks, by sex and age

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Chips, fried & roast potatoes & potato products												
Consumers (%)*	93	98	98	96	95	99	98	97	94	99	98	97
Mean intake in consumers (g/d)	20	23	25	23	22	22	22	22	21	22	24	22
Lower 95% confidence limit	18	21	22	21	19	19	20	20	19	21	22	21
Upper 95% confidence limit	23	25	28	24	24	25	25	24	23	24	26	24
Other potatoes, potato salads & dishes												
Consumers (%)*	88	91	93	91	90	97	95	94	89	94	94	92
Mean intake in consumers (g/d)	24	24	22	23	20	22	20	21	22	23	21	22
Lower 95% confidence limit	23	20	20	22	18	20	18	20	21	21	20	21
Upper 95% confidence limit	27	27	25	25	23	24	22	22	24	25	23	23
Crisps & savoury snacks												
Consumers (%)*	96	97	96	96	99	99	96	98	97	98	96	97
Mean intake in consumers (g/d)	18	24	20	20	20	24	21	21	19	24	20	21
Lower 95% confidence limit	16	21	17	19	17	21	18	19	17	22	18	19
Upper 95% confidence limit	20	28	23	22	22	27	24	23	20	26	23	22
Fruits, excluding fruit juice												
Consumers (%)*	97	98	96	97	100	100	97	99	98	99	97	98
Mean intake in consumers (g/d)	156	125	102	125	175	152	113	141	165	137	107	132
Lower 95% confidence limit	140	109	89	115	158	134	98	131	153	125	96	125
Upper 95% confidence limit	174	143	116	134	193	171	130	152	178	151	119	140
Nuts & seeds												
Consumers (%)*	26	29	46	34	23	43	46	38	24	35	46	36
Mean intake in consumers (g/d)	2	2	3	2	[2]	2	2	2	2	2	2	2
Lower 95% confidence limit	2	2	2	2	[2]	2	2	2	2	2	2	2
Upper 95% confidence limit	3	3	3	3	[3]	2	2	2	3	2	3	2
Table sugar & preserves												
Consumers (%)*	82	81	84	82	77	84	85	82	80	82	84	82
Mean intake in consumers (g/d)	3	3	3	3	3	2	2	2	3	3	2	3
Lower 95% confidence limit	3	3	2	3	2	2	2	2	2	2	2	2
Upper 95% confidence limit	4	4	3	3	3	3	2	2	3	3	3	3
Confectionery												
Consumers (%)*	98	99	97	98	100	97	99	98	99	98	98	98
Mean intake in consumers (g/d)	18	19	30	22	19	20	28	22	18	19	29	22
Lower 95% confidence limit	16	17	27	21	16	18	24	21	17	18	27	21
Upper 95% confidence limit	20	22	34	24	22	22	31	24	20	21	32	24
Fruit juice including smoothies												
Consumers (%)*	83	87	86	85	88	94	92	91	85	90	89	88
Mean intake in consumers (g/d)	68	59	73	67	56	61	58	58	62	60	65	63
Lower 95% confidence limit	57	48	60	59	48	52	49	53	56	52	57	57
Upper 95% confidence limit	80	71	89	76	64	72	68	64	68	69	75	68
Soft drinks, not diet												
Consumers (%)*	85	92	94	91	89	91	92	91	87	91	93	91
Mean intake in consumers (g/d)	123	156	221	168	119	153	186	154	122	155	203	161
Lower 95% confidence limit	104	132	182	148	95	133	151	134	105	138	175	145
Upper 95% confidence limit	146	185	267	190	149	176	228	178	140	174	235	179
Soft drinks, diet												
Consumers (%)*	88	87	85	86	86	93	87	88	87	90	86	87
Mean intake in consumers (g/d)	235	277	240	248	242	192	205	211	238	232	222	230
Lower 95% confidence limit	198	236	202	225	204	164	173	192	211	208	196	214
Upper 95% confidence limit	278	324	285	274	285	223	240	232	268	258	251	247

Table 5.1 continued **Consumption of foods and drinks, by sex and age**

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Tea, coffee & water												
Consumers (%)*	81	86	88	85	91	88	90	90	86	87	89	87
Mean intake in consumers (g/d)	199	229	248	227	207	240	251	234	203	235	250	230
Lower 95% confidence limit	164	198	209	203	182	214	213	211	180	215	219	212
Upper 95% confidence limit	240	265	293	254	234	269	295	259	228	256	284	250
Powdered beverages†												
Consumers (%)*	33	50	45	42	36	56	46	46	34	53	45	44
Mean intake in consumers (g/d)	4	3	3	3	4	3	3	3	4	3	3	3
Lower 95% confidence limit	3	2	2	3	2	2	2	3	3	2	2	3
Upper 95% confidence limit	5	4	4	4	7	3	5	4	5	3	4	4
Soups & sauces												
Consumers (%)*	96	98	99	98	99	100	100	99	98	99	99	99
Mean intake in consumers (g/d)	42	41	42	42	47	43	44	45	44	42	43	43
Lower 95% confidence limit	37	37	38	40	43	40	40	43	41	40	40	42
Upper 95% confidence limit	47	45	46	44	52	47	48	47	48	45	45	45
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

*% who consume at least once a month

†Variable not normally distributed

Table 5.1a P-values for associations between age group and the proportion of children consuming foods and drinks, by sex

	Sex		
	Boys	Girls	Boys & girls
Pasta, rice, pizza & other cereals	0.145	0.679	0.146
Bread excluding wholemeal	0.754	0.889	0.746
Wholemeal bread	**0.003**	0.308	**0.002**
Unsweetened breakfast cereals including muesli	0.070	**<0.001**	**<0.001**
Sweetened breakfast cereals	**0.013**	0.074	0.077
Biscuits, cakes & pastries	0.614	0.517	0.563
Puddings	0.280	0.161	0.071
Milk & cream	0.652	0.375	0.640
Cheese	**0.015**	0.382	0.230
Yoghurt & fromage frais	**<0.001**	0.092	**<0.001**
Ice cream	0.553	**0.008**	**0.010**
Eggs & egg dishes	0.123	0.905	0.236
Fats & oils	**0.042**	0.293	**0.020**
Meats & meat dishes, excluding processed meat	0.543	0.139	0.445
Processed meat including sausages, burgers, coated chicken	0.641	0.575	0.460
White fish, shellfish & fish dishes	**0.031**	**<0.001**	**<0.001**
Oily fish & dishes	0.251	0.814	0.424
Vegetables excluding potatoes & baked beans	0.619	0.281	0.277
Baked beans	0.092	0.662	0.189
Chips, fried & roast potatoes & potato products	**0.019**	0.058	**0.001**
Other potatoes, potato salads & dishes	0.127	**0.015**	**0.006**
Crisps & savoury snacks	0.618	0.119	0.284
Fruits, excluding fruit juice	0.322	**0.030**	**0.045**
Nuts & seeds	**<0.001**	**<0.001**	**<0.001**
Table sugar & preserves	0.701	0.057	0.223
Confectionery	0.247	0.112	0.608
Fruit juice including smoothies	0.653	0.058	0.057
Soft drinks, not diet	**0.001**	0.597	**0.003**
Soft drinks, diet	0.636	0.080	0.305
Tea, coffee & water	0.132	0.737	0.305
Powdered beverages	**0.003**	**<0.001**	**<0.001**
Soups & sauces	0.165	0.762	0.153

Table 5.1b P-values for associations between age group and the intake of foods and drinks in consumers, by sex

	Sex					
	Boys		Girls		Boys & girls	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
Pasta, rice, pizza & other cereals	0.237	0.363	0.230	0.281	0.446	0.205
Bread excluding wholemeal	0.116	0.100	0.604	0.324	0.481	0.708
Wholemeal bread	**0.023**	**0.006***	**0.024**	**0.009***	**<0.001**	**<0.001***
Unsweetened breakfast cereals including muesli	**0.031**	**0.019***	**0.013**	**0.008***	**<0.001**	**0.001***
Sweetened breakfast cereals	0.315	0.670	0.124	0.326	0.052	0.757
Biscuits, cakes & pastries	0.181	0.066	0.433	0.535	0.355	0.343
Puddings	0.092	0.167	**0.031**	**0.026***	**0.033**	**0.009***
Milk & cream	**0.005**	**0.044***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Cheese	**0.006**	**0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Yoghurt & fromage frais	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Ice cream	0.076	0.059	0.784	0.591	0.176	0.067
Eggs & egg dishes	0.821	0.681	0.076	**0.025***	0.093	**0.030***
Fats & oils	0.089	0.051	**<0.001**	**0.001***	**<0.001**	**<0.001***
Meats & meat dishes, excluding processed meat	0.123	0.052	0.106	0.190	0.207	0.505
Processed meat including sausages, burgers, coated chicken	0.513	0.539	0.060	**0.018***	0.166	0.127
White fish, shellfish & fish dishes	0.140	**0.046***	0.419	0.197	0.073	**0.021***
Oily fish & dishes	0.361	0.333	0.222	0.321	0.114	0.167
Vegetables excluding potatoes & baked beans	**0.048**	**0.040***	0.973	0.952	0.140	0.168
Baked beans	0.160	0.064	**0.025**	**0.010***	**0.007**	**0.002***
Chips, fried & roast potatoes & potato products	**0.037**	**0.011**†	0.917	0.668	0.093	**0.032**†
Other potatoes, potato salads & dishes	0.464	0.215	0.302	0.876	0.289	0.238
Crisps & savoury snacks	**0.005**	0.208	**0.038**	0.566	**<0.001**	0.211
Fruits, excluding fruit juice	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Nuts & seeds	0.376	0.160	-	-	0.163	0.334
Table sugar & preserves	0.507	0.443	**0.045**	**0.023***	**0.017**	**0.009***
Confectionery	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Fruit juice including smoothies	0.194	0.485	0.705	0.768	0.669	0.509
Soft drinks, not diet	**<0.001**	**<0.001**†	**0.003**	**0.001**†	**<0.001**	**<0.001**†
Soft drinks, diet	0.273	0.888	0.142	0.177	0.677	0.378
Tea, coffee & water	0.167	0.059	**0.042**	0.060	**0.033**	**0.013**†
Powdered beverages‡	0.653	0.367	0.321	0.618	0.221	0.371
Soups & sauces	0.910	0.982	0.305	0.263	0.500	0.499

*Intake of foods or drinks decreases with age group
†Intake of foods or drinks increases with age group
‡Variable not normally distributed

Table 5.1c P-values for differences between sexes in the proportion of children consuming foods and drinks, by age

	Age			
	3-7	8-11	12-17	All
Pasta, rice, pizza & other cereals	0.777	0.198	0.986	0.306
Bread excluding wholemeal	0.482	0.416	0.826	0.264
Wholemeal bread	0.745	0.137	0.616	0.285
Unsweetened breakfast cereals including muesli	0.201	0.103	0.526	0.497
Sweetened breakfast cereals	0.209	0.198	**0.005**	0.061
Biscuits, cakes & pastries	0.664	0.275	0.269	0.323
Puddings	0.895	0.649	0.702	0.673
Milk & cream	**0.017**	0.197	0.201	**0.010**
Cheese	0.402	**0.003**	**0.016**	**0.013**
Yoghurt & fromage frais	0.771	0.841	0.093	0.125
Ice cream	0.230	0.690	0.168	0.512
Eggs & egg dishes	0.667	0.223	0.496	0.728
Fats & oils	0.217	0.420	0.072	**0.017**
Meats & meat dishes, excluding processed meat	**0.019**	0.607	0.554	**0.045**
Processed meat including sausages, burgers, coated chicken	0.862	0.329	0.846	0.596
White fish, shellfish & fish dishes	**0.009**	0.086	0.357	0.303
Oily fish & dishes	0.569	0.261	0.553	0.500
Vegetables excluding potatoes & baked beans	**0.007**	0.245	**0.033**	**0.003**
Baked beans	0.904	0.985	0.153	0.328
Chips, fried & roast potatoes & potato products	0.296	0.673	0.849	0.287
Other potatoes, potato salads & dishes	0.465	**0.005**	0.396	**0.020**
Crisps & savoury snacks	0.071	0.308	0.968	0.196
Fruits, excluding fruit juice	0.062	0.135	0.363	**0.031**
Nuts & seeds	0.564	**0.003**	0.987	0.120
Table sugar & preserves	0.147	0.354	0.749	0.936
Confectionery	0.129	0.094	0.200	0.611
Fruit juice including smoothies	0.301	**0.027**	**0.026**	**0.002**
Soft drinks, not diet	0.162	0.624	0.239	0.919
Soft drinks, diet	0.455	**0.038**	0.527	0.385
Tea, coffee & water	**0.007**	0.509	0.436	**0.022**
Powdered beverages	0.469	0.140	0.844	0.232
Soups & sauces	**0.038**	0.090	0.284	**0.008**

Table 5.1d P-values for differences between sexes in the intake of foods and drinks in consumers, by age

	Age			
	3-7	8-11	12-17	All
Pasta, rice, pizza & other cereals	0.470	0.135	0.581	0.975
Bread excluding wholemeal	0.761	**0.019**	**0.010**	**0.005**
Wholemeal bread	0.526	0.171	0.325	0.082
Unsweetened breakfast cereals including muesli	**0.015**	0.075	**0.012**	**<0.001**
Sweetened breakfast cereals	0.426	0.197	**0.029**	**0.008**
Biscuits, cakes & pastries	0.402	0.160	**0.002**	**0.001**
Puddings	0.180	0.392	0.053	0.073
Milk & cream	**0.028**	**0.012**	**<0.001**	**<0.001**
Cheese	0.605	0.251	0.050	**0.022**
Yoghurt & fromage frais	0.398	0.458	0.149	**0.030**
Ice cream	0.726	0.260	0.156	0.952
Eggs & egg dishes	0.689	0.967	**0.028**	0.050
Fats & oils	0.144	0.057	0.438	0.489
Meats & meat dishes, excluding processed meat	0.843	0.348	**0.001**	**0.011**
Processed meat including sausages, burgers, coated chicken	0.697	0.071	**0.001**	**<0.001**
White fish, shellfish & fish dishes	0.633	0.762	0.922	0.692
Oily fish & dishes	0.909	0.825	0.811	0.890
Vegetables excluding potatoes & baked beans	0.737	**0.029**	0.069	**0.031**
Baked beans	0.961	0.676	0.267	0.566
Chips, fried & roast potatoes & potato products	0.321	0.507	0.124	0.354
Other potatoes, potato salads & dishes	**0.008**	0.500	0.203	**0.007**
Crisps & savoury snacks	0.154	0.747	0.734	0.457
Fruits, excluding fruit juice	0.129	**0.037**	0.246	**0.013**
Nuts & seeds	-	0.183	0.056	**0.028**
Table sugar & preserves	0.226	**0.033**	**0.006**	**<0.001**
Confectionery	0.628	0.704	0.259	0.967
Fruit juice including smoothies	0.102	0.684	0.055	**0.044**
Soft drinks, not diet	0.803	0.845	0.201	0.312
Soft drinks, diet	0.815	**0.001**	0.159	**0.013**
Tea, coffee & water	0.749	0.617	0.911	0.657
Powdered beverages*	0.805	0.284	0.794	0.957
Soups & sauces	0.115	0.452	0.593	0.074

*Variable not normally distributed

Table 5.2 Consumption of foods and drinks, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Pasta, rice, pizza & other cereals							
Consumers (%)‡	100	99	99	98	99	*0.249*	
Mean intake in consumers (g/d)	54	47	46	47	46	***0.030***	***0.010***#
Lower 95% confidence limit	49	43	42	44	42		
Upper 95% confidence limit	58	51	50	50	50		
Bread excluding wholemeal							
Consumers (%)‡	99	99	99	99	98	*0.937*	
Mean intake in consumers (g/d)	50	50	48	55	56	*0.072*	***0.031*********
Lower 95% confidence limit	46	45	43	49	51		
Upper 95% confidence limit	54	55	52	62	62		
Wholemeal bread							
Consumers (%)‡	68	64	58	56	47	***<0.001***	
Mean intake in consumers (g/d)	11	10	12	10	8	*0.074*	*0.078*
Lower 95% confidence limit	9	8	10	8	6		
Upper 95% confidence limit	14	12	15	13	9		
Unsweetened breakfast cereals including muesli							
Consumers (%)‡	89	84	87	89	83	*0.238*	
Mean intake in consumers (g/d)	16	15	15	16	15	*0.773*	*0.714*
Lower 95% confidence limit	14	13	13	14	13		
Upper 95% confidence limit	19	18	17	19	17		
Sweetened breakfast cereals							
Consumers (%)‡	65	63	64	69	70	*0.443*	
Mean intake in consumers (g/d)	6	6	7	7	7	*0.569*	*0.407*
Lower 95% confidence limit	5	5	6	6	6		
Upper 95% confidence limit	7	8	9	8	8		
Biscuits, cakes & pastries							
Consumers (%)‡	99	100	100	99	98	*0.185*	
Mean intake in consumers (g/d)	36	37	34	35	36	*0.863*	*0.837*
Lower 95% confidence limit	33	33	31	32	32		
Upper 95% confidence limit	39	41	37	39	40		
Puddings							
Consumers (%)‡	86	84	82	84	83	*0.775*	
Mean intake in consumers (g/d)	9	9	9	10	10	*0.412*	*0.067*
Lower 95% confidence limit	8	7	8	9	9		
Upper 95% confidence limit	10	10	10	11	12		
Milk & cream							
Consumers (%)‡	98	96	97	96	99	*0.396*	
Mean intake in consumers (g/d)	245	241	252	235	246	*0.879*	*0.909*
Lower 95% confidence limit	222	217	232	210	220		
Upper 95% confidence limit	270	267	275	262	274		
Cheese							
Consumers (%)‡	90	93	88	85	86	***0.018***	
Mean intake in consumers (g/d)	11	10	10	11	9	*0.141*	*0.572*
Lower 95% confidence limit	9	8	9	10	8		
Upper 95% confidence limit	12	11	11	13	11		
Yoghurt & fromage frais							
Consumers (%)‡	96	96	94	98	94	*0.157*	
Mean intake in consumers (g/d)	78	71	93	80	65	***0.001***	*0.306*
Lower 95% confidence limit	68	62	82	70	56		
Upper 95% confidence limit	88	81	104	90	75		

Table 5.2 continued **Consumption of foods and drinks, by Scottish Index of Multiple Deprivation**

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Ice cream							
Consumers (%)‡	92	89	91	89	89	*0.733*	
Mean intake in consumers (g/d)	11	12	12	14	15	***0.002***	***<0.001********
Lower 95% confidence limit	10	11	11	12	14		
Upper 95% confidence limit	13	13	13	16	17		
Eggs & egg dishes							
Consumers (%)‡	82	73	73	76	77	*0.085*	
Mean intake in consumers (g/d)	8	10	9	11	11	***<0.001***	***<0.001********
Lower 95% confidence limit	7	8	8	10	10		
Upper 95% confidence limit	9	11	11	13	13		
Fats & oils							
Consumers (%)‡	93	87	89	91	91	*0.294*	
Mean intake in consumers (g/d)	5	5	5	5	5	*0.878*	*0.477*
Lower 95% confidence limit	4	5	4	4	4		
Upper 95% confidence limit	5	6	5	6	6		
Meats & meat dishes, excluding processed meat							
Consumers (%)‡	95	97	97	94	98	*0.162*	
Mean intake in consumers (g/d)	28	26	29	30	30	*0.468*	*0.169*
Lower 95% confidence limit	27	25	26	27	27		
Upper 95% confidence limit	30	28	32	33	33		
Processed meat including sausages, burgers, coated chicken							
Consumers (%)‡	95	95	98	98	99	*0.092*	
Mean intake in consumers (g/d)	22	24	26	30	31	***<0.001***	***<0.001********
Lower 95% confidence limit	20	22	24	26	28		
Upper 95% confidence limit	23	26	28	33	33		
White fish, shellfish & fish dishes							
Consumers (%)‡	90	89	87	89	89	*0.910*	
Mean intake in consumers (g/d)	12	12	13	12	11	*0.765*	*0.295*
Lower 95% confidence limit	11	11	11	11	10		
Upper 95% confidence limit	14	13	14	13	13		
Oily fish & dishes							
Consumers (%)‡	48	43	37	33	33	***0.003***	
Mean intake in consumers (g/d)	5	6	5	5	5	*0.936*	*0.530*
Lower 95% confidence limit	5	5	4	4	4		
Upper 95% confidence limit	6	7	6	6	7		
Vegetables excluding potatoes & baked beans							
Consumers (%)‡	97	97	96	95	95	*0.593*	
Mean intake in consumers (g/d)	65	55	55	45	43	***<0.001***	***<0.001****#*
Lower 95% confidence limit	57	48	49	39	39		
Upper 95% confidence limit	73	63	62	52	48		
Baked beans							
Consumers (%)‡	74	74	70	76	73	*0.650*	
Mean intake in consumers (g/d)	7	6	7	7	8	*0.144*	***0.038********
Lower 95% confidence limit	6	6	6	6	7		
Upper 95% confidence limit	8	7	8	8	9		

Table 5.2 continued	Consumption of foods and drinks, by Scottish Index of Multiple Deprivation						
	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value*†
Chips, fried & roast potatoes & potato products							
Consumers (%)‡	96	97	97	96	97	*0.678*	
Mean intake in consumers (g/d)	17	20	24	24	29	***<0.001***	***<0.001*****
Lower 95% confidence limit	16	17	21	22	27		
Upper 95% confidence limit	19	22	26	27	32		
Other potatoes, potato salads & dishes							
Consumers (%)‡	92	92	91	93	93	*0.754*	
Mean intake in consumers (g/d)	22	22	23	23	20	*0.076*	*0.617*
Lower 95% confidence limit	20	20	21	21	18		
Upper 95% confidence limit	23	24	27	26	22		
Crisps & savoury snacks							
Consumers (%)‡	96	96	96	98	98	*0.390*	
Mean intake in consumers (g/d)	16	19	20	24	26	***<0.001***	***<0.001*****
Lower 95% confidence limit	14	16	18	21	23		
Upper 95% confidence limit	19	21	23	27	30		
Fruits, excluding fruit juice							
Consumers (%)‡	98	98	98	98	97	*0.828*	
Mean intake in consumers (g/d)	146	130	136	138	112	***0.025***	***0.007***#
Lower 95% confidence limit	130	118	125	124	99		
Upper 95% confidence limit	163	143	148	153	127		
Nuts & seeds							
Consumers (%)‡	38	40	32	35	35	*0.400*	
Mean intake in consumers (g/d)	2	2	2	2	2	*0.859*	*0.530*
Lower 95% confidence limit	2	2	2	2	2		
Upper 95% confidence limit	3	3	3	3	3		
Table sugar & preserves							
Consumers (%)‡	82	86	80	79	84	*0.257*	
Mean intake in consumers (g/d)	3	3	2	3	3	*0.421*	*0.537*
Lower 95% confidence limit	2	2	2	2	2		
Upper 95% confidence limit	3	3	3	3	3		
Confectionery							
Consumers (%)‡	98	99	97	98	99	*0.534*	
Mean intake in consumers (g/d)	19	20	21	25	29	***<0.001***	***<0.001*****
Lower 95% confidence limit	17	18	18	22	26		
Upper 95% confidence limit	20	23	24	28	32		
Fruit juice including smoothies							
Consumers (%)‡	92	90	89	86	83	***0.009***	
Mean intake in consumers (g/d)	87	72	59	58	41	***<0.001***	***<0.001***#
Lower 95% confidence limit	76	60	51	49	36		
Upper 95% confidence limit	100	86	68	67	46		
Soft drinks, not diet							
Consumers (%)‡	87	92	88	92	93	*0.095*	
Mean intake in consumers (g/d)	123	137	145	189	234	***<0.001***	***<0.001*****
Lower 95% confidence limit	104	108	124	163	204		
Upper 95% confidence limit	144	173	169	218	268		
Soft drinks, diet							
Consumers (%)‡	80	87	88	91	91	***0.015***	
Mean intake in consumers (g/d)	187	232	220	285	228	***<0.001***	***0.026*****
Lower 95% confidence limit	162	203	193	245	198		
Upper 95% confidence limit	214	265	251	330	262		

Table 5.2 continued **Consumption of foods and drinks, by Scottish Index of Multiple Deprivation**

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value*†
Tea, coffee & water							
Consumers (%)‡	92	88	86	85	84	*0.061*	
Mean intake in consumers (g/d)	250	245	226	209	216	*0.419*	*0.096*
Lower 95% confidence limit	209	210	195	181	179		
Upper 95% confidence limit	298	285	260	241	258		
Powdered beverages ††							
Consumers (%)‡	45	49	42	45	41	*0.345*	
Mean intake in consumers (g/d)	3	3	4	4	3	*0.237*	*0.404*
Lower 95% confidence limit	2	2	3	3	2		
Upper 95% confidence limit	4	4	6	6	4		
Soups & sauces							
Consumers (%)‡	99	98	98	99	98	*0.449*	
Mean intake in consumers (g/d)	42	44	43	42	45	*0.539*	*0.480*
Lower 95% confidence limit	38	40	40	38	42		
Upper 95% confidence limit	46	49	47	45	48		
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-values for the association between SIMD and the proportion of consumers, and for the overall association between SIMD and the intake of food groups

†P-values for the linear association between SIMD and the intake of food groups

‡% who consume at least once a month

#Intake of foods or drinks decreases from 1st (least deprived) to 5th (most deprived) quintile

**Intake of foods or drinks increases from 1st (least deprived) to 5th (most deprived) quintile

††Variable not normally distributed

Table 5.3 Consumption of foods and drinks, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Pasta, rice, pizza & other cereals							
Consumers (%)†	100	99	98	100	99	98	*0.499*
Mean intake in consumers (g/d)	48	47	48	44	49	[50]	-
Lower 95% confidence limit	45	44	41	38	44	[42]	
Upper 95% confidence limit	51	50	55	51	55	[61]	
Bread excluding wholemeal							
Consumers (%)†	99	98	99	99	99	100	*0.850*
Mean intake in consumers (g/d)	51	50	57	59	50	48	***0.040***
Lower 95% confidence limit	47	45	51	53	46	41	
Upper 95% confidence limit	55	55	63	65	54	56	
Wholemeal bread							
Consumers (%)†	58	55	60	52	65	78	*0.127*
Mean intake in consumers (g/d)	10	10	12	[7]	11	[9]	-
Lower 95% confidence limit	8	8	9	[6]	8	[6]	
Upper 95% confidence limit	13	12	15	[9]	14	[14]	
Unsweetened breakfast cereals including muesli							
Consumers (%)†	87	85	87	94	88	83	*0.375*
Mean intake in consumers (g/d)	16	14	17	18	17	[15]	-
Lower 95% confidence limit	14	12	13	13	14	[13]	
Upper 95% confidence limit	19	15	22	24	19	[18]	
Sweetened breakfast cereals							
Consumers (%)†	65	71	69	57	62	65	*0.167*
Mean intake in consumers (g/d)	7	7	7	[6]	6	[6]	-
Lower 95% confidence limit	6	6	5	[6]	5	[5]	
Upper 95% confidence limit	8	8	8	[7]	7	[8]	
Biscuits, cakes & pastries							
Consumers (%)†	100	99	97	99	100	100	*0.428*
Mean intake in consumers (g/d)	34	36	37	39	36	34	*0.171*
Lower 95% confidence limit	32	33	32	32	32	29	
Upper 95% confidence limit	36	39	42	47	41	40	
Puddings							
Consumers (%)†	81	85	84	87	85	87	*0.496*
Mean intake in consumers (g/d)	10	9	9	11	9	[8]	-
Lower 95% confidence limit	9	8	8	9	7	[6]	
Upper 95% confidence limit	11	10	11	12	11	[10]	
Milk & cream							
Consumers (%)†	98	97	96	100	96	100	*0.593*
Mean intake in consumers (g/d)	254	236	225	277	231	269	***0.029***
Lower 95% confidence limit	236	216	199	242	204	210	
Upper 95% confidence limit	274	258	253	317	260	340	
Cheese							
Consumers (%)†	87	87	92	90	91	92	*0.435*
Mean intake in consumers (g/d)	9	10	11	10	10	[13]	-
Lower 95% confidence limit	8	9	9	8	9	[11]	
Upper 95% confidence limit	11	11	13	12	12	[15]	
Yoghurt & fromage frais							
Consumers (%)†	97	95	97	95	93	96	*0.420*
Mean intake in consumers (g/d)	71	79	82	87	80	[59]	-
Lower 95% confidence limit	64	72	63	77	68	[43]	
Upper 95% confidence limit	80	86	106	98	93	[79]	

Table 5.3 continued **Consumption of foods and drinks, by urban/rural classification**

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Ice cream							
Consumers (%)†	91	87	90	94	90	98	*0.243*
Mean intake in consumers (g/d)	14	13	12	10	12	[11]	-
Lower 95% confidence limit	13	12	11	9	10	[10]	
Upper 95% confidence limit	15	15	13	12	14	[14]	
Eggs & egg dishes							
Consumers (%)†	78	74	75	77	78	91	*0.133*
Mean intake in consumers (g/d)	10	10	9	10	9	[12]	-
Lower 95% confidence limit	9	9	8	8	8	[10]	
Upper 95% confidence limit	11	11	10	13	10	[14]	
Fats & oils							
Consumers (%)†	89	90	94	87	92	94	*0.280*
Mean intake in consumers (g/d)	5	5	5	6	5	[5]	-
Lower 95% confidence limit	4	4	4	4	4	[4]	
Upper 95% confidence limit	5	5	6	7	6	[7]	
Meats & meat dishes, excluding processed meat							
Consumers (%)†	97	96	95	100	94	98	*0.455*
Mean intake in consumers (g/d)	29	28	29	29	28	[31]	-
Lower 95% confidence limit	27	26	26	25	26	[26]	
Upper 95% confidence limit	31	30	32	34	31	[37]	
Processed meat including sausages, burgers, coated chicken							
Consumers (%)†	97	97	97	99	95	95	*0.621*
Mean intake in consumers (g/d)	27	28	25	24	24	[19]	-
Lower 95% confidence limit	24	26	22	19	21	[17]	
Upper 95% confidence limit	30	30	29	29	27	[21]	
White fish, shellfish & fish dishes							
Consumers (%)†	90	87	87	91	88	96	*0.391*
Mean intake in consumers (g/d)	13	11	12	14	12	[13]	-
Lower 95% confidence limit	12	10	10	12	11	[11]	
Upper 95% confidence limit	14	12	15	15	14	[15]	
Oily fish & dishes							
Consumers (%)†	45	30	35	52	41	52	***<0.001***
Mean intake in consumers (g/d)	6	5	5	[6]	6	[4]	-
Lower 95% confidence limit	5	4	4	[4]	5	[4]	
Upper 95% confidence limit	7	6	5	[8]	7	[6]	
Vegetables excluding potatoes & baked beans							
Consumers (%)†	97	96	95	93	97	100	*0.619*
Mean intake in consumers (g/d)	51	47	51	67	57	78	***<0.001***
Lower 95% confidence limit	45	42	43	51	50	65	
Upper 95% confidence limit	59	53	61	87	65	93	
Baked beans							
Consumers (%)†	75	72	72	63	75	87	*0.096*
Mean intake in consumers (g/d)	7	7	7	[6]	7	[6]	-
Lower 95% confidence limit	7	6	6	[5]	6	[5]	
Upper 95% confidence limit	8	7	8	[8]	8	[8]	

Table 5.3 continued **Consumption of foods and drinks, by urban/rural classification**

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Chips, fried & roast potatoes & potato products							
Consumers (%)†	97	97	94	97	97	98	*0.560*
Mean intake in consumers (g/d)	23	24	25	19	18	[19]	-
Lower 95% confidence limit	20	22	21	18	16	[13]	
Upper 95% confidence limit	26	26	29	21	21	[27]	
Other potatoes, potato salads & dishes							
Consumers (%)†	94	91	92	91	92	96	*0.253*
Mean intake in consumers (g/d)	20	21	23	29	23	[30]	-
Lower 95% confidence limit	19	20	20	24	21	[26]	
Upper 95% confidence limit	22	23	25	34	26	[35]	
Crisps & savoury snacks							
Consumers (%)†	97	98	97	94	95	100	*0.545*
Mean intake in consumers (g/d)	21	23	18	23	18	15	***<0.001***
Lower 95% confidence limit	18	22	16	18	16	10	
Upper 95% confidence limit	25	25	22	29	19	21	
Fruits, excluding fruit juice							
Consumers (%)†	98	98	96	96	99	100	*0.511*
Mean intake in consumers (g/d)	136	125	142	131	132	145	*0.678*
Lower 95% confidence limit	123	111	121	96	117	126	
Upper 95% confidence limit	150	139	166	176	149	165	
Nuts & seeds							
Consumers (%)†	35	34	33	42	42	47	*0.163*
Mean intake in consumers (g/d)	2	2	3	[2]	2	[2]	-
Lower 95% confidence limit	2	2	2	[2]	2	[2]	
Upper 95% confidence limit	2	3	4	[3]	2	[4]	
Table sugar & preserves							
Consumers (%)†	81	82	81	85	82	94	*0.288*
Mean intake in consumers (g/d)	2	3	3	2	2	[2]	-
Lower 95% confidence limit	2	2	3	2	2	[2]	
Upper 95% confidence limit	3	3	4	3	3	[3]	
Confectionery							
Consumers (%)†	98	99	99	98	98	96	*0.434*
Mean intake in consumers (g/d)	24	24	19	20	21	[17]	-
Lower 95% confidence limit	21	22	17	17	18	[15]	
Upper 95% confidence limit	28	26	22	25	23	[20]	
Fruit juice including smoothies							
Consumers (%)†	89	86	90	87	87	90	*0.707*
Mean intake in consumers (g/d)	60	58	59	60	77	[111]	-
Lower 95% confidence limit	51	51	47	42	61	[91]	
Upper 95% confidence limit	71	66	72	85	97	[134]	
Soft drinks, not diet							
Consumers (%)†	90	93	87	96	91	83	*0.068*
Mean intake in consumers (g/d)	180	154	141	174	144	[184]	-
Lower 95% confidence limit	147	129	112	139	113	[154]	
Upper 95% confidence limit	219	183	176	216	182	[220]	
Soft drinks, diet							
Consumers (%)†	86	90	83	94	86	79	*0.069*
Mean intake in consumers (g/d)	208	257	266	195	217	[197]	-
Lower 95% confidence limit	177	232	221	129	180	[169]	
Upper 95% confidence limit	242	284	319	284	260	[229]	

Table 5.3 continued **Consumption of foods and drinks, by urban/rural classification**

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Tea, coffee & water							
Consumers (%)†	88	85	87	87	88	94	*0.442*
Mean intake in consumers (g/d)	254	207	221	231	222	[298]	-
Lower 95% confidence limit	220	182	176	195	185	[220]	
Upper 95% confidence limit	292	235	275	272	263	[397]	
Powdered beverages ‡							
Consumers (%)†	43	43	39	50	50	52	*0.177*
Mean intake in consumers (g/d)	4	3	3	[4]	3	[7]	-
Lower 95% confidence limit	3	2	2	[2]	2	[5]	
Upper 95% confidence limit	5	3	5	[6]	4	[13]	
Soups & sauces							
Consumers (%)†	99	98	98	97	99	100	*0.433*
Mean intake in consumers (g/d)	44	42	39	52	42	44	*0.269*
Lower 95% confidence limit	42	40	35	43	37	41	
Upper 95% confidence limit	47	45	44	62	48	47	
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and the proportion of consumers, and for the association between urban/rural classification and the intake of food groups

†% who consume at least once a month

‡Variable not normally distributed

Table 5.4 Consumption of alcoholic drinks by children aged 12-17 years, by sex

	Sex			
	Boys	Girls	Both boys & girls	*P-value**
Consumers (%)†	12	20	16	***0.011***
Mean intake in consumers (g/d)	[45]	[27]	33	
Lower 95% confidence limit	[25]	[20]	23	
Upper 95% confidence limit	[82]	[37]	46	
Base (weighted)	*268*	*261*	*530*	
Base (unweighted)	*240*	*251*	*491*	

*P-value for difference between sexes in the proportion of consumers
†% who consume at least once a month

Table 5.5 Consumption of alcoholic drinks by children aged 12-17 years, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile					
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**
Consumers (%)†	20	20	7	12	15	*0.162*
Mean intake in consumers (g/d)	[27]	[32]	[43]	[20]	[61]	
Lower 95% confidence limit	[15]	[18]	[13]	[8]	[25]	
Upper 95% confidence limit	[48]	[56]	[150]	[53]	[154]	
Base (weighted)	*115*	*121*	*83*	*97*	*103*	
Base (unweighted)	*108*	*116*	*82*	*86*	*90*	

*P-value for the association between SIMD and the proportion of consumers
†% who consume at least once a month

Table 5.6 Consumption of alcoholic drinks by children aged 12-17 years, by urban/rural classification

	Urban/rural classification					
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural
Consumers (%)*	13	17	[16]	[14]	14	[33]
Mean intake in consumers (g/d)	[30]	[38]	[30]	[17]	[38]	[32]
Lower 95% confidence limit	[15]	[22]	[8]	[10]	[15]	[14]
Upper 95% confidence limit	[59]	[66]	[131]	[29]	[95]	[77]
Base (weighted)	*181*	*174*	*52*	*32*	*72*	*20*
Base (unweighted)	*158*	*165*	*49*	*30*	*70*	*19*

*% who consume at least once a month

Table 5.7 Proportion of all children taking supplements, by age and sex

	Sex											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Any supplement	34	30	17	26	24	23	14	20	29	26	16	23
Cod liver oil & other fish based supplements	14	13	8	11	9	9	5	7	12	11	6	9
Vitamin C only	2	2	2	2	<1	3	3	2	1	2	3	2
Other vitamins, including multivitamins	21	16	6	14	15	12	8	11	18	14	7	12
Vitamins with minerals, including iron	2	2	3	3	<1	2	2	2	1	2	3	2
Minerals only, including iron	<1	<1	<1	<1	<1	<1	0	<1	<1	<1	<1	<1
Other	1	2	2	1	<1	2	1	1	<1	2	1	1
Base (weighted)	*246*	*223*	*311*	*779*	*225*	*204*	*299*	*729*	*472*	*427*	*610*	*1509*
Base (unweighted)	*249*	*251*	*275*	*775*	*222*	*230*	*285*	*737*	*471*	*481*	*560*	*1512*

Table 5.7a P-values for the associations between age group and the proportion taking supplements, by sex

	Sex		
	Boys	Girls	Both boys & girls
Any supplement	**<0.001**	**0.028**	**<0.001**
Cod liver oil & other fish based supplements	0.072	0.115	**0.005**
Vitamin C only	0.884	0.160	0.465
Other vitamins, including multivitamins	**<0.001**	**0.035**	**<0.001**
Vitamins with minerals, including iron	0.547	0.428	0.275
Minerals only, including iron	0.996	0.247	0.408
Other	0.730	0.145	0.214

Table 5.7b P-values for differences between the sexes in the proportion taking supplements, by age

	Age			
	3-7	8-11	12-17	All
Any supplement	**0.023**	0.096	0.306	**<0.001**
Cod liver oil & other fish based supplements	0.141	0.211	0.108	**0.010**
Vitamin C only	0.185	0.216	0.449	0.585
Other vitamins, including multivitamins	0.145	0.169	0.521	0.063
Vitamins with minerals, including iron	0.376	0.862	0.601	0.375
Minerals only, including iron	0.371	0.872	0.332	0.756
Other	0.401	0.519	0.710	0.855

Table 5.8 Proportion of all children taking supplements, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile					*P-value**
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	
	%	%	%	%	%	
Any supplement	27	26	26	19	18	***0.044***
Cod liver oil & other fish based supplements	11	11	10	9	6	*0.220*
Vitamin C only	1	3	4	2	1	*0.066*
Other vitamins, including multivitamins	16	12	14	9	11	*0.113*
Vitamins with minerals, including iron	1	5	3	2	1	***0.035***
Minerals only, including iron	<1	<1	<1	<1	<1	*0.971*
Other	3	1	0	1	1	*0.083*
Base (weighted)	*320*	*283*	*270*	*290*	*325*	
Base (unweighted)	*333*	*295*	*282*	*286*	*295*	

*P-values for the association between SIMD and supplement use

Table 5.9 Proportion of all children taking supplements, by urban/rural classification

	Urban/rural classification						*P-value**
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	
	%	%	%	%	%	%	
Any supplement	22	22	23	24	25	34	*0.636*
Cod liver oil & other fish based supplements	8	9	7	11	13	16	*0.139*
Vitamin C only	2	2	1	4	3	3	*0.525*
Other vitamins, including multivitamins	14	11	14	13	9	17	*0.534*
Vitamins with minerals, including iron	<1	3	1	1	4	8	***0.039***
Minerals only, including iron	<1	<1	0	0	<1	2	*0.744*
Other	1	2	<1	0	2	0	*0.879*
Base (weighted)	*523*	*490*	*173*	*82*	*195*	*45*	
Base (unweighted)	*493*	*500*	*178*	*83*	*207*	*51*	

*P-values for the association between urban/rural classification and supplement use

6 INTAKE OF ENERGY, TOTAL SUGARS AND NMES

This chapter describes the intake of energy and sugars in all children and variations by age, sex, deprivation and urban-rural residence are also reported. Intakes are also compared to Dietary Reference Values and Scottish Dietary Targets. The definition of the different classes of sugars is given in Chapter 1 (Section 1.2) while the validity of the estimates of energy and sugars intake based on data collected in the FFQ is discussed in Chapter 4 (Section 4.4). The full list of the food groups and their contribution to energy, total sugar and NMES intake are given in Appendix H.

6.1 Intake of energy and sugars

6.1.1 Intake of energy and sugars by age and sex

The intake of energy and sugars for all children and by sex and age is shown in Table 6.1. Statistical significance of differences in intake are shown in Tables 6.1a and 6.1b.

Boys had a significantly higher energy intake than girls overall and in those aged 8-11 years and 12-17 years. There was a significant increase in energy intake with age group in boys but not in girls. However, comparison between children under 11 years and those 12 years and over should take account of the fact that the C2 FFQ, used for children aged 3-11 years and designed for completion by parents, overestimated energy intake compared to that recorded in the diet diaries to a greater extent than the C3 FFQ used for young people aged 12-17 years which was designed for completion by the young people themselves (see Section 4.2).

Total sugars contributed on average 28.9% to food energy intake in children overall. There was a higher percentage contribution of total sugars to food energy intake amongst those aged 12-17 years (29.6%) compared to younger age groups (3-7 year olds, 28.6%, 8-11 year olds, 28.4%). This linear association between total sugars and age group was significant in girls but not in boys.

NMES contributed on average 17.4% to food energy intake in children overall and there was a highly significant increase in the percentage contribution with age group: in 3-7 year olds the mean percentage contribution was 15.8% while in 12-17 year olds the mean percentage contribution was 19.1%.

Intrinsic and milk sugars contributed on average 10.5% to food energy in children overall and there was a highly significant association with age group in the opposite direction to that seen for NMES: the mean percentage of food energy from intrinsic and milk sugars was 11.9% in the 3-7 year olds and 9.4% in the 12-17 year olds.

Sucrose contributed on average 13.4% to food energy in all children and the percentage contribution increased significantly with age group similar to the increase with age group seen for NMES.

There were no significant differences between boys and girls in the percentage contribution of the sugars to food energy intake.

When expressed as grams per day (g/d), the intake of total sugars, NMES and sucrose were significantly higher in boys than girls. The patterns of associations with age group for NMES, intrinsic and milk sugars and sucrose expressed as g/d were similar to those seen for percentage food energy. For total sugars the mean intake in all children was 138 g/d but intake increased with age in boys only.

Table 6.1, 6.1a, 6.1b

Tables 6.2, 6.2a, 6.2b show similar analyses for NMES, intrinsic and milk sugars and sucrose expressed as a percentage of total sugars intake. In all children NMES contributed on average 61.8% and intrinsic and milk sugars contributed 38.2% to total sugars intake. The mean contribution of sucrose to total sugars intake was 46.9%. There were no significant differences between boys and girls in these values but there were highly significant associations with the age groups. The contribution of NMES and sucrose were higher and the contribution of intrinsic and milk sugars lower in the older children.

Table 6.2, 6.2a and 6.2b

6.1.2 Intake of energy and sugars by Scottish Index of Multiple Deprivation

Intake of energy and sugars by SIMD quintile is shown in Table 6.3. There was a significant association between energy intake and SIMD quintile with higher energy intake associated with increasing deprivation. There was no significant association between the SIMD quintiles and the percentage of food energy from total sugars but there were significant associations with the intake of NMES, intrinsic and milk sugars and sucrose. NMES and sucrose contributed a higher proportion of food energy and intrinsic and milk sugars contributed a lower proportion of food energy in the more deprived quintiles.

A similar pattern was seen for sugars expressed as g/d, though the intake of total sugars was significantly higher in the more deprived groups. The intake of intrinsic and milk sugars was not significantly associated with SIMD quintiles.

Table 6.3

When intakes of NMES, intrinsic and milk sugars and sucrose were expressed as a percentage of total sugars, highly significant linear associations with deprivation quintiles were observed. NMES and sucrose comprised a higher proportion of total sugars in the more deprived quintiles. In contrast, intrinsic and milk sugars comprised a lower proportion of total sugars in the more deprived quintiles.

Table 6.4

6.1.3 Intake of energy and sugars by urban/rural classification

Intake of energy and sugars by urban/rural area of residence is shown in Table 6.5. There were no significant associations between the areas of residence and energy intake or the percentage of energy from total sugars, NMES, intrinsic and milk sugars or sucrose.There were significant associations between the intake of total sugars and sucrose expressed as g/d and the areas of residence, with higher intakes in the remote small towns and lower intakes in the accessible small towns and accessible rural areas. There were no significant associations between the areas of residence and the percentage contribution of NMES, intrinsic and milk sugars or sucrose to total sugars intake.

Table 6.5, Table 6.6

6.2 Contribution of food groups to intake of energy and sugars

Table 6.7 shows the mean percentage contribution of food groups contributing 5% or more to the intake of energy and sugars. The full list of the food groups and their contribution to energy, total sugar and NMES intake are given in Appendix H.

The food groups contributing the highest proportion of total energy intake were biscuits, cakes and pastries (9%) and bread excluding wholemeal (8%). Fruit (14%) and non-diet soft drinks (10%) were the food groups providing the highest proportion of total sugars. Non-diet soft drinks were also major contributors to NMES (17%), along with confectionery (12%) and biscuits, cakes and pastries (12%).

The main sources of NMES were similar to those in LIDNS and NDNS, though the contribution from table sugar and preserves was lower and the contribution from fruit juice (including smoothies) was higher than in the other surveys (see Appendix H).

Over half (56%) of intrinsic and milk sugars were obtained from fruit (35%) and milk and cream (21%). The food groups providing the highest proportion of sucrose intake were biscuits, cakes and pastries (13%), confectionery (12%) and non-diet soft drinks (12%).

Table 6.7

6.2.1 Contribution of food groups to intake of energy and sugars by age and sex

The differences in the percentage contribution of food groups to energy and sugars intake between boys and girls were generally small. The exceptions to this were a lower contribution of milk and cream (19% girls, 22% boys) and a higher contribution of fruit (37% girls, 32% boys) to intrinsic and milk sugars intake in girls compared to boys.

There were several significant associations between the percentage contribution of food groups to energy and sugars intake and age group. There was a clear pattern of lower contributions from milk and cream, yogurt and fromage frais and fruit, and higher contributions from non-diet soft drinks and confectionery to total sugars, NMES and sucrose intake with increasing age. The contribution of yogurt and fromage frais and fruit to intrinsic and milk sugars decreased with age.

Table 6.7, 6.7a and 6.7b

6.2.2 Contribution of food groups to intake of energy and sugars by Scottish Index of Multiple Deprivation

The contribution of food groups to energy and sugars intake by SIMD quintile is shown in Table 6.8. There were highly significant overall and linear associations between the SIMD quintiles and the percentage contribution of several food groups to both energy and sugars.

Children in the more deprived quintiles derived a lower proportion of energy from pasta, rice and other cereals and a higher proportion from crisps and savoury snacks than children in the less deprived quintiles. Children in the more deprived quintiles also obtained a lower proportion of total sugars from fruit, and a higher proportion from confectionery and non-diet soft drinks.

There was a more marked pattern for the contribution of food groups to NMES intake, particularly for drinks. Children in the more deprived quintiles obtained a higher percentage of NMES from non-diet soft drinks (23% in the most deprived quintile vs. 14% in the least deprived quintile) and a lower percentage from fruit juice (3% in the most deprived quintile vs. 9% in the least deprived quintile).

Children in the more deprived quintiles derived a higher proportion of sucrose from non-diet soft drinks and a lower proportion from fruit, biscuits cakes and pastries and yogurt and fromage frais. The contribution of fruit to intrinsic and milk sugars was also lower in the children in the more deprived quintiles.

Table 6.8

6.2.3 Contribution of food groups to intake of energy and sugars by urban/rural classification

Differences in the contribution of food groups to energy and sugars intake between urban and rural areas were generally less than those between deprivation categories. In urban areas the contribution of crisps and savoury snacks to total energy intake was higher, and the contribution of fruit juice to NMES intake was lower than in rural areas.

Table 6.9

6.3 Comparison of intake of energy and sugars with Dietary Reference Values and Scottish Dietary Targets

6.3.1 Comparison of intake of energy and sugars with DRVs and Scottish Dietary Targets by age and sex

Table 6.10 shows the Estimated Average Requirement (EAR) for energy in four age bands and the mean energy intake for the same age groups in this survey. The EAR defines the estimated average daily energy requirement of a given age group and sex at a given level of physical activity.[1] The mean energy intake expressed as a percentage of EAR for a given sex and age group in which all members were meeting their individual requirements would, therefore, be expected to be 100% of the EAR. Energy intake as a percentage of the EAR was calculated for each participant using the EAR appropriate for their age group and sex.

Energy intake as a percentage of the EAR was highest in younger children (109% in boys and 118% in girls aged 4-6 years) and lowest in the older children (78% in boys and 86% in girls aged 15-17 years).

Dietary Reference Values (DRVs) for NMES as recommended by the Committee on Medical Aspects of Food and Nutrition Policy (COMA) are expressed as population averages for percentages of energy intake derived from NMES.[1] The percentages are expressed in relation to energy from food and total dietary energy (including energy from alcohol). Current recommendations are shown in Table 6.10.

For NMES the recommended population average for adults is ≤10% of total energy or ≤11% food energy[1] (no value is given for children) and the Scottish Dietary Target for NMES for children is ≤10% of total energy. In the present survey the % food energy and % total energy are likely to be very similar since alcohol (which accounts for the difference between food energy and total energy) contributed less than 1% of energy intake in all children.

The NMES intake as a percentage of food energy was considerably higher than the recommended population average and the Scottish Dietary Target for children, with the values reaching 19.8% in boys and 18.7% in girls aged 15-17 years.

Table 6.10

6.3.2 Comparison of intake of energy and sugars with DRVs and Scottish Dietary Targets by Scottish Index of Multiple Deprivation and urban/rural classification.

Energy intake and NMES expressed as a percentage of food energy were higher in children in the more deprived quintiles. As a result the mean energy intake as a percentage of the EAR and the mean NMES as a percentage of the population average was higher in these children.

The mean energy intake as a percentage of the EAR was highest in children in remote small towns and lowest in those in accessible rural areas. For NMES the percentage of the recommended value was highest in children in other urban areas and lowest in those in accessible small towns and remote rural areas.

Table 6.11,Table 6.12

6.4 References

1 Department of Health. Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. London: HMSO,1991. [Report on Health and Social Subjects: 41].

Table 6.1 Daily intake of energy and sugars, by sex and age

	Sex/age group											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Energy (MJ)												
Mean	7.82	7.79	8.33	8.01	7.52	7.28	7.28	7.35	7.68	7.54	7.79	7.68
Lower 95% confidence limit	7.53	7.43	7.96	7.80	7.24	6.99	6.94	7.15	7.47	7.29	7.52	7.53
Upper 95% confidence limit	8.12	8.17	8.73	8.22	7.80	7.59	7.65	7.57	7.88	7.81	8.08	7.85
Energy (kcal)												
Mean	1856	1851	1979	1901	1785	1729	1730	1746	1822	1791	1851	1825
Lower 95% confidence limit	1788	1765	1890	1852	1720	1659	1648	1697	1775	1731	1787	1788
Upper 95% confidence limit	1927	1941	2073	1953	1852	1802	1817	1797	1872	1854	1918	1863
% of food energy												
Total sugars												
Mean	28.6	28.1	29.4	28.8	28.5	28.7	29.9	29.1	28.6	28.4	29.6	28.9
Lower 95% confidence limit	27.8	27.3	28.4	28.3	27.7	27.9	28.8	28.6	28.1	27.8	28.8	28.6
Upper 95% confidence limit	29.4	28.9	30.4	29.2	29.4	29.5	30.9	29.7	29.1	29.0	30.4	29.3
Non-milk extrinsic sugars												
Mean	16.0	16.9	19.0	17.4	15.6	16.9	19.1	17.4	15.8	16.9	19.1	17.4
Lower 95% confidence limit	15.2	16.2	18.0	16.9	14.7	16.3	18.0	16.7	15.3	16.4	18.2	17.0
Upper 95% confidence limit	16.8	17.6	20.1	17.9	16.5	17.5	20.3	18.0	16.3	17.4	19.9	17.8
Intrinsic & milk sugars												
Mean	11.7	10.4	9.3	10.4	12.1	11.1	9.6	10.7	11.9	10.7	9.4	10.5
Lower 95% confidence limit	11.3	9.9	8.8	10.0	11.5	10.4	8.9	10.3	11.5	10.3	9.0	10.2
Upper 95% confidence limit	12.2	11.0	9.9	10.7	12.7	11.8	10.2	11.2	12.3	11.2	9.9	10.9
Sucrose												
Mean	12.5	13.2	14.1	13.3	12.7	13.4	14.3	13.6	12.6	13.3	14.2	13.4
Lower 95% confidence limit	12.1	12.8	13.5	13.0	12.1	13.0	13.7	13.2	12.3	13.0	13.7	13.2
Upper 95% confidence limit	13.0	13.7	14.8	13.7	13.3	13.9	15.0	13.9	12.9	13.6	14.8	13.7
Grams												
Total sugars												
Mean	139	137	152	143	134	130	135	133	137	134	143	138
Lower 95% confidence limit	132	130	143	139	127	124	126	128	132	128	136	135
Upper 95% confidence limit	146	144	162	147	141	137	145	138	141	139	151	142
Non-milk extrinsic sugars												
Mean	77	82	98	86	72	76	86	79	75	79	92	83
Lower 95% confidence limit	72	77	91	83	67	72	79	75	72	76	86	80
Upper 95% confidence limit	83	87	107	90	78	81	95	84	79	83	99	86
Intrinsic & milk sugars												
Mean	58	51	49	52	57	51	44	50	57	51	46	51
Lower 95% confidence limit	55	48	46	50	54	47	41	48	55	48	44	50
Upper 95% confidence limit	61	55	52	54	61	55	48	52	60	54	49	53
Sucrose												
Mean	61	64	73	66	59	61	64	62	60	63	68	64
Lower 95% confidence limit	57	61	68	64	55	58	59	59	57	60	64	62
Upper 95% confidence limit	64	68	78	69	63	64	70	65	62	65	73	66
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

Table 6.1a P-values for differences between sexes in daily intake of energy and sugars, by age

	Age			
	3-7	8-11	12-17	All
Energy (MJ)	0.135	**0.021**	**<0.001**	**<0.001**
Energy (kcal)	0.138	**0.021**	**<0.001**	**<0.001**
% of food energy				
Total sugars	0.917	0.267	0.477	0.329
Non-milk extrinsic sugars	0.537	0.962	0.878	0.946
Intrinsic & milk sugars	0.224	0.120	0.512	0.148
Sucrose	0.723	0.521	0.645	0.375
Grams				
Total sugars	0.320	0.190	**0.006**	**0.002**
Non-milk extrinsic sugars	0.228	0.079	**0.023**	**0.006**
Intrinsic & milk sugars	0.877	0.970	**0.031**	0.078
Sucrose	0.577	0.191	**0.013**	**0.011**

Table 6.1b P-values for associations between age group and daily intake of energy and sugars, by sex

	Sex					
	Boys		Girls		Both boys & girls	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
Energy (MJ)	**0.047**	**0.022***	0.397	0.331	0.436	0.411
Energy (kcal)	**0.045**	**0.021***	0.401	0.336	0.432	0.400
% of food energy						
Total sugars	0.080	0.250	0.119	**0.045***	**0.039**	**0.037***
Non-milk extrinsic sugars	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Intrinsic & milk sugars	**<0.001**	**<0.001†**	**<0.001**	**<0.001†**	**<0.001**	**<0.001†**
Sucrose	**0.002**	**0.001***	**0.001**	**<0.001***	**<0.001**	**<0.001***
Grams						
Total sugars	**0.034**	**0.043***	0.653	0.814	0.130	0.113
Non-milk extrinsic sugars	**<0.001**	**<0.001***	**0.009**	**0.002***	**<0.001**	**<0.001***
Intrinsic & milk sugars	**<0.001**	**<0.001†**	**<0.001**	**<0.001†**	**<0.001**	**<0.001†**
Sucrose	**0.002**	**0.001***	0.224	0.079	**0.002**	**<0.001***

*Intake increases with age group
†Intake decreases with age group

Table 6.2 Daily intake of sugars as a percentage of total sugars, by sex and age

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
% of total sugars												
Non-milk extrinsic sugars												
Mean	57.6	61.6	66.3	62.2	56.2	60.2	65.9	61.4	57.0	60.9	66.1	61.8
Lower 95% confidence limit	56.0	59.9	64.3	61.0	54.2	58.4	63.5	59.9	55.6	59.7	64.4	60.8
Upper 95% confidence limit	59.2	63.3	68.3	63.3	58.3	62.0	68.3	62.9	58.3	62.2	67.8	62.8
Intrinsic & milk sugars												
Mean	42.3	38.4	33.6	37.8	43.7	39.8	34.0	38.6	43.0	39.0	33.8	38.2
Lower 95% confidence limit	40.8	36.7	31.6	36.6	41.7	37.9	31.7	37.1	41.7	37.8	32.1	37.2
Upper 95% confidence limit	43.9	40.0	35.6	38.9	45.8	41.6	36.4	40.1	44.3	40.3	35.6	39.1
Sucrose												
Mean	44.3	47.5	48.5	46.9	44.8	47.2	48.4	47.0	44.6	47.3	48.4	46.9
Lower 95% confidence limit	43.4	46.6	47.5	46.2	43.7	46.2	47.3	46.2	43.8	46.7	47.6	46.4
Upper 95% confidence limit	45.2	48.3	49.6	47.5	46.0	48.2	49.4	47.7	45.3	47.9	49.3	47.4
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

Table 6.2a P-values for differences between sexes in daily intake of sugars as a percentage of total sugars, by age

	Age			
	3-7	8-11	12-17	All
% of total sugars				
Non-milk extrinsic sugars	0.266	0.255	0.767	0.366
Intrinsic & milk sugars	0.263	0.256	0.753	0.360
Sucrose	0.476	0.696	0.807	0.830

Table 6.2b P-values for associations between age group and daily intake of sugars as a percentage of total sugars, by sex

	Sex					
	Boys		Girls		Both boys & girls	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
% of total sugars						
Non-milk extrinsic sugars	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Intrinsic & milk sugars	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Sucrose	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***

*Intake increases with age group
†Intake decreases with age group

Table 6.3 Daily intake of energy and sugars, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Energy (MJ)							
Mean	7.51	7.49	7.44	8.05	7.98	***0.018***	***0.002***‡
Lower 95% confidence limit	7.26	7.24	7.20	7.63	7.66		
Upper 95% confidence limit	7.76	7.76	7.69	8.49	8.33		
Energy (kcal)							
Mean	1782	1779	1767	1911	1897	***0.018***	***0.002***‡
Lower 95% confidence limit	1725	1719	1710	1813	1819		
Upper 95% confidence limit	1842	1843	1826	2016	1978		
% of food energy							
Total sugars							
Mean	28.7	29.0	28.8	29.3	28.9	*0.703*	*0.517*
Lower 95% confidence limit	28.1	28.0	28.0	28.6	28.0		
Upper 95% confidence limit	29.2	30.0	29.6	30.1	29.8		
Non-milk extrinsic sugars							
Mean	16.3	17.4	16.8	18.1	18.4	***0.003***	***0.001***‡
Lower 95% confidence limit	15.7	16.5	16.1	17.3	17.6		
Upper 95% confidence limit	17.0	18.3	17.5	18.9	19.2		
Intrinsic & milk sugars							
Mean	11.4	10.6	11.0	10.2	9.5	***<0.001***	***<0.001***#
Lower 95% confidence limit	10.8	10.0	10.5	9.7	9.0		
Upper 95% confidence limit	12.0	11.3	11.5	10.8	10.0		
Sucrose							
Mean	12.8	13.2	13.2	14.0	14.1	***0.007***	***<0.001***‡
Lower 95% confidence limit	12.4	12.7	12.8	13.5	13.5		
Upper 95% confidence limit	13.2	13.8	13.6	14.5	14.6		
Grams							
Total sugars							
Mean	134	135	133	147	143	***0.025***	***0.004***‡
Lower 95% confidence limit	129	128	127	139	135		
Upper 95% confidence limit	139	142	140	155	152		
Non-milk extrinsic sugars							
Mean	76	81	77	91	91	***<0.001***	***<0.001***‡
Lower 95% confidence limit	72	75	73	84	85		
Upper 95% confidence limit	80	86	82	98	98		
Intrinsic & milk sugars							
Mean	54	50	52	52	48	*0.152*	*0.064*
Lower 95% confidence limit	50	47	49	49	45		
Upper 95% confidence limit	58	53	54	55	51		
Sucrose							
Mean	59	61	61	70	70	***<0.001***	***<0.001***‡
Lower 95% confidence limit	57	58	58	65	66		
Upper 95% confidence limit	62	65	64	75	74		
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and nutrient intake
†P-values for the linear association between Scottish Index of Multiple Deprivation quintile and nutrient intake
‡Intake increases from 1st (least deprived) to 5th (most deprived) quintile
#Intake decreases from 1st (least deprived) to 5th (most deprived) quintile

Table 6.4 Daily intake of sugars as a percentage of total sugars, by Scottish Index of Multiple Deprivation quintile

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value*†
% of total sugars							
Non-milk extrinsic sugars							
Mean	58.7	61.6	60.0	63.5	65.3	***<0.001***	***<0.001***‡
Lower 95% confidence limit	56.7	59.6	58.4	61.7	63.6		
Upper 95% confidence limit	60.6	63.6	61.6	65.2	67.0		
Intrinsic & milk sugars							
Mean	41.3	38.3	40.0	36.5	34.7	***<0.001***	***<0.001***#
Lower 95% confidence limit	39.3	36.4	38.4	34.8	33.0		
Upper 95% confidence limit	43.2	40.3	41.5	38.2	36.4		
Sucrose							
Mean	45.0	46.1	46.2	48.1	49.1	***<0.001***	***<0.001***‡
Lower 95% confidence limit	44.2	45.1	45.3	47.1	48.1		
Upper 95% confidence limit	45.9	47.1	47.2	49.1	50.0		
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and nutrient intake
†P-values for the linear association between Scottish Index of Multiple Deprivation quintile and nutrient intake
‡Intake increases from 1st (least deprived) to 5th (most deprived) quintile
#Intake decreases from 1st (least deprived) to 5th (most deprived) quintile

Table 6.5 Daily intake of energy and sugars, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Energy (MJ)							
Mean	7.77	7.68	7.54	8.12	7.39	7.88	*0.242*
Lower 95% confidence limit	7.50	7.45	7.12	7.60	7.06	7.55	
Upper 95% confidence limit	8.06	7.93	7.98	8.68	7.73	8.22	
Energy (kcal)							
Mean	1846	1825	1790	1929	1754	1871	*0.240*
Lower 95% confidence limit	1781	1768	1691	1806	1677	1793	
Upper 95% confidence limit	1914	1883	1896	2063	1836	1953	
% of food energy							
Total sugars							
Mean	28.9	29.2	28.1	29.4	29.0	29.4	*0.558*
Lower 95% confidence limit	28.2	28.5	27.3	28.0	27.8	27.7	
Upper 95% confidence limit	29.6	29.8	28.9	30.9	30.1	31.2	
Non-milk extrinsic sugars							
Mean	17.3	17.8	16.8	17.5	17.4	16.7	*0.518*
Lower 95% confidence limit	16.5	17.1	15.9	16.3	16.3	15.6	
Upper 95% confidence limit	18.1	18.4	17.7	18.7	18.4	17.8	
Intrinsic & milk sugars							
Mean	10.6	10.3	10.5	10.8	10.7	11.3	*0.738*
Lower 95% confidence limit	10.2	9.7	9.7	9.3	10.0	10.2	
Upper 95% confidence limit	11.1	10.9	11.4	12.5	11.5	12.6	
Sucrose							
Mean	13.5	13.6	13.0	13.6	13.4	13.2	*0.401*
Lower 95% confidence limit	12.9	13.2	12.6	13.1	12.7	12.2	
Upper 95% confidence limit	14.0	14.0	13.4	14.1	14.1	14.2	
Grams							
Total sugars							
Mean	140	139	132	148	133	144	***0.006***
Lower 95% confidence limit	133	134	124	143	125	138	
Upper 95% confidence limit	147	145	141	154	142	150	
Non-milk extrinsic sugars							
Mean	83	85	78	88	80	80	*0.163*
Lower 95% confidence limit	78	80	72	81	74	74	
Upper 95% confidence limit	89	89	85	96	86	87	
Intrinsic & milk sugars							
Mean	52	50	50	55	50	56	*0.184*
Lower 95% confidence limit	50	47	45	49	46	52	
Upper 95% confidence limit	55	52	55	63	54	60	
Sucrose							
Mean	65	65	61	69	61	64	***0.017***
Lower 95% confidence limit	60	62	57	66	57	59	
Upper 95% confidence limit	69	68	66	71	66	69	
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and nutrient intake

Table 6.6 Daily intake of sugars as a percentage of total sugars, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
% of total sugars							
Non-milk extrinsic sugars							
Mean	61.5	62.8	61.3	61.3	61.4	59.2	*0.536*
Lower 95% confidence limit	59.7	61.0	58.6	56.7	59.1	56.0	
Upper 95% confidence limit	63.2	64.5	63.9	65.8	63.8	62.3	
Intrinsic & milk sugars							
Mean	38.5	37.2	38.7	38.7	38.5	40.8	*0.549*
Lower 95% confidence limit	36.7	35.5	36.1	34.1	36.1	37.6	
Upper 95% confidence limit	40.2	38.9	41.3	43.3	40.9	43.9	
Sucrose							
Mean	47.0	47.1	46.7	46.7	46.6	45.2	*0.688*
Lower 95% confidence limit	46.0	46.3	45.4	45.3	45.2	43.1	
Upper 95% confidence limit	48.0	48.0	48.0	48.1	48.1	47.3	
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and nutrient intake

Table 6.7 **Mean percentage contribution of food groups to energy and sugar intake (for food groups contributing ≥5% in all participants), by sex and age**

	Sex											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Energy												
Pasta, rice, pizza & other cereals	5	4	5	5	5	5	5	5	5	5	5	5
Bread excluding wholemeal	7	8	8	8	8	8	7	8	7	8	8	8
Biscuits, cakes & pastries	8	9	9	9	8	9	8	8	8	9	9	9
Milk & cream	9	7	7	7	8	6	5	6	8	7	6	7
Crisps & savoury snacks	5	7	5	5	6	7	6	6	5	7	6	6
Total sugars												
Biscuits, cakes & pastries	8	9	9	8	7	8	8	8	8	9	8	8
Milk & cream	10	9	8	9	9	8	6	8	10	8	7	8
Yoghurt & fromage frais	9	8	5	7	9	8	5	7	9	8	5	7
Fruit excluding fruit juice	17	13	10	13	19	16	12	15	17	15	11	14
Confectionery	6	7	10	8	7	7	10	8	6	7	10	8
Soft drinks, not diet	7	10	14	10	7	10	12	10	7	10	13	10
Non-milk extrinsic sugars												
Biscuits, cakes & pastries	12	13	12	12	12	12	11	12	12	13	11	12
Yogurt & fromage frais	9	8	4	7	10	8	4	7	9	8	4	7
Confectionery	10	11	14	12	11	11	15	12	11	11	14	12
Fruit juice, including smoothies	6	5	5	5	6	7	6	6	6	6	5	6
Soft drinks, not diet	13	17	22	17	14	17	20	17	13	17	21	17
Intrinsic & milk sugars												
Milk & cream	22	22	23	22	21	19	18	19	22	20	21	21
Yogurt & fromage frais	9	9	6	8	8	9	6	8	9	9	6	8
Fruit excluding fruit juice	36	34	28	32	41	39	34	37	38	36	31	35
Sucrose												
Biscuits, cakes & pastries	13	14	14	14	13	14	12	13	13	14	13	13
Yogurt & fromage frais	10	8	5	7	10	8	5	7	10	8	5	7
Fruit excluding fruit juice	14	11	8	11	16	14	9	12	15	12	9	11
Confectionery	9	10	15	12	10	10	15	12	10	10	15	12
Soft drinks, not diet	8	12	15	12	10	12	14	12	9	12	14	12
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

Table 6.7a P-values for differences between sexes in the percentage contribution of food groups to energy and sugar intake (for food groups contributing ≥5% in all participants), by age

	Age			
	3-7	8-11	12-17	All
Energy				
Pasta, rice, pizza & other cereals	0.864	**0.008**	0.060	**0.009**
Bread excluding wholemeal	0.629	0.138	0.399	0.364
Biscuits, cakes & pastries	0.537	0.473	0.118	0.063
Milk & cream	0.351	0.084	**0.001**	**<0.001**
Crisps & savoury snacks	**0.011**	0.370	0.077	**0.006**
Total sugars				
Biscuits, cakes & pastries	0.391	0.349	0.208	0.056
Milk & cream	0.589	0.098	**0.002**	**0.001**
Yoghurt & fromage frais	0.941	0.695	0.858	0.744
Fruit excluding fruit juice	**0.029**	**0.005**	**0.018**	**<0.001**
Confectionery	0.254	0.488	0.647	0.439
Soft drinks, not diet	0.456	0.942	0.446	0.983
Non-milk extrinsic sugars				
Biscuits, cakes & pastries	0.579	0.529	0.280	0.141
Yogurt & fromage frais	0.619	0.792	0.829	0.995
Confectionery	0.127	0.544	0.583	0.298
Fruit juice, including smoothies	0.900	**0.037**	0.545	0.208
Soft drinks, not diet	0.323	0.964	0.467	0.904
Intrinsic & milk sugars				
Milk & cream	0.321	**0.014**	**0.001**	**<0.001**
Yogurt & fromage frais	0.445	0.489	0.797	0.490
Fruit excluding fruit juice	**0.011**	**0.006**	**0.002**	**<0.001**
Sucrose				
Biscuits, cakes & pastries	0.305	0.339	0.187	**0.037**
Yogurt & fromage frais	0.967	0.864	0.835	0.855
Fruit excluding fruit juice	0.052	**0.006**	0.060	**0.002**
Confectionery	0.366	0.387	0.614	0.525
Soft drinks, not diet	0.305	0.812	0.482	0.951

Table 6.7b P-values for associations between age group and the percentage contribution of food groups to energy and sugar intake (for food groups contributing ≥5% in all participants), by sex

	Sex					
	Boys		Girls		Both boys & girls	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
Energy						
Pasta, rice, pizza & other cereals	0.654	0.722	0.059	**0.048***	0.300	0.128
Bread excluding wholemeal	0.131	0.511	0.706	0.517	0.218	0.985
Biscuits, cakes & pastries	0.207	0.247	0.338	0.954	0.089	0.403
Milk & cream	**<0.001**	**0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Crisps & savoury snacks	**<0.001**	0.408	**0.003**	0.398	**<0.001**	0.272
Total sugars						
Biscuits, cakes & pastries	0.078	0.195	0.142	0.542	**0.009**	0.204
Milk & cream	**0.014**	**0.004**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Yoghurt & fromage frais	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Fruit excluding fruit juice	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Confectionery	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Soft drinks, not diet	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Non-milk extrinsic sugars						
Biscuits, cakes & pastries	0.316	0.501	0.148	0.141	0.065	0.167
Yogurt & fromage frais	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Confectionery	**<0.001**	**<0.001***	**<0.001**	**0.001***	**<0.001**	**<0.001***
Fruit juice, including smoothies	0.699	0.443	0.227	0.871	0.566	0.467
Soft drinks, not diet	**<0.001**	**<0.001***	**0.002**	**<0.001***	**<0.001**	**<0.001***
Intrinsic & milk sugars						
Milk & cream	0.563	0.544	0.124	0.063	0.224	0.296
Yogurt & fromage frais	**<0.001**	**<0.001**†	**<0.001**	**0.001**†	**<0.001**	**<0.001**†
Fruit excluding fruit juice	**<0.001**	**<0.001**†	**0.002**	**<0.001**†	**<0.001**	**<0.001**†
Sucrose						
Biscuits, cakes & pastries	0.421	0.916	0.349	0.618	0.165	0.772
Yogurt & fromage frais	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Fruit excluding fruit juice	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Confectionery	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Soft drinks, not diet	**<0.001**	**<0.001***	**0.009**	**0.002***	**<0.001**	**<0.001***

*Intake increases with age group
†Intake decreases with age group

Table 6.8 **Mean percentage contribution of food groups to energy and sugar intake (for food groups contributing ≥5% in all participants), by Scottish Index of Multiple Deprivation quintile**

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Energy							
Pasta, rice, pizza & other cereals	5	5	5	4	4	***0.002***	***<0.001‡***
Bread excluding wholemeal	8	8	7	8	8	*0.792*	*0.673*
Biscuits, cakes & pastries	9	9	9	8	8	*0.160*	***0.018‡***
Milk & cream	7	7	7	6	7	*0.232*	*0.570*
Crisps & savoury snacks	5	5	6	6	7	***0.001***	***<0.001#***
Total sugars							
Biscuits, cakes & pastries	8	9	8	8	8	*0.261*	***0.044‡***
Milk & cream	8	8	9	8	9	*0.154*	*0.800*
Yoghurt & fromage frais	7	7	8	7	6	***0.005***	***0.030‡***
Fruit excluding fruit juice	16	14	15	14	11	***<0.001***	***<0.001‡***
Confectionery	7	7	7	8	9	***0.004***	***<0.001#***
Soft drinks, not diet	8	9	9	11	14	***<0.001***	***<0.001#***
Non-milk extrinsic sugars							
Biscuits, cakes & pastries	13	13	12	11	11	***0.024***	***0.001‡***
Yogurt & fromage frais	7	6	8	7	5	***0.006***	***0.012‡***
Confectionery	11	12	11	12	14	***0.046***	***0.004#***
Fruit juice, including smoothies	9	7	6	5	3	***<0.001***	***<0.001‡***
Soft drinks, not diet	14	16	15	19	23	***<0.001***	***<0.001#***
Intrinsic & milk sugars							
Milk & cream	20	20	21	20	23	*0.197*	*0.080*
Yogurt & fromage frais	8	7	9	8	7	***0.011***	*0.397*
Fruit excluding fruit juice	36	35	35	36	31	***0.019***	***0.005‡***
Sucrose							
Biscuits, cakes & pastries	14	15	13	13	12	***0.041***	***0.002‡***
Yogurt & fromage frais	8	7	8	7	6	***0.004***	***0.008‡***
Fruit excluding fruit juice	13	12	12	11	9	***<0.001***	***<0.001‡***
Confectionery	11	11	11	12	13	***0.048***	***0.007#***
Soft drinks, not diet	9	11	10	13	16	***<0.001***	***<0.001#***
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and the percentage contribution of food groups to nutrient intake

†P-values for the linear association between Scottish Index of Multiple Deprivation quintile and the percentage contribution of food groups to nutrient intake

‡Intake decreases from 1st (least deprived) to 5th (most deprived) quintile

#Intake increases from 1st (least deprived) to 5th (most deprived) quintile

Table 6.9 **Mean percentage contribution of food groups to energy and sugar intake (for food groups contributing ≥5% in all participants), by urban/rural classification**

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Energy							
Pasta, rice, pizza & other cereals	5	5	5	4	5	5	*0.305*
Bread excluding wholemeal	8	7	8	8	8	7	*0.120*
Biscuits, cakes & pastries	8	9	9	9	9	8	*0.493*
Milk & cream	7	7	6	8	7	8	***0.003***
Crisps & savoury snacks	6	7	5	6	5	4	***<0.001***
Total sugars							
Biscuits, cakes & pastries	8	8	8	8	9	8	*0.523*
Milk & cream	9	8	8	9	8	9	*0.052*
Yoghurt & fromage frais	6	7	8	7	7	5	***0.016***
Fruit excluding fruit juice	14	13	15	13	15	15	*0.390*
Confectionery	8	8	7	7	8	6	***0.027***
Soft drinks, not diet	11	10	9	11	9	9	*0.590*
Non-milk extrinsic sugars							
Biscuits, cakes & pastries	11	12	13	12	13	12	*0.692*
Yogurt & fromage frais	6	7	7	7	7	5	*0.238*
Confectionery	12	13	11	11	12	9	***0.026***
Fruit juice, including smoothies	5	5	6	5	7	9	***<0.001***
Soft drinks, not diet	18	17	15	20	16	16	*0.433*
Intrinsic & milk sugars							
Milk & cream	22	20	19	23	20	22	***0.015***
Yogurt & fromage frais	7	8	9	8	8	6	***0.006***
Fruit excluding fruit juice	35	34	36	32	36	37	*0.463*
Sucrose							
Biscuits, cakes & pastries	13	14	14	13	14	13	*0.488*
Yogurt & fromage frais	7	7	8	8	7	6	*0.057*
Fruit excluding fruit juice	12	11	12	10	12	13	*0.428*
Confectionery	12	13	11	10	12	9	***0.024***
Soft drinks, not diet	12	12	10	14	11	12	*0.463*
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and the percentage contribution of food groups to nutrient intake

Table 6.10 **Daily intake of energy and non-milk extrinsic sugars in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by sex and age**

	Sex							
	Boys				Girls			
	4-6	7-10	11-14	15-17	4-6	7-10	11-14	15-17
Energy								
Target								
DRV Estimated Average Requirement (EAR) (MJ)	7.16	8.24	9.27	11.51	6.46	7.28	7.72	8.83
Survey results								
Mean intake (MJ)	7.73	7.81	8.05	8.91	7.60	7.29	7.19	7.55
Lower 95% confidence limit (MJ)	7.41	7.45	7.69	8.20	7.26	7.04	6.80	6.96
Upper 95% confidence limit (MJ)	8.07	8.19	8.43	9.70	7.96	7.56	7.60	8.21
Mean intake (% of EAR)*	109	95	88	78	118	101	94	86
Lower 95% confidence limit	104	91	84	71	113	97	89	79
Upper 95% confidence limit	113	100	92	85	124	105	99	94
Non-milk extrinsic sugars								
Targets								
DRV Population average (% of food energy)†	≤11	≤11	≤11	≤11	≤11	≤11	≤11	≤11
Scottish Dietary Target (% of total energy)	≤10	≤10	≤10	≤10	≤10	≤10	≤10	≤10
Survey results								
Mean intake (% of food energy)	16.2	16.7	18.2	19.8	15.4	16.5	19.0	18.7
Lower 95% confidence limit	15.3	16.1	17.3	18.2	14.4	15.8	17.8	16.8
Upper 95% confidence limit	17.1	17.4	19.3	21.4	16.4	17.2	20.4	20.7
Mean intake (% of DRV population average)	147	152	166	180	140	150	173	170
Lower 95% confidence limit	139	146	157	166	131	144	162	153
Upper 95% confidence limit	155	158	175	194	149	156	185	188
Base (weighted)	*147*	*202*	*227*	*104*	*117*	*196*	*202*	*110*
Base (unweighted)	*161*	*225*	*233*	*68*	*119*	*223*	*219*	*83*

*Calculated for each participant using the EAR appropriate for age group and sex

†The population average of ≤11% of food energy is equivalent to ≤10% of total energy if alcohol intake averages 5% of total energy. This target is for adults.

Table 6.11 **Daily intake of energy and non-milk extrinsic sugars in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by Scottish Index of Multiple Deprivation quintile**

	Scottish Index of Multiple Deprivation quintile				
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)
Energy					
Mean intake (% of EAR)*	93	91	94	99	100
Lower 95% confidence limit	89	88	91	94	96
Upper 95% confidence limit	97	95	98	104	105
Non-milk extrinsic sugars					
Mean intake (% of population average)	150	158	155	164	169
Lower 95% confidence limit	144	149	149	157	161
Upper 95% confidence limit	157	167	161	172	177
Base (weighted)	*281*	*258*	*237*	*254*	*260*
Base (unweighted)	*296*	*272*	*250*	*254*	*241*

*Calculated for each participant using the EAR appropriate for age group and sex

Table 6.12 **Daily intake of energy and non-milk extrinsic sugars in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by urban/rural classification**

	Urban/rural classification					
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural
Energy						
Mean intake (% of EAR)*	97	94	95	101	91	[94]
Lower 95% confidence limit	94	91	90	93	87	[86]
Upper 95% confidence limit	101	98	101	109	96	[104]
Non-milk extrinsic sugars						
Mean intake (% of population average)	159	162	155	159	158	[155]
Lower 95% confidence limit	152	156	147	147	148	[144]
Upper 95% confidence limit	166	168	163	171	168	[168]
Base (weighted)	*441*	*428*	*147*	*73*	*176*	*42*
Base (unweighted)	*425*	*444*	*153*	*74*	*188*	*47*

*Calculated for each participant using the EAR appropriate for age group and sex

7 INTAKE OF OTHER NUTRIENTS

This chapter describes the intake of total fat, saturated fatty acids, carbohydrate, protein, non-starch polysaccharides, iron and calcium for all children and by age, sex, deprivation and urban/rural classification. Intakes are also compared to Dietary Reference Values and Scottish Dietary Targets. The full list of the food groups and their contribution to total fat and saturated fatty acids intake are given in Appendix H.

7.1 Intake of other nutrients

The intake of other macronutrients, expressed as percentage of food energy and as grams per day (g/d), and of non-starch polysaccharides as g/d and iron and calcium as milligrams per day (mg/d) in all children and in sub-groups divided by age and sex is shown in Table 7.1. Statistical significance of differences between sexes and associations with age group shown in Tables 7.1a and 7.1b.

In all children the mean intake of total fat as a percentage of food energy was 32.9% with saturated fatty acids providing 13.8% of food energy. Carbohydrate and protein contributed 53.6% and 13.1% of food energy respectively.

7.1.1 Intake of other nutrients by age and sex

There were no significant differences in the percentage food energy from total fat, saturated fatty acids, carbohydrate or protein between boys and girls, though the amounts of these nutrients as g/d was significantly higher in boys as a result of their higher energy intake (see Chapter 6). The intake of non-starch polysaccharides was not significantly different between boys and girls but the intake of iron and calcium was significantly higher in boys than girls. There were significant linear associations between age group and the contribution of saturated fatty acids, carbohydrate and protein to food energy with the contribution of saturated fatty acids and protein decreasing with age and the contribution of carbohydrate increasing with age. There was also a significant decrease in the intake of protein (g/d) and of calcium (mg/d) with increasing age.

Tables 7.1, 7.1a, 7.1b

7.1.2 Intake of other nutrients by Scottish Index of Multiple Deprivation

Intake of other nutrients by quintile of SIMD is shown in Table 7.2. There were no significant associations between SIMD quintile and the contribution of total fat, saturated fatty acids or carbohydrate to food energy intake. There was a significant linear association between SIMD quintile and the contribution of protein to food energy intake with lower values in children in the more deprived quintiles. The higher energy intake in children in the more deprived quintiles (see Chapter 6) was reflected in the higher intakes of total fat, saturated fatty acids and carbohydrate (g/d) but no difference in protein intake (g/d) in children in the more deprived quintiles. There was no significant association between protein (g/d), non-starch polysaccharides (g/d), iron or calcium (mg/d) intake and SIMD quintile.

Table 7.2

7.1.3 Intake of other nutrients by urban/rural classification

Intake of other nutrients by urban/rural area of residence is shown in Table 7.3. There were no significant associations between area of residence and the percentage of food energy from total fat, saturated fatty acids, carbohydrate or protein or in the absolute intakes of total fat, saturated fatty acids, carbohydrate, non-starch polysaccharides (g/d) or of iron or calcium (mg/d). There was a significant association with the intake of protein (g/d) with the highest value in the children in the remote rural areas and lowest value in the children in the accessible rural areas.

Table 7.3

7.2 Contribution of food groups to intake of other nutrients

Table 7.4 shows the food groups which contributed 5% or more to the intake of total fat, saturated fatty acids, carbohydrate, protein, non-starch polysaccharides, iron and calcium. The full list of the food groups and their contribution to total fat and saturated fatty acids intake are given in Appendix H.

The food groups contributing the highest proportion of total fat intake were biscuits, cakes and pastries (10%) and crisps and savoury snacks (9%). For saturated fatty acids the food groups providing the highest proportion were milk and cream (12%) and biscuits, cakes and pastries (10%). Bread excluding wholemeal and biscuits, cakes and pastries contributed 10% and 9% to total carbohydrate intake respectively. The main source of protein was milk and cream (14%) followed by meat and meat dishes (excluding processed meat) (10%). For non-starch polysaccharides the major food sources were fruit (16%) and bread excluding wholemeal (13%). Unsweetened breakfast cereals and bread excluding wholemeal contributed 13% and 11% of iron intake respectively, while calcium was derived principally from milk and cream (29%) with bread excluding wholemeal and yogurt and fromage frais each contributing 9%.

Table 7.4

7.2.1 Contribution of food groups to intake of other nutrients by age and sex

There were significant differences in these values between boys and girls for many food groups but the magnitude of these differences was small (Table 7.4a). The differences in the values between age groups were more substantial, particularly for milk and cream (decreasing contribution to total fat, saturated fatty acids, protein and calcium with age); fruit (decreasing contribution to carbohydrate and non-starch polysaccharides with age group); confectionery (increasing contribution to saturated fatty acids with age group) and unsweetened breakfast cereals (decreasing contribution to iron intake with age group).

Tables 7.4, 7.4a, 7.4b

7.2.2 Contribution of food groups to intake of other nutrients by Scottish Index of Multiple Deprivation

The contribution of food groups to the intake of total fat, saturated fatty acids, carbohydrate, protein, non-starch polysaccharides, iron and calcium by quintile of SIMD is shown in Table 7.5. There were significant overall associations and linear associations between SIMD quintile and the percentage contribution of several food groups to the intake of many other nutrients, particularly processed meats (higher contribution to total fat, saturated fatty acids and protein in the more deprived quintiles), crisps and savoury snacks (higher contribution to total fat, saturated fatty acids and carbohydrate in the more deprived quintiles); fruit (lower contribution to carbohydrate and non-starch polysaccharides intake in the more deprived quintiles); non-diet soft drinks (higher contribution to carbohydrate intake in the more deprived quintiles) and vegetables, excluding potatoes and baked beans (lower contribution to non-starch polysaccharides intake in the more deprived quintiles).

Table 7.5

7.2.3 Contribution of food groups to intake of other nutrients by urban/rural classification

There were significant associations between urban and rural areas and the contribution of food groups to the intake of many other nutrients. These were most marked for the contribution of processed meats to protein intake (8% in urban areas vs. 5% in remote rural areas) and the contribution of vegetables, excluding potatoes and baked beans, to non-starch polysaccharides intake (8% in smaller urban areas and accessible small towns vs. 12% in the remote rural areas).

Table 7.6

7.3 Comparison of intake of other nutrients with Dietary Reference Values and Scottish Dietary Targets

7.3.1 Comparison of intake of other nutrients with Dietary Reference Values and Scottish Dietary Targets by age and sex

Table 7.7 Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by sex and age
shows the mean daily intake of fat, saturated fatty acids and carbohydrate as percentage of food energy. The mean daily intake of protein and non-starch polysaccharides (g/d), and the mean intake of iron and calcium (mg/d) are also presented and compared with the recommended levels in the four age bands used in the DRV report.

The mean intake of total fat as percentage of food energy was lower than the DRV population average and that recommended in the Scottish Dietary Targets (35% and ≤35% respectively) in all age and sex groups. However, the mean intake of saturated fatty acids was above the recommended levels in all age and sex groups.

The mean carbohydrate intake as percentage of food energy was a little above the recommended levels in all age and sex groups. The mean protein intake (g/d) was above the recommended level in all age and sex groups, particularly in the younger age groups. The mean intake of non-starch polysaccharides was below the recommended intake and close to the individual minimum for adults in all age and sex groups.

The mean iron intake (mg/d) was above the recommended level in younger children but below the recommended level in older children, particularly older girls, while the mean intake of calcium was above the recommended level for all age and sex groups, particularly the younger children.

Table 7.7

7.3.2 Comparison of intake of other nutrients with Dietary Reference Values and Scottish Dietary Targets by Scottish Index of Multiple Deprivation and urban/rural classification.

There were no clear patterns of adequacy of the intake of other nutrients between the SIMD quintiles (Table 7.8) or for urban/rural area of residence (Table 7.9).

Table 7.8, Table 7.9

Table 7.1 **Daily intake of other nutrients, by sex and age**

	Sex											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
% of food energy												
Total fat												
Mean	32.7	32.9	32.9	32.9	33.3	32.9	32.9	33.0	33.0	32.9	32.9	32.9
Lower 95% confidence limit	32.3	32.3	32.2	32.5	32.8	32.2	32.3	32.7	32.7	32.4	32.4	32.7
Upper 95% confidence limit	33.2	33.5	33.7	33.2	33.9	33.5	33.6	33.4	33.4	33.3	33.5	33.2
Saturated fatty acids												
Mean	14.2	13.9	13.7	13.9	14.3	13.6	13.4	13.7	14.2	13.7	13.6	13.8
Lower 95% confidence limit	13.9	13.5	13.3	13.7	14.0	13.3	13.1	13.5	14.0	13.5	13.3	13.7
Upper 95% confidence limit	14.5	14.3	14.2	14.2	14.6	13.9	13.7	13.9	14.4	14.0	13.8	14.0
Carbohydrate												
Mean	53.1	53.6	54.0	53.6	52.6	53.7	54.4	53.7	52.9	53.7	54.2	53.6
Lower 95% confidence limit	52.6	52.9	53.2	53.2	52.0	53.1	53.6	53.2	52.5	53.2	53.6	53.3
Upper 95% confidence limit	53.8	54.4	54.8	54.1	53.3	54.3	55.2	54.1	53.4	54.2	54.8	54.0
Protein												
Mean	13.7	13.1	12.7	13.2	13.7	13.1	12.3	12.9	13.7	13.1	12.5	13.1
Lower 95% confidence limit	13.5	12.8	12.4	13.0	13.4	12.8	11.9	12.7	13.5	12.9	12.2	12.9
Upper 95% confidence limit	14.0	13.4	13.1	13.4	13.9	13.4	12.7	13.2	13.9	13.3	12.8	13.2
Grams												
Total fat												
Mean	68.7	68.6	73.2	70.4	67.1	64.2	63.8	64.9	67.9	66.4	68.4	67.7
Lower 95% confidence limit	66.2	64.8	69.6	68.2	64.2	61.5	60.7	62.9	66.0	63.9	65.9	66.1
Upper 95% confidence limit	71.4	72.6	77.1	72.7	70.0	67.0	67.2	67.0	70.0	69.1	71.0	69.4
Saturated fatty acids												
Mean	29.9	29.1	30.8	30.0	28.8	26.6	26.2	27.1	29.4	27.9	28.4	28.6
Lower 95% confidence limit	28.8	27.4	29.2	29.0	27.6	25.5	24.8	26.2	28.5	26.8	27.3	27.9
Upper 95% confidence limit	31.2	31.0	32.5	31.1	30.2	27.9	27.7	28.0	30.4	29.1	29.6	29.3
Carbohydrate												
Mean	259	261	280	268	247	244	247	246	254	253	263	257
Lower 95% confidence limit	249	249	266	261	238	234	234	239	247	244	253	252
Upper 95% confidence limit	270	273	295	275	257	255	261	254	261	262	274	263
Protein												
Mean	63.1	59.9	62.0	61.8	60.4	56.2	52.5	55.9	61.8	58.1	57.2	58.9
Lower 95% confidence limit	60.6	56.7	59.0	59.9	58.0	53.6	50.2	54.3	60.0	55.8	55.2	57.5
Upper 95% confidence limit	65.6	63.2	65.2	63.7	62.8	58.9	55.0	57.4	63.7	60.5	59.2	60.2
Non-starch polysaccharides												
Mean	13.0	12.6	12.7	12.8	12.8	12.4	11.9	12.3	12.9	12.5	12.3	12.5
Lower 95% confidence limit	12.4	11.9	12.0	12.4	12.2	11.8	11.3	11.9	12.5	12.0	11.8	12.3
Upper 95% confidence limit	13.7	13.3	13.4	13.2	13.3	13.1	12.5	12.7	13.3	13.0	12.8	12.8
Milligrams												
Iron												
Mean	9.9	9.7	10.0	9.9	9.2	8.8	8.3	8.7	9.5	9.3	9.1	9.3
Lower 95% confidence limit	9.4	9.2	9.4	9.5	8.8	8.3	7.9	8.4	9.2	8.9	8.7	9.1
Upper 95% confidence limit	10.4	10.2	10.6	10.2	9.5	9.3	8.8	9.0	9.9	9.7	9.5	9.5
Calcium												
Mean	1109	1021	1044	1058	1034	935	851	928	1074	979	945	994
Lower 95% confidence limit	1059	953	988	1024	984	887	804	899	1037	934	907	970
Upper 95% confidence limit	1161	1094	1102	1093	1087	985	901	958	1111	1026	984	1018
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

Table 7.1a P-values for differences between sexes in daily intake of other nutrients, by age

	Age			
	3-7	8-11	12-17	All
% of food energy				
Total fat	0.108	0.904	0.986	0.503
Saturated fatty acids	0.781	0.149	0.130	0.073
Carbohydrate	0.242	0.841	0.443	0.852
Protein	0.768	0.976	**0.045**	0.052
Grams				
Total fat	0.365	**0.041**	**<0.001**	**<0.001**
Saturated fatty acids	0.195	**0.013**	**<0.001**	**<0.001**
Carbohydrate	0.099	**0.033**	**0.001**	**<0.001**
Protein	0.090	0.051	**<0.001**	**<0.001**
Non-starch polysaccharides	0.566	0.737	0.082	0.098
Milligrams				
Iron	**0.022**	**0.004**	**<0.001**	**<0.001**
Calcium	**0.042**	**0.036**	**<0.001**	**<0.001**

Table 7.1b P-values for associations between age group and daily intake of other nutrients, by sex

	Sex					
	Boys		Girls		Both boys & girls	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
% of food energy						
Total fat	0.883	0.721	0.527	0.390	0.903	0.796
Saturated fatty acids	0.122	0.069	**0.001**	**<0.001***	**<0.001**	**<0.001***
Carbohydrate	0.323	0.140	**0.004**	**0.001†**	**0.003**	**0.001†**
Protein	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Grams						
Total fat	0.050	**0.020†**	0.250	0.148	0.491	0.681
Saturated fatty acids	0.343	0.324	**0.023**	**0.012***	0.111	0.158
Carbohydrate	0.050	**0.020†**	0.910	0.998	0.258	0.104
Protein	0.306	0.628	**<0.001**	**<0.001***	**0.001**	**0.001***
Non-starch polysaccharides	0.696	0.533	0.063	**0.020***	0.148	0.067
Milligrams						
Iron	0.797	0.805	**0.015**	**0.007***	0.155	0.095
Calcium	0.077	0.110	**<0.001**	**<0.001***	**<0.001**	**<0.001***

*Intake decreases with age group
†Intake increases with age group

Table 7.2 Daily intake of other nutrients, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value*†
% of food energy							
Total fat							
Mean	32.8	32.7	32.9	32.8	33.4	*0.616*	*0.164*
Lower 95% confidence limit	32.3	32.3	32.3	32.2	32.8		
Upper 95% confidence limit	33.3	33.2	33.5	33.3	34.1		
Saturated fatty acids							
Mean	13.8	13.8	13.8	13.8	14.0	*0.925*	*0.545*
Lower 95% confidence limit	13.4	13.6	13.5	13.5	13.6		
Upper 95% confidence limit	14.2	14.1	14.1	14.1	14.3		
Carbohydrate							
Mean	53.4	53.7	53.4	54.1	53.7	*0.444*	*0.349*
Lower 95% confidence limit	52.7	53.1	52.7	53.5	52.9		
Upper 95% confidence limit	54.1	54.2	54.0	54.7	54.6		
Protein							
Mean	13.4	13.2	13.4	12.8	12.5	***<0.001***	***<0.001***‡
Lower 95% confidence limit	13.2	12.9	13.1	12.5	12.1		
Upper 95% confidence limit	13.7	13.4	13.7	13.1	12.9		
Grams							
Total fat							
Mean	65.9	65.7	65.4	70.3	71.5	***0.013***	***0.001***#
Lower 95% confidence limit	63.4	63.4	63.0	66.2	68.4		
Upper 95% confidence limit	68.6	68.1	68.0	74.7	74.7		
Saturated fatty acids							
Mean	27.8	27.8	27.6	29.8	30.1	***0.022***	***0.003***#
Lower 95% confidence limit	26.5	26.8	26.6	28.0	28.8		
Upper 95% confidence limit	29.1	28.9	28.6	31.7	31.5		
Carbohydrate							
Mean	250	251	248	272	268	***0.004***	***0.001***#
Lower 95% confidence limit	242	241	239	258	255		
Upper 95% confidence limit	258	260	256	286	281		
Protein							
Mean	59.3	57.9	58.3	60.2	58.6	*0.822*	*0.886*
Lower 95% confidence limit	57.0	55.8	56.3	56.7	55.8		
Upper 95% confidence limit	61.7	60.1	60.4	64.0	61.5		
Non-starch polysaccharides							
Mean	13.0	12.4	12.2	12.9	12.1	*0.152*	*0.187*
Lower 95% confidence limit	12.3	11.9	11.8	12.4	11.6		
Upper 95% confidence limit	13.7	12.9	12.7	13.6	12.7		
Milligrams							
Iron							
Mean	9.3	9.1	9.0	9.7	9.3	*0.285*	*0.461*
Lower 95% confidence limit	8.9	8.7	8.6	9.2	8.8		
Upper 95% confidence limit	9.8	9.5	9.4	10.3	9.9		
Calcium							
Mean	1002	984	990	1009	986	*0.967*	*0.917*
Lower 95% confidence limit	953	941	943	946	933		
Upper 95% confidence limit	1053	1029	1039	1075	1042		
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-value for the overall association between Scottish Index of Multiple Deprivation quintile and nutrient intake. † P-value for the linear association between Scottish Index of Multiple Deprivation quintile and nutrient intake. ‡Intake decreases from 1st (least deprived) to 5th (most deprived) quintile. #Intake increases from 1st (least deprived) to 5th (most deprived) quintile

Table 7.3 Daily intake of other nutrients, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
% of food energy							
Total fat							
Mean	33.2	33.0	32.5	32.5	32.6	33.2	*0.306*
Lower 95% confidence limit	32.8	32.5	31.7	31.3	32.1	32.0	
Upper 95% confidence limit	33.6	33.5	33.2	33.7	33.2	34.4	
Saturated fatty acids							
Mean	13.9	13.9	13.6	13.7	13.7	13.9	*0.647*
Lower 95% confidence limit	13.6	13.6	13.1	13.0	13.4	13.3	
Upper 95% confidence limit	14.2	14.1	14.1	14.5	14.0	14.5	
Carbohydrate							
Mean	53.3	53.8	53.9	54.0	53.8	52.8	*0.389*
Lower 95% confidence limit	52.7	53.3	52.9	52.7	53.2	51.7	
Upper 95% confidence limit	54.0	54.4	54.9	55.2	54.5	53.8	
Protein							
Mean	13.1	12.8	13.3	13.1	13.2	13.6	*0.050*
Lower 95% confidence limit	12.8	12.5	13.0	12.6	12.8	13.3	
Upper 95% confidence limit	13.4	13.1	13.6	13.7	13.5	14.0	
Grams							
Total fat							
Mean	69.1	67.7	65.5	70.4	64.5	69.8	*0.222*
Lower 95% confidence limit	66.8	64.9	61.6	64.2	61.6	64.6	
Upper 95% confidence limit	71.6	70.6	69.8	77.3	67.6	75.5	
Saturated fatty acids							
Mean	29.2	28.6	27.6	29.9	27.2	29.3	*0.198*
Lower 95% confidence limit	28.1	27.4	25.8	27.1	26.1	26.9	
Upper 95% confidence limit	30.3	29.9	29.6	33.1	28.4	31.9	
Carbohydrate							
Mean	258	258	253	273	248	259	*0.163*
Lower 95% confidence limit	248	250	239	259	237	251	
Upper 95% confidence limit	270	266	269	288	261	267	
Protein							
Mean	59.8	57.5	59.0	62.7	57.2	62.9	***0.026***
Lower 95% confidence limit	57.5	55.3	55.5	57.6	54.5	60.1	
Upper 95% confidence limit	62.2	59.8	62.6	68.3	60.1	65.7	
Non-starch polysaccharides							
Mean	12.6	12.2	12.7	13.1	12.5	13.2	*0.470*
Lower 95% confidence limit	12.2	11.8	11.8	12.0	11.8	12.5	
Upper 95% confidence limit	13.1	12.7	13.6	14.3	13.3	13.8	
Milligrams							
Iron							
Mean	9.4	9.1	9.4	9.8	9.2	9.5	*0.535*
Lower 95% confidence limit	9.0	8.7	8.6	8.8	8.6	9.2	
Upper 95% confidence limit	9.9	9.4	10.1	10.8	9.8	9.9	
Calcium							
Mean	998	987	985	1093	957	1041	*0.072*
Lower 95% confidence limit	957	941	916	1007	905	986	
Upper 95% confidence limit	1040	1036	1059	1185	1013	1099	
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and nutrient intake

Table 7.4 **Mean percentage contribution of food groups to intake of other nutrients (for food groups contributing ≥5% in all participants), by sex and age**

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Total fat												
Biscuits, cakes & pastries	10	11	11	11	9	11	10	10	10	11	10	10
Milk & cream	10	8	8	8	9	7	6	7	10	7	7	8
Processed meat, including sausages, burgers, coated chicken	8	8	8	8	8	7	7	7	8	7	7	8
Crisps & savoury snacks	8	11	8	9	9	11	10	10	8	11	9	9
Saturated fatty acids												
Biscuits, cakes & pastries	10	11	11	11	9	11	10	10	10	11	10	10
Milk & cream	15	12	12	13	14	10	9	11	15	11	10	12
Cheese	7	5	4	5	6	6	5	6	7	6	4	5
Yogurt & fromage frais	8	7	4	6	8	7	4	6	8	7	4	6
Processed meat, including sausages, burgers, coated chicken	7	7	7	7	7	6	7	7	7	6	7	7
Crisps & savoury snacks	7	9	7	8	8	10	9	9	7	10	8	8
Confectionery	4	4	7	5	4	4	8	5	4	4	8	5
Carbohydrate												
Pasta, rice, pizza & other cereals	5	5	5	5	5	6	6	6	5	5	5	5
Bread excluding wholemeal	10	11	10	10	10	10	10	10	10	11	10	10
Biscuits, cakes & pastries	9	9	9	9	8	9	8	8	9	9	9	9
Crisps & savoury snacks	4	5	4	4	5	6	5	5	4	5	4	5
Fruit excluding fruit juice	9	7	5	7	10	9	7	8	10	8	6	8
Soft drinks, not diet	4	5	7	5	4	5	7	5	4	5	7	5
Protein												
Pasta, rice, pizza & other cereals	4	4	5	4	4	5	5	5	4	5	5	5
Bread excluding wholemeal	8	9	8	8	8	8	8	8	8	8	8	8
Milk & cream	16	14	15	15	15	13	12	13	16	14	13	14
Yogurt & fromage frais	7	6	4	6	7	6	4	6	7	6	4	6
Meats & meat dishes, excluding processed meat	9	11	11	10	10	11	11	11	10	11	11	10
Processed meat, including sausages, burgers, coated chicken	7	8	8	8	8	7	7	7	7	7	7	7
Non-starch polysaccharides												
Pasta, rice, pizza & other cereals	6	5	6	6	6	6	6	6	6	6	6	6
Bread excluding wholemeal	12	14	13	13	12	12	12	12	12	13	13	13
Biscuits, cakes & pastries	6	6	6	6	5	6	5	5	5	6	6	6
Vegetables, excluding potatoes & baked beans	9	7	8	8	9	9	10	9	9	8	9	9
Crisps & savoury snacks	5	8	6	6	6	8	7	7	6	8	7	7
Fruit excluding fruit juice	17	15	12	14	20	18	14	17	19	17	13	16
Iron												
Pasta, rice, pizza & other cereals	5	4	5	5	5	5	5	5	5	5	5	5
Bread excluding wholemeal	10	11	11	11	10	10	11	10	10	11	11	11
Unsweetened breakfast cereals, including muesli	17	13	12	14	15	12	10	12	16	13	11	13
Biscuits, cakes & pastries	7	8	8	8	7	8	8	8	7	8	8	8
Calcium												
Bread excluding wholemeal	8	9	9	9	8	9	9	9	8	9	9	9
Milk & cream	32	30	30	31	31	28	26	28	32	29	28	29
Cheese	6	5	4	5	6	6	5	5	6	6	4	5
Yoghurt & fromage frais	11	10	7	9	10	10	7	9	10	10	7	9
Base (weighted)	*234*	*203*	*281*	*719*	*202*	*185*	*273*	*660*	*436*	*388*	*554*	*1379*
Base (unweighted)	*237*	*230*	*252*	*719*	*200*	*209*	*263*	*672*	*437*	*439*	*515*	*1391*

Table 7.4a **P-values for differences between sexes in the percentage contribution of food groups to intake of other nutrients (for food groups contributing ≥5% in all participants), by age**

	Age			
	3-7	8-11	12-17	All
Total fat				
Biscuits, cakes & pastries	0.303	0.444	0.097	**0.037**
Milk & cream	0.208	**0.031**	**0.001**	**<0.001**
Processed meat, including sausages, burgers, coated chicken	0.799	0.154	0.157	0.125
Crisps & savoury snacks	**0.039**	0.465	0.094	**0.014**
Saturated fatty acids				
Biscuits, cakes & pastries	0.435	0.345	0.084	**0.036**
Milk & cream	0.254	**0.039**	**0.003**	**0.001**
Cheese	0.512	0.112	0.462	0.466
Yogurt & fromage frais	0.807	0.956	0.449	0.803
Processed meat, including sausages, burgers, coated chicken	0.684	0.218	0.209	0.250
Crisps & savoury snacks	**0.032**	0.275	0.057	**0.005**
Confectionery	0.686	0.756	0.121	0.162
Carbohydrate				
Pasta, rice, pizza & other cereals	0.794	**0.006**	0.062	**0.005**
Bread excluding wholemeal	0.511	0.112	0.369	0.368
Biscuits, cakes & pastries	0.722	0.500	0.112	0.077
Crisps & savoury snacks	**0.004**	0.300	0.068	**0.003**
Fruit excluding fruit juice	**0.020**	**0.005**	**0.017**	**<0.001**
Soft drinks, not diet	0.454	0.934	0.491	0.935
Protein				
Pasta, rice, pizza & other cereals	0.885	**0.006**	**0.011**	**0.002**
Bread excluding wholemeal	0.743	0.125	0.784	0.546
Milk & cream	0.375	0.179	**0.004**	**0.002**
Yogurt & fromage frais	0.958	0.819	0.376	0.850
Meats & meat dishes, excluding processed meat	0.207	0.755	0.823	0.401
Processed meat, including sausages, burgers, coated chicken	0.790	0.142	0.215	0.160
Non-starch polysaccharides				
Pasta, rice, pizza & other cereals	0.970	0.053	0.294	0.059
Bread excluding wholemeal	0.932	**0.014**	0.095	**0.029**
Biscuits, cakes & pastries	0.657	0.292	**0.037**	**0.024**
Vegetables, excluding potatoes & baked beans	0.385	**0.004**	**0.002**	**<0.001**
Crisps & savoury snacks	**0.018**	0.634	0.148	**0.028**
Fruit excluding fruit juice	**0.006**	**0.001**	**0.011**	**<0.001**
Iron				
Pasta, rice, pizza & other cereals	0.395	**0.001**	**0.009**	**<0.001**
Bread excluding wholemeal	0.473	0.203	0.661	0.693
Unsweetened breakfast cereals, including muesli	0.258	0.552	0.268	0.089
Biscuits, cakes & pastries	0.945	0.765	0.634	0.887
Calcium				
Bread excluding wholemeal	0.691	0.274	0.829	0.962
Milk & cream	0.608	0.264	**0.003**	**0.003**
Cheese	0.713	0.115	0.191	0.181
Yoghurt & fromage frais	0.963	0.850	0.218	0.539

Table 7.4b P-values for associations between age group and the percentage contribution of food groups to intake of other nutrients (for food groups contributing ≥5% in all participants), by sex

	Sex					
	Boys		Girls		All	
	Overall association	Linear association	Overall association	Linear association	Overall association	Linear association
Total fat						
Biscuits, cakes & pastries	0.139	0.155	0.144	0.493	**0.030**	0.153
Milk & cream	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Processed meat, including sausages, burgers, coated chicken	0.914	0.697	0.142	0.084	0.203	0.103
Crisps & savoury snacks	**<0.001**	0.352	**<0.001**	0.210	**<0.001**	0.155
Saturated fatty acids						
Biscuits, cakes & pastries	**0.034**	0.088	0.110	0.477	**0.009**	0.100
Milk & cream	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Cheese	**<0.001**	**<0.001***	**<0.001**	**0.001***	**<0.001**	**<0.001***
Yogurt & fromage frais	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Processed meat, including sausages, burgers, coated chicken	0.436	0.206	0.393	0.688	0.455	0.607
Crisps & savoury snacks	**<0.001**	0.200	**<0.001**	0.072	**<0.001**	**0.045**†
Confectionery	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Carbohydrate						
Pasta, rice, pizza & other cereals	0.642	0.970	0.240	0.207	0.697	0.396
Bread excluding wholemeal	0.169	0.535	0.672	0.383	0.327	0.822
Biscuits, cakes & pastries	0.366	0.404	0.470	0.586	0.245	0.842
Crisps & savoury snacks	**0.002**	0.568	**0.011**	0.779	**<0.001**	0.544
Fruit, excluding fruit juice	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Soft drinks, not diet	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†	**<0.001**	**<0.001**†
Protein						
Pasta, rice, pizza & other cereals	0.310	0.172	**<0.001**	**<0.001**†	**0.006**	**0.002**†
Bread excluding wholemeal	**0.030**	**0.033**†	0.429	0.191	**0.025**	**0.017**†
Milk & cream	0.052	0.085	**0.002**	**<0.001***	**<0.001**	**<0.001***
Yogurt & fromage frais	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Meats & meat dishes, excluding processed meat	**0.012**	**0.006**†	0.165	0.138	**0.002**	**0.002**†
Processed meat, including sausages, burgers, coated chicken	0.863	0.682	0.486	0.308	0.861	0.596
Non-starch polysaccharides						
Pasta, rice, pizza & other cereals	0.329	0.217	**0.039**	**0.020**†	0.092	**0.028**†
Bread excluding wholemeal	0.063	0.057	0.925	0.768	0.206	0.125
Biscuits, cakes & pastries	0.479	0.274	0.707	0.576	0.537	0.706
Vegetables, excluding potatoes & baked beans	**0.015**	**0.025***	0.411	0.712	**0.029**	0.228
Crisps & savoury snacks	**<0.001**	0.077	**0.007**	0.103	**<0.001**	**0.039**†
Fruit, excluding fruit juice	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Iron						
Pasta, rice, pizza & other cereals	0.542	0.611	0.058	**0.038**†	0.253	0.096
Bread excluding wholemeal	0.086	0.084	0.924	0.697	0.184	0.127
Unsweetened breakfast cereals, including muesli	**<0.001**	**0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***
Biscuits, cakes & pastries	0.282	0.145	0.307	0.428	0.071	0.138
Calcium						
Bread excluding wholemeal	**0.013**	**0.007**†	0.105	**0.031**†	**0.003**	**0.001**†
Milk & cream	0.069	0.216	**0.003**	**0.001***	**<0.001**	**<0.001***
Cheese	**0.001**	**<0.001***	**0.025**	**0.041***	**<0.001**	**<0.001***
Yoghurt & fromage frais	**<0.001**	**<0.001***	**<0.001**	**<0.001***	**<0.001**	**<0.001***

*Intake decreases with age group
†Intake increases with age group

Table 7.5 Mean percentage contribution of food groups to intake of other nutrients (for food groups contributing ≥5% in all participants), by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Total fat							
Biscuits, cakes & pastries	10	11	10	10	10	*0.104*	***0.010***‡
Milk & cream	8	8	8	7	8	*0.370*	*0.583*
Processed meat, including sausages, burgers, coated chicken	7	7	8	8	9	***<0.001***	***<0.001***#
Crisps & savoury snacks	7	9	9	10	11	***0.001***	***<0.001***#
Saturated fatty acids							
Biscuits, cakes & pastries	10	11	10	10	10	*0.195*	***0.047***‡
Milk & cream	12	12	12	11	12	*0.312*	*0.622*
Cheese	6	6	6	5	5	***0.045***	***0.005***‡
Yogurt & fromage frais	6	6	7	6	5	***0.001***	***0.038***‡
Processed meat, including sausages, burgers, coated chicken	6	6	7	7	8	***<0.001***	***<0.001***#
Crisps & savoury snacks	7	7	8	9	10	***0.002***	***<0.001***#
Confectionery	5	5	5	5	6	***0.022***	***0.029***#
Carbohydrate							
Pasta, rice, pizza & other cereals	6	5	5	5	5	***<0.001***	***<0.001***‡
Bread excluding wholemeal	10	10	10	10	11	*0.800*	*0.449*
Biscuits, cakes & pastries	9	9	9	8	8	*0.140*	***0.015***‡
Crisps & savoury snacks	4	4	5	5	6	***0.002***	***<0.001***#
Fruit excluding fruit juice	9	8	8	7	6	***<0.001***	***<0.001***‡
Soft drinks, not diet	4	5	5	6	7	***<0.001***	***<0.001***#
Protein							
Pasta, rice, pizza & other cereals	5	5	4	4	4	*0.051*	***0.023***‡
Bread excluding wholemeal	8	8	8	8	9	*0.213*	*0.076*
Milk & cream	14	14	15	13	15	*0.440*	*0.762*
Yogurt & fromage frais	6	5	6	6	5	***0.005***	*0.113*
Meats & meat dishes, excluding processed meat	10	10	11	10	11	*0.416*	*0.253*
Processed meat, including sausages, burgers, coated chicken	6	7	7	8	8	***<0.001***	***<0.001***#
Non-starch polysaccharides							
Pasta, rice, pizza & other cereals	6	6	6	6	6	*0.129*	*0.166*
Bread excluding wholemeal	12	12	12	13	14	*0.098*	***0.016***#
Biscuits, cakes & pastries	6	6	6	5	5	*0.664*	*0.260*
Vegetables, excluding potatoes & baked beans	10	9	9	7	7	***<0.001***	***<0.001***‡
Crisps & savoury snacks	5	6	7	8	9	***<0.001***	***<0.001***#
Fruit excluding fruit juice	17	16	16	16	13	***0.003***	***0.001***‡
Iron							
Pasta, rice, pizza & other cereals	5	5	5	5	5	***0.030***	***0.008***‡
Bread excluding wholemeal	10	10	10	11	11	*0.415*	*0.116*
Unsweetened breakfast cereals, including muesli	13	13	13	14	13	*0.809*	*0.881*
Biscuits, cakes & pastries	8	9	8	8	7	*0.218*	***0.029***‡
Calcium							
Bread excluding wholemeal	8	9	8	9	10	*0.175*	***0.033***#
Milk & cream	30	29	30	28	30	*0.229*	*0.832*
Cheese	6	5	5	5	5	*0.258*	*0.052*
Yoghurt & fromage frais	9	9	10	9	7	***0.003***	*0.101*
Base (weighted)	*303*	*264*	*247*	*270*	*277*		
Base (unweighted)	*315*	*278*	*259*	*268*	*253*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and the percentage contribution of food groups to nutrient intake. †P-values for the linear association between Scottish Index of Multiple Deprivation quintile and the percentage contribution of food groups to nutrient intake. ‡Intake decreases from 1st (least deprived) to 5th (most deprived) quintile. #Intake increases from 1st (least deprived) to 5th (most deprived) quintile

Table 7.6 Mean percentage contribution of food groups to intake of other nutrients (for food groups contributing ≥5% in all participants), by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Total fat							
Biscuits, cakes & pastries	10	10	11	10	11	10	*0.332*
Milk & cream	8	7	7	9	8	10	***0.002***
Processed meat, including sausages, burgers, coated chicken	8	8	8	7	7	5	***<0.001***
Crisps & savoury snacks	9	11	9	10	8	7	***<0.001***
Saturated fatty acids							
Biscuits, cakes & pastries	10	10	11	10	11	10	*0.198*
Milk & cream	13	11	11	13	12	14	***0.010***
Cheese	5	5	7	5	6	7	***0.004***
Yogurt & fromage frais	5	6	6	6	6	5	*0.076*
Processed meat, including sausages, burgers, coated chicken	7	7	7	6	6	5	***<0.001***
Crisps & savoury snacks	8	9	8	8	7	6	***<0.001***
Confectionery	5	6	5	4	5	4	***0.002***
Carbohydrate							
Pasta, rice, pizza & other cereals	5	5	5	5	6	6	*0.353*
Bread excluding wholemeal	10	10	11	11	10	10	*0.083*
Biscuits, cakes & pastries	8	9	9	9	9	9	*0.633*
Crisps & savoury snacks	5	5	4	5	4	4	***<0.001***
Fruit excluding fruit juice	8	7	8	7	8	9	*0.449*
Soft drinks, not diet	6	5	4	6	5	5	*0.456*
Protein							
Pasta, rice, pizza & other cereals	5	5	5	4	5	4	*0.170*
Bread excluding wholemeal	8	8	9	9	8	8	*0.059*
Milk & cream	15	14	13	16	14	16	***0.012***
Yogurt & fromage frais	5	6	6	6	6	4	***0.008***
Meats & meat dishes, excluding processed meat	10	10	10	11	10	11	*0.843*
Processed meat, including sausages, burgers, coated chicken	8	8	7	7	7	5	***<0.001***
Non-starch polysaccharides							
Pasta, rice, pizza & other cereals	6	6	6	5	6	6	*0.679*
Bread excluding wholemeal	12	12	14	14	12	12	*0.060*
Biscuits, cakes & pastries	5	6	5	6	6	6	*0.460*
Vegetables, excluding potatoes & baked beans	9	8	8	9	10	12	***<0.001***
Crisps & savoury snacks	7	8	6	7	6	5	***<0.001***
Fruit excluding fruit juice	16	15	16	14	16	17	*0.606*
Iron							
Pasta, rice, pizza & other cereals	5	5	5	4	5	5	*0.481*
Bread excluding wholemeal	10	10	12	12	11	10	*0.110*
Unsweetened breakfast cereals, including muesli	14	12	14	16	14	12	*0.158*
Biscuits, cakes & pastries	7	8	8	8	8	8	*0.451*
Calcium							
Bread excluding wholemeal	9	9	10	9	9	8	***0.032***
Milk & cream	31	29	27	32	28	31	***0.007***
Cheese	5	5	6	5	6	7	*0.058*
Yoghurt & fromage frais	8	9	10	9	9	7	*0.075*
Base (weighted)	*466*	*452*	*159*	*75*	*182*	*45*	
Base (unweighted)	*445*	*463*	*164*	*76*	*193*	*50*	

*P-values for the association between urban/rural classification and the percentage contribution of food groups to nutrient intake

Table 7.7 **Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by sex and age**

	Sex							
	Boys				Girls			
	4-6	7-10	11-14	15-17	4-6	7-10	11-14	15-17
Total fat								
Targets								
DRV Population average (% of food energy)	35	35	35	35	35	35	35	35
Scottish Dietary Target (% of food energy)	≤35	≤35	≤35	≤35	≤35	≤35	≤35	≤35
Survey results								
Mean intake (% of food energy)	32.7	32.5	33.1	32.8	33.4	33.0	32.9	32.9
Lower 95% confidence limit (% of food energy)	32.1	32.0	32.4	31.6	32.6	32.4	32.2	31.9
Upper 95% confidence limit (% of food energy)	33.2	33.1	33.8	34.0	34.2	33.6	33.6	33.9
Mean intake (% of population average)	93	93	95	94	96	94	94	94
Lower 95% confidence limit (% of population average)	92	91	93	90	93	93	92	91
Upper 95% confidence limit (% of population average)	95	95	97	97	98	96	96	97
Saturated fatty acids								
Targets								
DRV Population average (% of food energy)	11	11	11	11	11	11	11	11
Scottish Dietary Target (% of food energy)	≤11	≤11	≤11	≤11	≤11	≤11	≤11	≤11
Survey results								
Mean intake (% of food energy)	14.2	13.8	13.9	13.5	14.4	13.7	13.5	13.1
Lower 95% confidence limit (% of food energy)	13.9	13.5	13.6	12.8	14.0	13.4	13.1	12.7
Upper 95% confidence limit (% of food energy)	14.5	14.2	14.2	14.3	14.9	14.0	13.9	13.6
Mean intake (% of population average)	129	126	126	123	131	124	123	119
Lower 95% confidence limit (% of population average)	127	122	123	117	127	121	119	115
Upper 95% confidence limit (% of population average)	132	129	129	130	135	127	127	124
Carbohydrate								
Target								
DRV Population average (% of food energy)	50	50	50	50	50	50	50	50
Survey results								
Mean intake (% of food energy)	53.3	53.8	53.6	54.2	52.5	53.4	54.3	54.4
Lower 95% confidence limit (% of food energy)	52.7	53.1	52.8	53.0	51.6	52.8	53.4	53.4
Upper 95% confidence limit (% of food energy)	53.9	54.6	54.5	55.5	53.5	54.1	55.2	55.5
Mean intake (% of population average)	107	108	107	108	105	107	109	109
Lower 95% confidence limit (% of population average)	105	106	106	106	103	106	107	107
Upper 95% confidence limit (% of population average)	108	109	109	111	107	108	110	111
Protein								
Target								
DRV Reference Nutrient Intake (RNI) (g)	19.7	28.3	42.1	55.2	19.7	28.3	41.2	45.0
Survey results								
Mean intake (g)	62.2	61.0	60.5	65.2	61.3	56.6	52.4	54.6
Lower 95% confidence limit (g)	59.4	57.8	57.5	60.2	58.2	54.5	49.7	50.0
Upper 95% confidence limit (g)	65.3	64.5	63.6	70.5	64.5	58.9	55.3	59.6
Mean intake (% of RNI)*	316	216	144	118	311	200	127	122
Lower 95% confidence limit (% of RNI)	301	204	137	109	296	193	121	111
Upper 95% confidence limit (% of RNI)	332	228	151	128	327	208	134	133

Table 7.7 continued **Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by sex and age**

	Sex							
	Boys				Girls			
	4-6	7-10	11-14	15-17	4-6	7-10	11-14	15-17
Non-starch polysaccharides								
Targets†								
DRV Population average (g)	18	18	18	18	18	18	18	18
Individual minimum (g)	12	12	12	12	12	12	12	12
Individual maximum (g)	24	24	24	24	24	24	24	24
Mean intake (g)	12.8	12.7	12.6	13.0	12.9	12.4	11.6	12.8
Lower 95% confidence limit (g)	12.1	12.0	12.0	11.7	12.3	11.8	10.9	11.9
Upper 95% confidence limit (g)	13.6	13.5	13.3	14.4	13.5	13.0	12.3	13.9
Iron								
Target								
DRV Reference Nutrient Intake (RNI) (mg)	6.1	8.7	11.3	11.3	6.1	8.7	14.8	14.8
Survey results								
Mean intake (mg)	9.7	9.8	9.7	10.6	9.4	8.9	8.2	8.8
Lower 95% confidence limit (mg)	9.2	9.3	9.2	9.6	9.0	8.5	7.6	8.0
Upper 95% confidence limit (mg)	10.3	10.4	10.2	11.8	9.8	9.3	8.7	9.8
Mean intake (% of RNI)*	161	114	87	95	154	103	56	61
Lower 95% confidence limit (% of RNI)	152	108	83	86	148	99	53	55
Upper 95% confidence limit (% of RNI)	170	120	92	105	161	108	60	68
Calcium								
Target								
DRV Reference Nutrient Intake (RNI) (mg)	450	550	1000	1000	450	550	800	800
Survey results								
Mean intake (mg)	1104	1051	1019	1084	1055	940	881	836
Lower 95% confidence limit (mg)	1046	983	965	981	986	904	825	763
Upper 95% confidence limit (mg)	1164	1122	1075	1196	1128	978	942	916
Mean intake (% of RNI)*	245	191	102	109	234	171	111	105
Lower 95% confidence limit (% of RNI)	232	179	97	99	219	164	104	96
Upper 95% confidence limit (% of RNI)	259	204	108	120	251	178	118	115
Base (weighted)	*147*	*202*	*227*	*104*	*117*	*196*	*202*	*110*
Base (unweighted)	*161*	*225*	*233*	*68*	*119*	*223*	*219*	*83*

*Calculated for each participant using the RNI appropriate for age group and sex
†These targets are for adults

Table 7.8 **Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by Scottish Index of Multiple Deprivation quintile**

	Scottish Index of Multiple Deprivation quintile				
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)
Total fat					
Mean intake (% of population average)	94	93	94	94	96
Lower 95% confidence limit (% of population average)	92	92	92	92	94
Upper 95% confidence limit (% of population average)	95	95	96	95	97
Saturated fatty acids					
Mean intake (% of population average)	125	125	125	125	127
Lower 95% confidence limit (% of population average)	121	123	122	122	123
Upper 95% confidence limit (% of population average)	128	128	127	128	130
Carbohydrate					
Mean intake (% of population average)	107	107	107	108	108
Lower 95% confidence limit (% of population average)	106	106	106	107	106
Upper 95% confidence limit (% of population average)	108	109	108	110	109
Protein					
Mean intake (% of RNI)*	180	170	188	183	181
Lower 95% confidence limit (% of RNI)	168	159	175	170	167
Upper 95% confidence limit (% of RNI)	193	181	202	197	196
Iron					
Mean intake (% of RNI)*	97	92	98	102	98
Lower 95% confidence limit (% of RNI)	91	86	92	95	90
Upper 95% confidence limit (% of RNI)	104	98	104	109	106
Calcium					
Mean intake (% of RNI)*	149	143	155	150	147
Lower 95% confidence limit (% of RNI)	139	133	144	140	136
Upper 95% confidence limit (% of RNI)	161	153	167	161	159
Base (weighted)	*281*	*258*	*237*	*254*	*260*
Base (unweighted)	*296*	*272*	*250*	*254*	*241*

*Calculated for each participant using the RNI appropriate for age group and sex

Table 7.9 Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in participants aged 4-17 years, by urban/rural classification

	Urban/rural classification					
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural
Total fat						
Mean intake (% of population average)	95	94	92	93	93	94
Lower 95% confidence limit (% of population average)	94	93	90	89	91	90
Upper 95% confidence limit (% of population average)	96	96	95	96	95	98
Saturated fatty acids						
Mean intake (% of population average)	126	126	122	125	124	124
Lower 95% confidence limit (% of population average)	124	124	118	118	121	117
Upper 95% confidence limit (% of population average)	129	128	127	131	127	132
Carbohydrate						
Mean intake (% of population average)	107	108	108	108	108	106
Lower 95% confidence limit (% of population average)	106	107	106	106	106	104
Upper 95% confidence limit (% of population average)	108	109	110	111	109	109
Protein						
Mean intake (% of RNI)*	185	171	191	192	174	185
Lower 95% confidence limit (% of RNI)	175	161	173	162	158	156
Upper 95% confidence limit (% of RNI)	195	183	209	227	192	219
Iron						
Mean intake (% of RNI)*	99	93	102	100	96	100
Lower 95% confidence limit (% of RNI)	93	87	93	85	87	89
Upper 95% confidence limit (% of RNI)	105	98	111	119	105	112
Calcium						
Mean intake (% of RNI)*	150	144	154	165	143	150
Lower 95% confidence limit (% of RNI)	143	135	138	142	129	131
Upper 95% confidence limit (% of RNI)	159	154	171	192	158	172
Base (weighted)	*441*	*428*	*147*	*73*	*176*	*42*
Base (unweighted)	*425*	*444*	*153*	*74*	*188*	*47*

*Calculated for each participant using the RNI appropriate for age group and sex

8 OVERWEIGHT AND OBESITY

This chapter describes the prevalence of overweight and obesity in all children and in sub-groups of age, sex, deprivation category and urban/rural area of residence. The association between overweight and obesity and intake of energy and percentage energy as fat and sugars and of selected food groups high in fat or sugars is also presented.

8.1 Height and weight measurements

The mean height and weight of children with reliable measurements are shown in Table 8.1. As expected both height and weight increased linearly with age in both boys and girls. For each age group the mean height for boys was greater than that for girls but the differences were only significant for the oldest age group, 12-17 year olds. Boys in this age group were, on average, 6.5 cm taller than girls (166.2 vs. 159.7 cm).

The only significant difference in the mean weight between boys and girls was in those aged 12-17 years. In this age group boys were on average, 2.3 kg heavier than girls (57.6 vs. 55.3 kg).

Table 8.1, Table 8.1a

There was an association between mean height and SIMD quintile, with the highest mean value (145.3 cm) in the 2nd quintile and the lowest mean value (137.9 cm) in the most deprived (5th) quintile. The same pattern was seen in weight with a significant difference in the mean weight between the SIMD quintiles with the highest mean value (39.1 kg) in the 2nd quintile and the lowest mean value (34.7 kg) in the most deprived (5th) quintile, which probably reflects the strong association between height and weight. There was no significant difference in height or weight by area of residence.

Table 8.2, Table 8.3

8.2 Body Mass Index (BMI) and the prevalence of overweight and obesity

8.2.1 BMI

BMI was calculated for the 1,615 participants who had reliable measurements of both height and weight. BMI was calculated by dividing weight in kilograms by height in metres squared. The UK 1990 centile charts[1] were then used to classify children as follows (results are presented in Section 8.2.2):

- underweight (defined as BMI below or equal to the 5th centile of the UK 1990 reference data)
- normal weight (defined as above 5th centile and below the 85th centile)
- overweight (defined as BMI equal to or above the 85th and below the 95th centile)
- obese (defined as BMI equal to or above the 95th centile)

In this chapter underweight and normal weight categories have been combined in the tables and are shown as *neither overweight nor obese.*

Z-scores (the number of standard deviations (SDs) above or below the median value) are also used to describe anthropometric data. If a measurement in an individual is the same as the median value for the reference population the z-score will be zero: values above the median will have positive z-scores with those more than 1 SD above the median having values above +1 and those more than 1 SD below the median having values below -1. The overall mean z-score for BMI was +0.51 indicating that on average the values were 0.51 SD above the median values in the reference population.

There was a strong linear association between mean BMI and age group increasing from 16.2 kg/m^2 for boys aged 3-7 to 20.5 kg/m^2 for boys aged 12-17. In girls the corresponding increase was 16.4 to 21.3 kg/m^2. Mean BMI was higher in girls than boys overall (18.4 vs. 18.0 kg/m^2) and in all age sub-groups but the difference was only significant for the 12-17 year old age group. The BMI z-score was not significantly different between the three age groups or between boys and girls.

Table 8.4, 8.4a, 8.4b

There was a significant overall association between BMI and SIMD quintiles but no evidence of a linear association: children in the least deprived (1st) quintile had the lowest mean BMI (17.9 kg/m^2) while those in 2nd quintile had the highest (18.6 kg/m^2). There were significant associations between both BMI and BMI z-score and the urban/rural areas of residence, with lowest values in the accessible small towns and accessible rural areas.

Table 8.5, Table 8.6

8.2.2 Prevalence of overweight and obesity

Overall the prevalence of overweight and obesity was 14% and 17% respectively. There were no significant differences between the sexes in the prevalence of overweight and obesity overall: 13% of boys and 15% of girls were overweight and 16% of boys and 18% of girls were obese. However, significantly fewer boys in the youngest age group were obese compared with girls (8% vs. 18%). The prevalence of obesity was significantly higher amongst 12-17 year old boys than the 3-7 year old boys (21% vs. 8%). About a third of children were either overweight or obese: 30% of boys and 33% of girls.

Table 8.7, 8.7a, 8.7b

The overall prevalence of overweight and obesity was similar to that reported in the 2003 Scottish Health Survey (SHS).[2] In the SHS, which surveyed children aged 2-15, 16.7% of boys and 16.1% of girls were classed as overweight and 18.0% of boys and 13.8% of girls were classed as obese using the same classification method as used in this survey.

In addition to the UK reference standards for BMI, new international cut-offs have been proposed[3] and have been used in many countries though the issues determining the choice of national vs. international reference data are complex.[4] For comparison with other countries the prevalence of overweight and obesity was also assessed using the International Obesity Task Force cut-offs which are set at centile values close to the 89th and 99th centile of the international reference population data. Using these standards the prevalence of overweight in the present survey was 18% and the prevalence of obesity was 7%.

The prevalence of underweight amongst children was low at 2%, (not shown in tables) compared to an expected value of 5% for the 5th percentile.

Prevalence of overweight and obesity by SIMD and urban/rural classification

There was an association between prevalence of *overweight including obese* and deprivation. In both sexes, the highest proportion of children in the *overweight including obese* category appeared in the middle (3rd) quintile of deprivation (33% for boys and 38% for girls) while the lowest proportion of children in the combined *overweight including obese* category was in the least deprived (1st) quintile (25% for both sexes).

Table 8.8

No association was found between the prevalence of overweight and obesity and urban/rural classification.

Table 8.9

8.3 Intake of selected food groups and overweight and obesity

In this section intake of selected foods by **all** consumers is examined in relation to overweight and obesity. Food groups were selected based on their content of fat or sugar or both.

There was little evidence for associations between the intake of foods high in fat or sugar and overweight and obesity. The only significant linear association between BMI group and intake of foods was for the food group biscuits, cakes and pastries with the lowest intake in the obese group but the difference in the amount consumed between the groups was small. The results of these analyses could be influenced by dieting and/or under-reporting in the overweight and obese. As no information was collected on dieting behaviour and no adjustment of the data has been made for possible under-reporting the differences between the BMI categories should be interpreted with caution.

Table 8.10

8.4 Association between intake of energy, fat and sugars and overweight and obesity

There was no statistical evidence for an association between energy intake (MJ/day) and BMI group although energy intake in the overweight group tended to be higher than that in the *neither overweight nor obese* group and the obese group. There were small but significant linear associations between BMI group and the percentage of food energy from total fat, saturated fatty acids and total sugars. Intake of total fat and saturated fatty acids as a percentage of energy was lower in overweight and obese children than in children who were neither overweight nor obese. In contrast, total sugar intake was higher in overweight and obese children than in those who were neither overweight nor obese.

Table 8.11

8.5 References

1 Cole TJ, Freeman JV, Preece MA. Body Mass Index reference curves for the UK, 1990. Archives of Disease in Childhood 1995;73:25-9.

2 Bromley C, Sproston K, Shelton N (Eds) The Scottish Health Survey 2003 (Vol 3). Edinburgh, The Stationary Office, 2005.

3 Cole TJ, Bellizzi M, Flegal KM, Dietz WH Establishing a standard definition for childhood overweight and obesity worldwide: international survey. British Medical Journal; 2000; 320:1240-6.

4 Reilly JJ. Assessment of Childhood Obesity: National Reference Data or International Approach? Obesity Research 2002;10:838-840

Table 8.1 Mean height and weight, by sex and age

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
Height (cm)												
Mean	113.3	139.3	166.2	142.1	112.5	138.8	159.7	138.8	112.9	139.0	163.0	140.4
Lower 95% confidence limit	112.0	138.2	164.4	140.1	111.2	137.5	158.6	136.9	111.9	138.2	161.9	139.1
Upper 95% confidence limit	114.6	140.4	168.0	144.0	113.8	140.0	160.7	140.7	114.0	139.9	164.1	141.8
Weight (kg)												
Mean	20.8	34.6	57.6	36.2	21.0	35.0	55.3	35.5	20.9	34.8	56.4	35.9
Lower 95% confidence limit	20.3	33.8	56.1	34.9	20.3	33.8	53.5	34.1	20.4	34.1	55.2	34.8
Upper 95% confidence limit	21.4	35.4	59.1	37.6	21.6	36.2	57.0	37.0	21.4	35.5	57.7	37.0
Base (weighted)												
Height	*258*	*236*	*334*	*829*	*253*	*228*	*318*	*798*	*511*	*464*	*653*	*1627*
Weight	*260*	*236*	*334*	*830*	*254*	*226*	*311*	*792*	*514*	*463*	*645*	*1622*
Base (unweighted)												
Height	*259*	*267*	*294*	*820*	*252*	*255*	*304*	*811*	*511*	*522*	*598*	*1631*
Weight	*261*	*267*	*293*	*821*	*253*	*254*	*297*	*804*	*514*	*521*	*590*	*1625*

Table 8.1a P-values for differences between sexes in height and weight, by age

	Age			
	3-7	8-11	12-17	All
Height	0.254	0.503	**<0.001**	**0.014**
Weight	0.751	0.602	**0.032**	0.413

Table 8.2 Mean height and weight, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
Height (cm)							
Mean	140.7	145.3	138.6	140.0	137.9	***0.004***	***0.012***‡
Lower 95% confidence limit	138.1	142.5	135.6	136.6	135.3		
Upper 95% confidence limit	143.3	148.1	141.5	143.4	140.4		
Weight (kg)							
Mean	35.4	39.1	35.0	35.5	34.7	***0.025***	*0.153*
Lower 95% confidence limit	33.6	37.0	32.7	33.2	32.8		
Upper 95% confidence limit	37.3	41.4	37.5	38.1	36.7		
Base (weighted)							
Height	*345*	*317*	*291*	*311*	*364*		
Weight	*347*	*313*	*292*	*308*	*362*		
Base (unweighted)							
Height	*346*	*317*	*304*	*311*	*353*		
Weight	*347*	*313*	*305*	*308*	*352*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and height and weight
†P-values for the linear association between Scottish Index of Multiple Deprivation quintile and height and weight
‡Height decreases from 1st (least deprived) to 5th (most deprived) quintile

Table 8.3 Mean height and weight, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
Height (cm)							
Mean	140.4	140.4	136.4	142.1	142.7	144.2	*0.307*
Lower 95% confidence limit	138.3	138.4	132.2	133.5	139.2	138.1	
Upper 95% confidence limit	142.5	142.4	140.7	150.6	146.2	150.3	
Weight (kg)							
Mean	36.0	36.3	32.5	37.4	36.7	38.5	*0.109*
Lower 95% confidence limit	34.6	34.6	29.9	31.5	34.3	34.9	
Upper 95% confidence limit	37.4	38.0	35.3	44.5	39.2	42.6	
Base (weighted)							
Height	*562*	*534*	*186*	*84*	*211*	*50*	
Weight	*561*	*535*	*186*	*81*	*208*	*50*	
Base (unweighted)							
Height	*535*	*545*	*192*	*87*	*218*	*54*	
Weight	*534*	*546*	*192*	*84*	*215*	*54*	

*P-values for the overall association between urban/rural classification and height and weight

Table 8.4 Mean BMI and BMI z-score, by sex and age

	Sex											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
BMI (kg/m^2)												
Mean	16.2	17.5	20.5	18.0	16.4	17.8	21.3	18.4	16.3	17.6	20.9	18.2
Lower 95% confidence limit	16.0	17.2	20.2	17.8	16.2	17.4	20.8	18.2	16.1	17.4	20.6	18.0
Upper 95% confidence limit	16.4	17.8	20.8	18.2	16.7	18.2	21.8	18.7	16.5	17.9	21.2	18.4
BMI z-score												
Mean	0.42	0.52	0.54	0.50	0.54	0.41	0.59	0.52	0.48	0.47	0.56	0.51
Lower 95% confidence limit	0.29	0.40	0.42	0.41	0.40	0.27	0.44	0.45	0.38	0.37	0.46	0.44
Upper 95% confidence limit	0.56	0.64	0.66	0.58	0.68	0.56	0.73	0.60	0.58	0.56	0.67	0.58
Base (weighted)	*258*	*235*	*331*	*825*	*250*	*226*	*310*	*786*	*509*	*461*	*641*	*1611*
Base (unweighted)	*259*	*266*	*291*	*816*	*250*	*253*	*296*	*799*	*509*	*519*	*587*	*1615*

Table 8.4a P-values for differences between sexes in BMI and BMI z-score, by age

	Age			
	3-7	8-11	12-17	All
BMI	0.102	0.173	**0.003**	**0.002**
BMI z-score	0.208	0.276	0.590	0.551

Table 8.4b P-values for associations between age group and BMI and BMI z-score, by sex

	Sex		
	Boys	Girls	Boys & girls
BMI			
Overall association	**<0.001**	**<0.001**	**<0.001**
Linear association	**<0.001***	**<0.001***	**<0.001***
BMI z-score			
Overall association	0.335	0.272	0.347
Linear association	0.168	0.623	0.181

*BMI increases with age group

Table 8.5 Mean BMI and BMI z-score, by Scottish Index of Multiple Deprivation

	Scottish Index of Multiple Deprivation quintile						
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**	*P-value†*
BMI (kg/m²)							
Mean	17.9	18.6	18.2	18.3	18.1	***0.017***	*0.904*
Lower 95% confidence limit	17.5	18.3	17.7	17.9	17.7		
Upper 95% confidence limit	18.3	19.0	18.7	18.7	18.5		
BMI z-score							
Mean	0.38	0.52	0.62	0.57	0.49	*0.152*	*0.193*
Lower 95% confidence limit	0.24	0.41	0.46	0.45	0.37		
Upper 95% confidence limit	0.51	0.62	0.78	0.69	0.62		
Base (weighted)	*343*	*313*	*290*	*305*	*361*		
Base (unweighted)	*344*	*313*	*303*	*305*	*350*		

*P-values for the overall association between Scottish Index of Multiple Deprivation quintile and BMI and BMI z-score
†P-values for the linear association between Scottish Index of Multiple Deprivation quintile and BMI and BMI z-score

Table 8.6 Mean BMI and BMI z-score, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
BMI (kg/m²)							
Mean	18.3	18.4	17.4	18.7	18.1	18.7	***0.003***
Lower 95% confidence limit	18.0	18.0	17.1	17.7	17.6	18.1	
Upper 95% confidence limit	18.6	18.7	17.8	19.9	18.5	19.4	
BMI z-score							
Mean	0.55	0.53	0.31	0.73	0.40	0.67	***0.002***
Lower 95% confidence limit	0.43	0.42	0.20	0.55	0.25	0.51	
Upper 95% confidence limit	0.67	0.64	0.42	0.91	0.55	0.84	
Base (weighted)	*555*	*531*	*186*	*81*	*208*	*49*	
Base (unweighted)	*529*	*542*	*192*	*84*	*215*	*53*	

*P-values for the overall association between urban/rural classification and BMI and BMI z-score

Table 8.7 Prevalence of overweight and obesity, by sex and age

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Neither overweight nor obese	76	71	66	70	70	69	64	67	73	70	65	69
Overweight but not obese*	16	11	13	13	12	16	17	15	14	13	15	14
Obese†	8	18	21	16	18	15	19	18	13	16	20	17
Overweight including obese‡	*24*	*29*	*34*	*30*	*30*	*31*	*36*	*33*	*27*	*30*	*35*	*31*
Base (weighted)	*258*	*235*	*331*	*825*	*250*	*226*	*310*	*786*	*509*	*461*	*641*	*1611*
Base (unweighted)	*259*	*266*	*291*	*816*	*250*	*253*	*296*	*799*	*509*	*519*	*587*	*1615*

*≥85th and <95th centile
†≥95th centile
‡≥85th centile

Table 8.7a P-values for associations between sex and BMI classification, by age

	Age			
	3-7	8-11	12-17	All
3 BMI categories*	**0.003**	0.243	0.339	0.249
2 BMI categories†	0.171	0.672	0.480	0.072

* Neither overweight nor obese, Overweight but not obese, Obese
† Neither overweight nor obese, Overweight including obese

Table 8.7b P-values for associations between age group and BMI classification, by sex

	Sex		
	Boys	Girls	Both boys & girls
3 BMI categories*	**0.001**	0.264	**0.017**
2 BMI categories†	**0.041**	0.258	**0.018**

* Neither overweight nor obese, Overweight but not obese, Obese
† Neither overweight nor obese, Overweight including obese

Table 8.8 Prevalence of overweight and obesity, by Scottish Index of Multiple Deprivation and sex

	Scottish Index of Multiple Deprivation quintile					
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)	*P-value**
	%	%	%	%	%	
Boys						
Neither overweight nor obese	75	72	67	68	69	
Overweight but not obese†	12	13	14	17	12	
Obese‡	12	15	19	15	19	*0.601*
Overweight including obese#	*25*	*28*	*33*	*32*	*31*	*0.475*
Girls						
Neither overweight nor obese	75	68	62	63	68	
Overweight but not obese†	14	14	14	16	17	
Obese‡	12	17	24	22	16	*0.137*
Overweight including obese#	*25*	*32*	*38*	*37*	*32*	*0.094*
All						
Neither overweight nor obese	75	70	64	66	68	
Overweight but not obese†	13	13	14	16	15	
Obese‡	12	16	22	18	17	*0.105*
Overweight including obese#	*25*	*30*	*36*	*34*	*32*	***0.047***
Base (weighted)						
Boys	*178*	*158*	*152*	*167*	*170*	
Girls	*165*	*155*	*137*	*138*	*190*	
All	*343*	*313*	*290*	*305*	*361*	
Base (unweighted)						
Boys	*176*	*156*	*158*	*163*	*163*	
Girls	*168*	*157*	*145*	*142*	*187*	
All	*344*	*313*	*303*	*305*	*350*	

*P-values for the association between Scottish Index of Multiple Deprivation quintile and BMI classification
†≥85th and <95th centile
‡≥95th centile
#≥85th centile

Table 8.9 Prevalence of overweight and obesity, by urban/rural classification

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value**
	%	%	%	%	%	%	
Neither overweight nor obese	67	69	75	60	72	67	
Overweight but not obese†	15	14	12	20	13	13	
Obese‡	18	17	13	21	15	20	*0.508*
Overweight including obese#	*33*	*31*	*25*	*40*	*28*	*33*	*0.073*
Base (weighted)	*555*	*531*	*186*	*81*	*208*	*49*	
Base (unweighted)	*529*	*542*	*192*	*84*	*215*	*53*	

*P-values for the association between urban/rural classification and BMI classification
†≥85th and <95th centile
‡≥95th centile

Table 8.10 **Intake of selected food groups (grams/day), by sex and BMI classification**

	Sex														
	Boys					Girls					Both boys & girls				
	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*
Sweetened breakfast cereals															
Mean	2	3	2	*0.840*	*0.786*	2	1	2	*0.385*	*0.261*	2	2	2	*0.666*	*0.382*
Lower 95% confidence limit	2	2	1			2	1	1			2	1	1		
Upper 95% confidence limit	3	4	3			2	2	2			3	3	3		
Biscuits, cakes & pastries															
Mean	40	36	33	*0.158*	*0.054*	33	35	29	*0.176*	*0.262*	36	36	31	***0.025***	***0.010‡***
Lower 95% confidence limit	37	30	28			30	30	25			34	32	28		
Upper 95% confidence limit	43	43	39			36	41	34			39	40	34		
Puddings															
Mean	7	7	8	*0.571*	*0.371*	6	9	7	*0.075*	*0.329*	7	8	7	*0.235*	*0.167*
Lower 95% confidence limit	6	5	6			6	7	5			6	6	6		
Upper 95% confidence limit	8	9	10			7	11	9			7	9	9		
Ice cream															
Mean	11	13	13	*0.302*	*0.166*	11	11	11	*0.992*	*0.970*	11	12	12	*0.564*	*0.353*
Lower 95% confidence limit	10	11	10			10	8	9			10	10	10		
Upper 95% confidence limit	13	17	15			13	14	14			12	14	14		
Processed meat including sausages, burgers, coated chicken															
Mean	27	26	27	*0.929*	*0.877*	23	24	26	*0.375*	*0.167*	25	25	26	*0.706*	*0.409*
Lower 95% confidence limit	25	22	24			21	20	22			23	22	23		
Upper 95% confidence limit	30	32	32			25	29	30			27	29	30		
Chips, fried & roast potatoes & potato products															
Mean	21	20	24	*0.236*	*0.323*	21	22	21	*0.832*	*0.863*	21	21	23	*0.565*	*0.369*
Lower 95% confidence limit	19	16	21			19	19	18			20	19	20		
Upper 95% confidence limit	24	24	28			23	27	25			23	24	25		
Crisps & savoury snacks															
Mean	20	18	20	*0.721*	*0.968*	21	20	23	*0.592*	*0.364*	20	19	21	*0.497*	*0.494*
Lower 95% confidence limit	18	14	16			19	16	19			19	16	19		
Upper 95% confidence limit	22	22	25			23	25	27			22	23	25		

Table 8.10 continued **Intake of selected food groups (grams/day), by sex and BMI classification**

	Sex														
	Boys					Girls					Both boys & girls				
	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value*†	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value*†	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value*†
Table sugar & preserves															
Mean	2	2	2	*0.348*	*0.275*	1	2	1	*0.214*	*0.885*	2	2	2	*0.159*	*0.596*
Lower 95% confidence limit	2	2	2			1	1	1			2	2	1		
Upper 95% confidence limit	2	3	3			2	2	2			2	3	2		
Confectionery															
Mean	22	23	21	*0.663*	*0.567*	21	24	23	*0.510*	*0.309*	22	23	22	*0.562*	*0.614*
Lower 95% confidence limit	20	19	17			19	19	19			20	20	19		
Upper 95% confidence limit	24	28	25			23	29	27			23	27	24		
Fruit juice including smoothies															
Mean	48	57	48	*0.510*	*0.732*	51	44	46	*0.542*	*0.360*	49	50	47	*0.834*	*0.729*
Lower 95% confidence limit	40	42	36			44	34	36			43	40	39		
Upper 95% confidence limit	56	78	63			59	56	58			55	63	55		
Soft drinks, not diet															
Mean	129	147	154	*0.376*	*0.162*	121	154	129	*0.381*	*0.417*	125	150	141	*0.165*	*0.114*
Lower 95% confidence limit	111	114	118			101	109	99			111	122	116		
Upper 95% confidence limit	149	188	200			144	213	167			140	184	170		
Base (weighted)	*481*	*97*	*106*			*415*	*95*	*109*			*896*	*191*	*215*		
Base (unweighted)	*475*	*99*	*108*			*427*	*98*	*109*			*902*	*197*	*217*		

*P-values for the overall association between BMI classification and the intake of food groups
†P-values for the linear association between BMI classification and the intake of food groups
‡Intake of food group decreases from *neither overweight nor obese* category to obese category

Table 8.11 **Intake of energy and percentage energy as fat, saturated fatty acids, total sugars and non-milk extrinsic sugars, by sex and BMI classification**

	Sex														
	Boys					**Girls**					**Both boys & girls**				
	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*	Neither overweight nor obese	Over-weight	Obese	*p-value**	*p-value†*
Energy (MJ/day)															
Mean	8.01	8.15	7.99	*0.879*	*0.935*	7.29	7.82	7.29	*0.136*	*0.603*	7.67	7.98	7.62	*0.245*	*0.810*
Lower 95% confidence limit	7.77	7.65	7.56			7.04	7.34	6.85			7.49	7.64	7.28		
Upper 95% confidence limit	8.27	8.69	8.46			7.55	8.33	7.76			7.85	8.35	7.98		
Total fat (% of food energy)															
Mean	33.1	32.4	32.4	*0.161*	*0.057*	33.2	32.5	32.8	*0.367*	*0.296*	33.1	32.5	32.6	*0.061*	***0.032*‡**
Lower 95% confidence limit	32.6	31.6	31.6			32.8	31.5	31.9			32.8	31.8	32.0		
Upper 95% confidence limit	33.5	33.2	33.1			33.6	33.6	33.8			33.4	33.2	33.2		
Saturated fatty acids (% of food energy)															
Mean	14.0	14.0	13.5	*0.051*	*0.062*	13.8	13.4	13.4	*0.082*	***0.045*‡**	13.9	13.7	13.4	***0.015***	***0.004*‡**
Lower 95% confidence limit	13.7	13.6	13.1			13.6	12.9	12.8			13.7	13.4	13.1		
Upper 95% confidence limit	14.3	14.5	13.9			14.0	14.0	13.9			14.1	14.1	13.8		
Total sugars (% of food energy)															
Mean	28.4	29.7	29.2	*0.138*	*0.126*	28.8	30.7	29.1	*0.065*	*0.227*	28.6	30.2	29.2	***0.007***	***0.045#***
Lower 95% confidence limit	27.9	28.4	27.8			28.1	29.1	27.9			28.2	29.2	28.2		
Upper 95% confidence limit	28.9	31.0	30.5			29.4	32.3	30.4			29.0	31.2	30.1		
Non-milk extrinsic sugars (% of food energy)															
Mean	17.1	18.1	17.8	*0.284*	*0.165*	17.2	18.4	17.2	*0.360*	*0.720*	17.1	18.2	17.5	*0.117*	*0.175*
Lower 95% confidence limit	16.6	16.8	16.6			16.5	16.7	16.0			16.8	17.2	16.7		
Upper 95% confidence limit	17.6	19.4	19.0			17.9	20.2	18.5			17.5	19.3	18.3		
Base (weighted)	*481*	*97*	*106*			*415*	*95*	*109*			*896*	*191*	*215*		
Base (unweighted)	*475*	*99*	*108*			*427*	*98*	*109*			*902*	*197*	*217*		

*P-values for the overall association between BMI classification and the intake of nutrients
†P-values for the linear association between BMI classification and the intake of nutrients
‡Intake of nutrient decreases from neither overweight nor obese category to obese category
#Intake of nutrient increases from neither overweight nor obese category to obese category

9 PHYSICAL ACTIVITY

9.1 Introduction

Physical activity is a broad term to describe movement of the body that uses energy. There are many types of physical activity including exercise, sport, play, dance and active living such as walking, housework and gardening. Physical activity does not have to be strenuous to have significant effects on people's health, general well being and productivity.[1]

Regular physical activity is considered vital for healthy growth. The benefits of being active from an early age include:

- Reducing the risk factors for heart and circulatory diseases
- Helping in preventing weight gain
- Promoting positive mental health

The Scottish Executive's physical activity targets are outlined in the Physical Activity Task Force 2003 publication *Let's make Scotland more active: A strategy for physical activity.*[1] Its primary recommendation is that all children and young people, including children with disabilities, should take part in at least one hour of moderate physical activity a day.

The long-term target is for 80% of all children aged 16 and under to meet the minimum recommended level of physical activity by 2022 i.e. one hour of moderate physical activity each day.

This chapter presents data on participation in physical activities, overall physical activity levels and a measure of inactivity. The association between physical activity and obesity is examined. The questions used in this element of the survey were the same as those used in the 1998 and 2003 Scottish Health Surveys (SHS)[2,3] and included questions on activities that were thought to account for the largest part of children's total activity. The physical activity questions did not include any activity undertaken as part of the school curriculum.

Although this survey used the same questions as those used in the 1998 and 2003 SHS there were differences in other areas of the methodology employed such as the sampling and age range. In addition, the field work for this study was undertaken between May and September in contrast to the SHS which was a continuous survey with field work being conducted throughout the year. Levels of physical activity are likely to be higher in the summer months and in particular in the school holidays. The results of the two surveys are therefore not directly comparable.

9.2 Physical activity questions

Information was sought on the four different types of physical activity thought to account for the largest part of children's total activity: sport/exercise, active play, walking and housework/gardening. All children were asked questions on the number of days and the time spent each day in the last 7 days on each of these physical activities. Children of all ages were asked about each of these activities in contrast to the SHS in which children under 8 years were not asked about their participation in housework/gardening.

Information about sports and exercise and active play was collected separately for weekend and weekdays. Questions on walking and housework/gardening did not distinguish between these activities carried out on a weekday and at weekends.

There was no lower time limit for the inclusion of sport/exercise or active play but only episodes of housework/gardening which lasted for at least 15 minutes were included. The questions about walking asked about walks of at least 5 minutes duration.

No information on the intensity of housework, sports and exercise or active play was collected. For the purpose of this report it is assumed that all activity was at least of moderate intensity.

Questions were also asked about the time spent in front of a screen as a measure of physical inactivity. Children were asked about the average number of hours spent sitting in front of a television or computer screen on an average week day and on an average weekend day.

Further details of the information sought in relation to physical activity can be found in the 2003 SHS.[3]

9.2.1 Participation in physical activities over the previous week

This section presents reported participation in physical activity by number of days and hours participation in the previous week. It should be noted that the sample in this survey is not the same as in the 2003 SHS[3] which included children aged 2-15 years compared to 3-16 years in this survey.

Table 9.1 shows the number of days on which children participated in all physical activities in the previous 7 days. This adds together the number of days on which sport and exercise, active play, housework/gardening and walking were done. This summary of overall participation is equivalent to the number of occasions children engaged in physical activities, as it assumes that each activity was done on a different day. So for example, if a child had participated in sports and exercise and active play on the same day, this would get counted as two days of activity. For this reason the number of days of participation exceeds the number of days in the week. For example, a child who had participated in sports and exercise on five days and undertook a walk of a least 5 minutes duration on five days would be counted as having participated on 10 days when calculating overall participation in physical activities. This is the same method as used in the 2003 Scottish Health Survey.

It should be noted that calculations of the mean number of days are based on all children, including those that reported that they did not participate in any activity.

Virtually all children had participated in some form of physical activity in the previous week and most children (97%) participated in physical activities on 5 days or more in the previous week. This was the case for both boys and girls (97% for both).

There was a linear association between age group and participation in physical activities in the previous week. The number of days spent participating in physical activities in the previous week was lower in the oldest age group than in the two younger age groups. The association was significant in both girls and boys.

The mean number of days participation was significantly lower for girls than for boys overall, and in the eldest age group.

Table 9.1, 9.1a and 9.1b

The amount of time spent on physical activities is presented in Table 9.2. Calculations of mean time spent on each activity type are based on all children, including those who did not participate in any activities. Children had spent an average of 19.7 hours engaged in physical activities in the previous week. Boys had spent significantly more time than girls on physical activities (21.2 hours vs. 18.0 hours).

Time spent participating in physical activities was associated with age group. There was little difference between the two youngest age groups in the number of hours spent participating in physical activities for both boys and girls. However there was a decrease in the number of hours spent participating in these activities for the oldest age group (12-17 years). This was significant in girls but not in boys. Girls aged 12-17 spent an average of 15.1 hours participating in physical activities compared to 19.9 hours for boys.

Table 9.2, 9.2a and 9.2b

9.2.2 Summary physical activity levels over the previous week

The frequency and time spent on physical activity and the intensity of that activity are all important factors in measuring levels of physical activity.

Following a review and consultation exercise by the Health Education Authority in 1997, a set or recommendations on physical activity levels for young people aged 5-18 were set.[4] These recommendations were endorsed by the then Scottish Executive.[1] The primary recommendations were:

- All young people should participate in physical activity of at least moderate intensity for one hour per day.
- Young people who currently do little activity should participate in physical activity of at least moderate intensity for at least half an hour per day.

In this section participation in the different types of activity has been summarised into a frequency-duration scale, by taking account of the average time spent participating in physical activities and the number of active days in the previous week. There were no questions on level of intensity of the physical activities so it is assumed that participation in activity was at least of moderate intensity.

The summary physical activity levels are as follows:

- ➢ High: active for 60 minutes on 7 days in the last week. Assuming that all reported activities were of at least moderate intensity, this group refers to those children who met the recommended levels of physical activity.

- Medium: active for 30-59 minutes on 7 days in the last week. This group represents those achieving the lower recommended level which is at least 30 minutes (but less than an hour) of at least moderate intensity per day. Again activities were assumed to be undertaken at moderate intensity levels.
- Low: active at a lower level or not active at all. This group refers to children who did not meet either of the recommended physical activity levels.

Overall, 86% of children reached the higher recommended physical activity level. A significantly higher proportion of boys reached this level - 89% of boys compared with 83% of girls. The difference between the sexes in the proportions of children reaching the higher recommended activity level was significant only in the 12-17 age group (86% for boys, 69% for girls). A further 5% of boys and 9% of girls reached the medium level of activity. The 2003 SHS[3] and many other studies have also found that boys are more physically active than girls.

The proportion of children reaching the higher recommended physical activity level was greater than the proportion reaching this level in the 2003 SHS[3]. In the 2003 SHS 74% of boys and 63% of girls reached the higher recommended physical activity level. As stated previously it is likely that this is due in part to the timing of fieldwork.

There was a significant association between age group and activity levels for all children and for girls. Amongst both boys and girls the levels of both high and medium activity were very similar in the two youngest age groups. In both sexes, levels of activity decreased in the oldest age group although there was a sharper decline in activity amongst girls (boys 93%, girls 85%).

This pattern of decrease in activity with increasing age and the sharper decline amongst girls than boys is consistent with that found in the 2003 SHS[3] and in other studies.

Table 9.3, 9.3a and 9.3b

9.2.3 Time spent sitting at a screen

Boys spent more time sitting in front of a screen than girls (2.2 vs. 2.0 hours per day). The difference in time between boys and girls was significant overall and for the 3-7 and 12-17 year age group.

There was a significant overall association and a linear trend between the time spent in front of a screen and age group. This association was significant for both sexes with 14% of both boys and girls in the oldest age group (12-17 years) sitting in front of a screen for an average of at least 4 hours a day compared to 5% of boys and 4% of girls in the youngest age group (3-7 years).

Table 9.4, 9.4a and 9.4b

9.2.4 Physical activity by Scottish Index of Multiple Deprivation

Table 9.5 presents the proportion of children meeting the higher physical activity recommendation by SIMD quintile. There was no clear pattern in the relationship between those meeting the physical activity recommendations and level of deprivation for either sex.

Children in all quintiles of deprivation met the target of 80% achieving the higher physical activity recommendation with the exception of girls in the 2nd quintile, where 79% achieved the physical activity recommendation.

Table 9.5

9.2.5 Physical activity by urban/rural classification

There was no clear relationship between the proportion of children reaching the current physical activity recommendations and urban/rural classification.

Table 9.6

9.3 Physical activity and Body Mass Index (BMI)

In this section, levels of activity (the proportion of children meeting the recommended physical activity level) by BMI is examined. Children are classified into one of two BMI groups for the analysis in this section: *neither overweight nor obese* or *overweight including obese.*

There were significant differences in the proportion of children reaching the physical activity recommendations by BMI classification. A higher proportion of children in the *neither overweight nor obese* category reached the recommended level compared with those in the *overweight including obese* category (88% vs. 81%). The differences were significant for the two younger age groups but were not significant for the oldest age group (12-17 year olds).

The target of 80% of children reaching the higher physical activity recommendation was achieved by boys in both BMI categories and in all age groups. In contrast, only girls in the two youngest age groups met the target in both BMI categories. Girls in the oldest age group and in both BMI categories failed to meet the target.

Table 9.7

9.3.1 Body Mass Index, physical activity, Scottish Index of Multiple Deprivation and urban/rural classification

Scottish Index of Multiple Deprivation (SIMD)

Table 9.8 shows there was no clear pattern in the association between BMI category and the proportion meeting physical activity recommendations by SIMD. A smaller proportion of children in the *overweight including obese* category met the physical activity recommendations than those in the *neither overweight nor obese* category with the exception of those in the 2nd quintile*.* These differences were only significant in the 3rd and 5th quintiles.

The only group not meeting the target of 80% reaching the higher physical activity recommendation was the *overweight including obese* group in the most deprived (5th) quintile.

Table 9.8

Urban/rural classification

Bases for *overweight including obese* categories fell below 50 in three urban/rural categories so statistical tests were not carried out on these groups.

There were no clear patterns in the proportions meeting the physical activity recommendations by BMI and urban/rural classification.

There were significant differences between the BMI categories in the proportions meeting the physical activity recommendations in children living in the large urban and accessible rural areas. Children classified as *overweight including obese* in these two areas of residence were also the only groups not to achieve the 80% target.

Table 9.9

9.3.2 Time spent participating in physical activities in the last week by Body Mass Index

Overall there was a significant association between the time spent participating in physical activities in the last week and BMI category. A higher proportion of children in the *neither overweight nor obese* category spent 14 hours or more a week participating in physical activities than those in the *overweight including obese* category (64% vs. 58%). This significant association was also seen in the 3-7 and 12-17 year age groups.

Table 9.10

9.3.3 Time spent at a screen by Body Mass Index

For all children and for boys there was a significant association between BMI category and time spent sitting in front of a screen. A higher proportion of children in the *overweight including obese* category spent more than 3 hours in front of a screen than those in the *neither overweight nor obese* category (25% vs. 20%). For boys the proportions were 28% vs. 21%.

Table 9.11

9.4 References

1 National Physical Activity Task Force. Let’s make Scotland more active: A Strategy for Physical Activity. Edinburgh, Scottish Executive. 2003. http://www.scotland.gov.uk/library5/cultrue/lmsa-00.asp

2 Shaw A et al. (Eds) (2000). The Scottish Health Survey 1998 (2 Vols). Edinburgh, The Stationery Office.

3 Bromley C, Sproston K, Shelton N (Eds) The Scottish Health Survey 2003 (4 Vols). Edinburgh, The Stationary Office, 2005.

4 Biddle, S.J.H., Sallis, J.F. & Cavill, N. (Eds.) Young and active? Young people and health-enhancing physical activity: Evidence and implications. London, Health Education Authority. (1998).

Table 9.1 Participation in physical activity in the past week, by age and sex

No. of days of physical activity	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Any physical activities												
None	0	<1	<1	<1	<1	0	0	<1	<1	<1	<1	<1
1-4 days	<1	1	2	1	2	2	5	3	1	1	4	2
5-10 days	13	12	17	14	11	11	29	18	12	12	23	16
11-15 days	37	31	41	37	50	39	38	42	43	35	40	39
16-20 days	37	37	28	33	27	36	23	28	32	37	25	31
21 days or more	12	18	12	13	10	12	5	9	11	15	8	11
Mean number of days	15.3	15.9	14.4	15.1	14.5	15.3	12.5	13.9	14.9	15.6	13.5	14.5
Standard error of the mean	0.35	0.30	0.34	0.22	0.35	0.28	0.29	0.21	0.28	0.22	0.24	0.19
Base (weighted)	*273*	*248*	*344*	*865*	*263*	*232*	*334*	*830*	*536*	*480*	*679*	*1695*
Base (unweighted)	*274*	*280*	*301*	*855*	*262*	*260*	*319*	*841*	*536*	*540*	*620*	*1696*

Table 9.1a P-values for associations between sex and participation in physical activity (days) in the past week, by age

	Age			
	3-7	8-11	12-17	All
Participation in physical activity in the past week (categories)	**0.038**	0.286	**<0.001**	**<0.001**
Mean number of days	0.069	0.107	**<0.001**	**<0.001**

Table 9.1b P-values for associations between age group and participation in physical activity (days) in the past week, by sex

	Sex		
	Boys	Girls	Both boys & girls
Participation in physical activity in the past week (categories)	**0.033**	**<0.001**	**<0.001**
Mean number of days			
Overall association	**0.005**	**<0.001**	**<0.001**
Linear association	**0.030***	**<0.001***	**<0.001***

*Time spent participating decreases with age group

Table 9.2 Time spent participating in physical activities in the last week, by age and sex

Time spent participating (hrs)	Sex											
All activities	**Boys**				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
None or less than 1 hour	<1	<1	<1	<1	<1	<1	3	2	<1	<1	2	1
1, less than 7 hours	6	5	13	9	10	6	26	15	8	5	19	12
7, less than 14 hours	20	21	25	22	27	28	25	27	23	24	25	24
14, less than 21 hours	28	21	19	23	26	24	18	22	27	23	18	22
21, less than 28 hours	21	27	17	21	18	19	14	17	20	23	16	19
28 hours and over	25	25	24	25	19	23	13	18	22	24	19	21
Mean number of hours	22.1	22.2	19.9	21.2	19.5	20.6	15.1	18.0	20.8	21.4	17.5	19.7
Standard error of the mean	0.89	0.89	0.87	0.57	0.86	0.81	0.66	0.55	0.67	0.69	0.56	0.48
Base (weighted)	*272*	*246*	*345*	*863*	*260*	*232*	*334*	*826*	*532*	*478*	*680*	*1690*
Base (unweighted)	*273*	*278*	*302*	*853*	*259*	*259*	*319*	*837*	*532*	*537*	*621*	*1690*

Table 9.2a P-values for associations between sex and time spent particpating in physical activities in the last week, by age

	Age			
	3-7	8-11	12-17	All
Participation in physical activities in the last week (categories)	0.210	0.130	**<0.001**	**<0.001**
Mean number of hours	**0.020**	0.106	**<0.001**	**<0.001**

Table 9.2b P-values for associations between age group and time spent particpating in physical activities in the last week, by sex

	Sex		
	Boys	Girls	Both boys & girls
Participation in physical activities in the last week (categories)	**0.012**	**<0.001**	**<0.001**
Mean number of hours			
Overall association	0.137	**<0.001**	**<0.001**
Linear association	0.066	**<0.001***	**<0.001***

*Time spent participating decreases with age group

Table 9.3 **Summary physical activity levels, by age and sex**

Summary activity levels*	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
High	91	92	86	89	90	93	69	83	91	93	78	86
Medium	4	3	7	5	5	2	16	9	4	3	11	7
Low	5	5	7	6	5	5	15	9	5	5	11	7
Base (weighted)	*272*	*246*	*342*	*860*	*259*	*232*	*334*	*825*	*531*	*477*	*676*	*1684*
Base (unweighted)	*273*	*277*	*299*	*849*	*258*	*259*	*318*	*835*	*531*	*536*	*617*	*1684*

* High=60 minutes or more on all 7 days; medium=30-59 minutes on all 7 days; low = lower level of activity

Table 9.3a **P-values for associations between sex and summary physical activity levels, by age**

Age			
3-7	8-11	12-17	All
0.780	0.625	**<0.001**	**0.003**

Table 9.3b **P-values for associations between age group and summary physical activity levels, by age**

Sex		
Boys	Girls	Both boys & girls
0.116	**<0.001**	**<0.001**

Table 9.4 **Time spent sitting at a screen* on an average day, by age and sex**

Average time† (hrs)	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
less than 1 hour	24	14	8	15	29	19	13	20	26	16	10	17
at least 1, less than 2 hours	42	34	26	33	42	40	32	37	42	37	29	35
at least 2, less than 3 hours	24	31	32	29	21	25	27	24	22	28	29	27
at least 3, less than 4 hours	5	15	20	14	5	10	14	10	5	13	17	12
at least 4 hours	5	7	14	9	4	6	14	8	4	6	14	9
Mean number of hours	1.7	2.1	2.7	2.2	1.5	1.9	2.4	2.0	1.6	2.0	2.5	2.1
Standard error of the mean	0.07	0.06	0.10	0.06	0.06	0.10	0.08	0.05	0.05	0.06	0.07	0.05
Base (weighted)	*275*	*246*	*345*	*866*	*263*	*231*	*334*	*828*	*538*	*477*	*680*	*1695*
Base (unweighted)	*276*	*278*	*302*	*856*	*262*	*258*	*319*	*839*	*538*	*536*	*621*	*1695*

*Time spent in front of a screen includes television viewing or using a computer or games console, other than at school
†The average time includes hours spent on week days and weekend days

Table 9.4a **P-values for associations between sex and time spent sitting at a screen on an average day, by age**

	Age			
	3-7	8-11	12-17	All
Time spent sitting at a screen (categories)	0.586	0.200	0.082	**0.006**
Mean hours per day	**0.029**	0.070	**0.027**	**0.001**

Table 9.4b **P-values for associations between age group and time spent sitting at a screen on an average day, by sex**

	Sex		
	Boys	Girls	Both boys & girls
Time spent sitting at a screen (categories)	**<0.001**	**<0.001**	**<0.001**
Mean hours per day			
Overall association	**<0.001**	**<0.001**	**<0.001**
Linear association	**<0.001***	**<0.001***	**<0.001***

*Time spent sitting at a screen increases with age group

Table 9.5 Proportion of children meeting the current physical activity recommendations*, by Scottish Index of Multiple Deprivation quintile and sex

	Scottish Index of Multiple Deprivation quintile					
	1st (Least deprived)	2nd	3rd	4th	5th (Most deprived)	*P-value*†
	%	%	%	%	%	
Boys	89	92	91	87	87	*0.457*
Girls	83	79	83	89	81	*0.182*
All	86	86	87	88	84	*0.489*
Bases (weighted):						
Boys	*186*	*162*	*159*	*171*	*180*	
Girls	*171*	*158*	*141*	*148*	*207*	
All	*357*	*321*	*300*	*319*	*387*	
Bases (unweighted):						
Boys	*185*	*160*	*164*	*168*	*172*	
Girls	*173*	*160*	*148*	*151*	*203*	
All	*358*	*320*	*312*	*319*	*375*	

*At least 60 minutes or more on all 7 days

†P-values for the association between Scottish Index of Multiple Deprivation quintile and the proportion meeting current physical activity recommendations

Table 9.6 Proportion of children meeting the current physical activity recommendations*, by urban/rural classification and sex

	Urban/rural classification						
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	*P-value*†
	%	%	%	%	%	%	
Boys	89	87	92	[94]	91	[91]	-
Girls	81	83	82	[91]	85	[82]	-
All	85	85	88	92	88	87	*0.371*
Base (weighted)							
Boys	*284*	*280*	*104*	*42*	*120*	*30*	
Girls	*303*	*275*	*86*	*43*	*97*	*21*	
All	*587*	*555*	*189*	*85*	*217*	*51*	
Base (unweighted)							
Boys	*266*	*281*	*107*	*41*	*122*	*32*	
Girls	*292*	*283*	*88*	*47*	*102*	*23*	
All	*558*	*564*	*195*	*88*	*224*	*55*	

*At least 60 minutes or more on all 7 days

†P-values for the association between urban/rural classification and the proportion meeting current physical activity recommendations; not presented if unweighted base contains fewer than 50 observations

Table 9.7 **Proportion of children meeting physical activity recommendations*, by age, sex and whether overweight including obese**

	Age			
	3-7	8-11	12-17	All
	%	%	%	%
Boys				
Neither overweight nor obese	92	94	88	91
Overweight including obese	88	86	83	85
P-value†	*0.387*	***0.025***	*0.383*	***0.033***
Girls				
Neither overweight nor obese	94	95	71	86
Overweight including obese	83	90	65	77
P-value†	***0.017***	*0.178*	*0.420*	***0.010***
All				
Neither overweight nor obese	93	94	80	88
Overweight including obese	85	88	74	81
P-value†	***0.020***	***0.006***	*0.203*	***<0.001***
Base (weighted)				
Boys				
Neither overweight nor obese	*194*	*165*	*216*	*575*
Overweight including obese	*63*	*68*	*110*	*242*
Girls				
Neither overweight nor obese	*173*	*157*	*197*	*526*
Overweight including obese	*75*	*68*	*113*	*255*
All				
Neither overweight nor obese	*367*	*322*	*412*	*1101*
Overweight including obese	*138*	*136*	*223*	*497*
Base (unweighted)				
Boys				
Neither overweight nor obese	*193*	*185*	*184*	*562*
Overweight including obese	*65*	*78*	*103*	*246*
Girls				
Neither overweight nor obese	*173*	*176*	*188*	*537*
Overweight including obese	*74*	*76*	*107*	*257*
All				
Neither overweight nor obese	*366*	*361*	*372*	*1099*
Overweight including obese	*139*	*154*	*210*	*503*

*At least 60 minutes or more on all 7 days

†P-value for association between the proportion meeting physical activity recommendations and whether overweight including obese

Table 9.8 **Proportion of children meeting physical activity recommendations*, by Scottish Index of Multiple Deprivation quintile and whether overweight including obese**

	Scottish Index of Multiple Deprivation quintile				
	1st (least deprived)	2nd	3rd	4th	5th (most deprived)
	%	%	%	%	%
Neither overweight nor obese	88	86	92	90	87
Overweight including obese	81	86	81	83	75
P-value†	*0.206*	*0.965*	***0.005***	*0.092*	***0.022***
Base (weighted)					
Neither overweight nor obese	*254*	*219*	*185*	*199*	*245*
Overweight including obese	*86*	*92*	*102*	*102*	*114*
Base (unweighted)					
Neither overweight nor obese	*255*	*215*	*196*	*195*	*238*
Overweight including obese	*87*	*96*	*104*	*106*	*110*

*At least 60 minutes or more on all 7 days

†P-value for association between the proportion meeting physical activity recommendations and whether overweight including obese

Table 9.9 **Proportion of children meeting physical activity recommendations*, by urban/rural classification and whether overweight including obese**

	Urban/rural classification					
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural
	%	%	%	%	%	%
Neither overweight nor obese	88	87	89	94	91	[89]
Overweight including obese	79	81	[82]	[92]	79	[82]
P-value†	***0.009***	*0.121*	-	-	***0.015***	-
Base (weighted)						
Neither overweight nor obese	*369*	*363*	*139*	*49*	*149*	*33*
Overweight including obese	*180*	*164*	*46*	*33*	*58*	*17*
Base (unweighted)						
Neither overweight nor obese	*348*	*371*	*143*	*50*	*151*	*36*
Overweight including obese	*176*	*166*	*48*	*34*	*62*	*17*

*At least 60 minutes or more on all 7 days

†P-value for association between the proportion meeting physical activity recommendations and whether overweight including obese; not presented if unweighted base contains fewer than 50 observations

Table 9.10 **Time spent participating in physical activities in the last week (hrs), by age, whether overweight including obese and sex**

	Age							
	3-7		8-11		12-17		All	
All activities	Neither overweight nor obese	Overweight including obese	Neither overweight nor obese	Overweight including obese	Neither overweight nor obese	Overweight including obese	Neither overweight nor obese	Overweight including obese
	%	%	%	%	%	%	%	%
Boys								
None or less than 1 hour	0	1	<1	1	<1	2	<1	1
1, less than 7 hours	6	9	3	10	11	16	7	12
7, less than 14 hours	19	16	21	20	24	29	21	23
14, less than 21 hours	30	20	22	20	23	13	25	17
21, less than 28 hours	18	31	26	25	18	17	20	23
28 hours and over	26	24	27	24	24	24	25	24
*P-value**	*0.107*		*0.242*		*0.305*		***0.032***	
Girls								
None or less than 1 hour	0	0	0	0	1	7	<1	3
1, less than 7 hours	6	17	5	9	27	27	14	19
7, less than 14 hours	30	20	30	27	24	27	28	25
14, less than 21 hours	26	25	24	26	19	10	23	19
21, less than 28 hours	19	17	16	26	14	16	16	19
28 hours and over	18	21	26	12	14	14	19	15
*P-value**	*0.076*		***0.036***		*0.137*		***0.033***	
Both boys & girls								
None or less than 1 hour	0	<1	<1	<1	<1	4	<1	2
1, less than 7 hours	6	13	4	10	19	21	10	16
7, less than 14 hours	24	18	25	23	24	28	24	24
14, less than 21 hours	28	22	23	23	21	12	24	18
21, less than 28 hours	19	23	21	26	16	17	18	21
28 hours and over	23	22	26	18	19	19	22	19
*P-value**	***0.035***		*0.054*		***0.021***		***<0.001***	
Base (weighted)								
Boys	*194*	*63*	*166*	*68*	*217*	*112*	*577*	*244*
Girls	*173*	*75*	*157*	*68*	*197*	*113*	*527*	*255*
All	*367*	*138*	*322*	*136*	*414*	*225*	*1104*	*499*
Base (unweighted)								
Boys	*193*	*65*	*186*	*78*	*185*	*105*	*564*	*248*
Girls	*173*	*74*	*176*	*76*	*189*	*107*	*538*	*257*
All	*366*	*139*	*362*	*154*	*374*	*212*	*1102*	*505*

*P-value for association between time spent participating in physical activities and whether overweight including obese

Table 9.11 Time spent sitting at a screen on an average day (hrs), by age, whether overweight including obese and sex

All activities	Age 3-7 Neither over-weight nor obese	Age 3-7 Overweight including obese	Age 8-11 Neither over-weight nor obese	Age 8-11 Overweight including obese	Age 12-17 Neither over-weight nor obese	Age 12-17 Overweight including obese	All Neither over-weight nor obese	All Overweight including obese
	%	%	%	%	%	%	%	%
Boys								
Less than 1 hour	24	16	16	10	7	11	15	12
At least 1, less than 2 hours	43	43	37	23	28	18	36	26
At least 2, less than 3 hours	23	29	26	43	32	32	27	34
At least 3, less than 4 hours	5	7	14	18	20	21	13	17
At least 4 hours	5	6	7	6	13	18	8	11
*P-value**	*0.629*		*0.056*		*0.337*		***0.030***	
Girls								
Less than 1 hour	29	26	20	17	14	12	21	18
At least 1, less than 2 hours	44	41	43	38	32	28	39	34
At least 2, less than 3 hours	20	23	23	28	26	30	23	27
At least 3, less than 4 hours	6	3	9	10	14	13	10	9
At least 4 hours	1	7	5	7	14	18	7	12
*P-value**	*0.214*		*0.725*		*0.828*		*0.136*	
Both boys & girls								
Less than 1 hour	26	21	18	13	10	11	18	15
At least 1, less than 2 hours	43	42	40	31	30	23	37	30
At least 2, less than 3 hours	22	26	25	36	29	31	25	31
At least 3, less than 4 hours	5	5	12	14	17	17	12	13
At least 4 hours	3	6	6	7	13	18	8	12
*P-value**	*0.380*		*0.109*		*0.434*		***0.007***	
Base (weighted)								
Boys	*195*	*63*	*167*	*67*	*217*	*112*	*578*	*243*
Girls	*175*	*76*	*156*	*68*	*197*	*113*	*528*	*256*
All	*370*	*139*	*322*	*135*	*414*	*225*	*1107*	*499*
Base (unweighted)								
Boys	*194*	*65*	*187*	*77*	*185*	*105*	*566*	*247*
Girls	*175*	*75*	*175*	*76*	*189*	*107*	*539*	*258*
All	*369*	*140*	*362*	*153*	*374*	*212*	*1105*	*505*

*P-value for association between time spent sitting at a screen and whether overweight including obese

10 DENTAL HEALTH

10.1 Introduction

Scottish children have worse dental health than those in the UK as a whole,[1] and within Scotland, dental health has changed little between 1998 and 2003.[2] The development of dental caries (decay) is influenced by previous disease, social factors, use of fluoride, plaque control, saliva, medical history and diet.[3] The dietary factors include the amount of sugar consumed, sugar concentration of food, physical form of carbohydrate, oral retentiveness (length of time teeth are exposed to reduced plaque pH), frequency of eating meals and snacks, length of interval between eating, and sequence of food consumption.[3] In particular, it is the amount and frequency of consumption of NMES that are the major causes of dental caries in the UK.[4]

The questions used in this survey were the same as those used in the 2003 Scottish Health Survey.[2] The chapter reports on the dental health of children and provides information on attendance at the dentist and the type of dental treatment received including treatment for decay (fillings or teeth taken out due to decay). Information is not included on the level of decay, such as the number of fillings or the number of teeth removed due to decay. The data is presented by age and sex and then by SIMD and urban/rural classification. The association between dental disease and intake of total sugar, NMES and foods with high sugar content is explored.

10.2 Attendance at a dentist

The vast majority of children (97%) had attended the dentist. There was a marked association between the proportion of those who had ever attended the dentist and increasing age. At age 3-7, 94% of children (95% of boys and 92% of girls) had attended the dentist. This proportion rose to 99% (98% boys and 100% girls) by age 12-17.

The average age of first attendance at the dentist for all children was 2.2 years for both boys and girls.

The most common reason for first attendance amongst both sexes was to get used to going to the dentist (boys 59%, girls 61%). Going for a check up was the second most common reason. The only significant difference between the sexes was in the 8-11 year old age group. In this group boys were more likely than girls (32% vs. 21%) to attend the dentist for the first time for a check up and less likely than girls to go to get used to going to the dentist (59% vs. 68%).

Table 10.1, 10.1a, 10.1b

10.3 Dental treatment

There were no significant differences between the sexes in the type of dental treatment received. About a third of children had received treatments to stop decay such as painting and sealing. A similar proportion had had fillings but no teeth taken out due to decay (boys

32%, girls 31%). In addition, another 17% of boys and 16% of girls had had both fillings and teeth extracted due to decay.

All types of treatment were more common in older children with the exception of teeth extraction but no fillings. Those aged 8-11 years were more likely to have teeth extracted but have no fillings.

Over half of all children had received treatment for decay. The likelihood of receiving treatment for this reason increased with age. A quarter of children in the youngest age group, 3-7 years, had received treatment for decay (boys 26%, girls 26%). This proportion rose to almost three quarters for those aged 12-17 years (boys 74%, girls 73%).

Table 10.2 10.2a, 10.2b

10.4 Dental health by socio-demographic characteristics

10.4.1 Scottish Index of Multiple Deprivation (SIMD)

There was no clear trend in the proportion of children who had never attended a dentist across the SIMD quintiles. However there were clear trends in some of the type of treatments received by level of deprivation. The likelihood of having teeth taken out but no fillings and having both fillings and teeth taken out increased with increasing deprivation. Amongst boys, those living in most deprived areas were seven times as likely to have had teeth removed than those in the least deprived areas. Girls in the most deprived (5th) quintile were three times as likely to have had teeth removed as girls in the least deprived (1st) quintile.

All treatment for decay was also associated with increasing deprivation in both sexes. Boys in the most deprived quintile were twice as likely to have had treatment for decay than boys in the least deprived quintile (71% vs. 35% respectively). This trend was also apparent in girls although the difference between the highest and lowest quintiles was not as great (65% vs. 43%). These trends are likely to reflect higher rates of decay in more deprived groups.

Table 10.3

10.4.2 Urban/rural classification

Statistical tests were not carried out for dental treatment by urban/rural classification for boys and girls separately due to small numbers of children and results should be interpreted with caution.

Boys living in other urban areas, remote small towns and remote rural areas were most likely never to have attended a dentist (4% and 5% and 16% respectively). This compared to 1 or 2% never attending the dentist in other areas. There was a similar pattern amongst girls, for those living in other urban areas and remote small towns where 6% and 7% had not attended a dentist. However all girls in remote rural areas had attended a dentist.

Around a half of all children in all types of area had received dental treatment for decay with the exception of boys in other urban areas and boys and girls in remote small towns where the percentage of those receiving treatment for decay rose to 60% or more.

Table 10.4

10.5 Association between diet and dental health

Intakes of total sugars, NMES and selected food groups were compared between children who had received treatment for decay (had either fillings or teeth taken out due to decay) and children who had never received treatment for decay. The food groups selected were those that contributed at least 5% to the intake of total sugars and NMES, and also crisps and savoury snacks which may be important in the development of dental caries.

Statistical tests were not carried out for girls aged 3-7 years due to low numbers of children in the group treated for decay. It should also be noted that untreated caries may be more common in the youngest (3-7 years) age group, therefore for this age group, the comparison of diet between those who had had treatment for decay and those who had not may not be a true reflection of dietary intake of those with and without dental caries.

10.5.1 Intake of total sugars and NMES and treatment for decay

The mean intake of total sugars, expressed as a percentage of food energy, was not significantly different between children who had been treated for decay (29.1% food energy) and those who had never been treated for decay (28.8% food energy). However, mean NMES intake was significantly higher in children who had been treated for decay (18.5% food energy) than in children who had not (16.1% food energy). This difference in NMES intake was significant in boys and in girls, and was most evident in children aged 12-17.

Table 10.5

10.5.2 Intake of selected foods and treatment for decay

Children who had been treated for decay reported significantly higher intakes of crisps and savoury snacks, confectionery, and non-diet soft drinks than those who had never been treated for decay. Boys who had been treated for decay also reported higher intakes of biscuits, cakes and pastries. In boys, these significant differences were seen for crisps and savoury snacks and confectionery in all age groups, and for non-diet soft drinks in 12-17 year olds. In girls these significant differences were only seen in 12-17 year olds.

Children who had received treatment for decay also reported significantly lower intakes of milk and cream, yogurt and fromage frais, fruit and fruit juice including smoothies than those who had never received treatment for decay. These significant differences were only seen for fruit and fruit juice including smoothies in 8-11 and 12-17 year olds.

Table 10.6

10.6 References

1 An Action Plan for Dental Services in Scotland. Edinburgh: Scottish Executive 2000.

2 Bromley C, Sproston K, Shelton N (Eds) The Scottish Health Survey 2003 (4 Vols). Edinburgh, The Stationary Office, 2005.

3 Scottish Intercollegiate Guidelines Network. Preventing Dental Caries in Children and High Caries Risk: Targeted prevention of dental caries in the permanent teeth of 6-16 year olds presenting for dental care. SIGN Publication Number 47. Edinburgh: Scottish Intercollegiate Guidelines Network, 2000.

4 Department of Health. Dietary Sugars and Human Disease. London: HMSO, (Reports on health and social subjects; 37), 1989.

Table 10.1 Attendance at dentist and reason for first visit, by age and sex

No. of days participation	Sex											
	Boys				**Girls**				**Both boys & girls**			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Ever attended a dentist	95	99	98	97	92	98	100	97	94	98	99	97
Mean age of first attendance (years)	1.7	2.2	2.5	2.2	1.8	2.0	2.5	2.2	1.8	2.1	2.5	2.2
Standard error of the mean	0.07	0.09	0.13	0.07	0.07	0.08	0.11	0.06	0.05	0.06	0.09	0.05
Reason for first attendance												
Trouble with teeth	4	5	9	6	6	6	8	7	5	6	8	7
Note from school dentist	<1	2	3	2	0	1	2	1	<1	1	3	1
For a check up	32	32	27	30	28	21	33	28	30	27	30	29
To get used to going to the dentist	61	59	58	59	63	68	55	61	62	63	57	60
Other reason	3	3	3	3	3	4	2	3	3	3	3	3
Base (weighted)												
All	*275*	*248*	*343*	*866*	*263*	*232*	*334*	*830*	*538*	*480*	*678*	*1696*
Mean age of first attendance	*260*	*243*	*330*	*833*	*243*	*225*	*322*	*790*	*503*	*469*	*652*	*1623*
Reason for first attendance	*260*	*245*	*335*	*840*	*243*	*227*	*333*	*803*	*503*	*472*	*668*	*1643*
Base (unweighted)												
All	*276*	*280*	*301*	*857*	*262*	*260*	*319*	*841*	*538*	*540*	*620*	*1698*
Mean age of first attendance	*261*	*275*	*291*	*827*	*242*	*252*	*307*	*801*	*503*	*527*	*598*	*1628*
Reason for first attendance	*261*	*276*	*295*	*832*	*242*	*254*	*318*	*814*	*503*	*530*	*613*	*1646*

Table 10.1a P-values for associations between sex and attendance at dentist and reason for first visit, by age

	Age			
	3-7	8-11	12-17	All
Ever attended a dentist	0.240	0.352	0.081	0.827
Mean age of first attendance	0.493	0.145	0.737	0.982
Reason for first attendance	0.575	**0.049**	0.517	0.812

Table 10.1b P-values for associations between age group and attendance at dentist and reason for first visit, by sex

	Sex		
	Boys	Girls	Both boys & girls
Ever attended a dentist	**0.037**	**<0.001**	**<0.001**
Mean age of first attendance			
Overall association	**<0.001**	**<0.001**	**<0.001**
Linear association	**<0.001***	**<0.001***	**<0.001***
Reason for first attendance	0.139	**0.015**	**0.016**

*Age of first attendance increases with age group

Table 10.2 Dental treatment by age and sex

	Sex											
	Boys				Girls				Both boys & girls			
	3-7	8-11	12-17	All	3-7	8-11	12-17	All	3-7	8-11	12-17	All
	%	%	%	%	%	%	%	%	%	%	%	%
Type of dental treatment												
Type of treatment for decay												
Fillings but no teeth taken out	16	28	46	32	15	30	44	31	15	29	45	31
Teeth taken out but no fillings	7	12	4	7	6	10	7	8	7	11	5	7
Both fillings and teeth taken out	2	23	24	17	5	20	22	16	4	21	23	17
All treatment for decay*	26	63	74	56	26	60	73	55	26	62	74	56
Treatment to stop decay such as painting and/or sealing	16	36	38	30	18	34	42	32	17	35	40	31
Orthodontics	<1	7	29	14	<1	10	35	17	<1	8	32	15
Any other treatment	2	7	10	7	2	8	10	7	2	7	10	7
Base (weighted)												
Type of treatment for decay	*261*	*244*	*334*	*840*	*243*	*227*	*333*	*803*	*504*	*472*	*668*	*1643*
All treatment for decay	*261*	*244*	*335*	*840*	*243*	*227*	*333*	*803*	*504*	*472*	*668*	*1644*
Treatment to stop decay	*261*	*243*	*331*	*836*	*242*	*227*	*333*	*803*	*503*	*471*	*665*	*1638*
Orthodontics/Any other treatment	*261*	*245*	*335*	*841*	*243*	*227*	*333*	*803*	*504*	*473*	*668*	*1645*
Base (unweighted)												
Type of treatment for decay	*262*	*276*	*294*	*832*	*242*	*254*	*318*	*814*	*504*	*530*	*612*	*1646*
All treatment for decay	*262*	*276*	*295*	*833*	*242*	*254*	*318*	*814*	*504*	*530*	*613*	*1647*
Treatment to stop decay	*262*	*275*	*292*	*829*	*241*	*254*	*318*	*813*	*503*	*529*	*610*	*1642*
Orthodontics/Any other treatment	*262*	*277*	*295*	*834*	*242*	*254*	*318*	*814*	*504*	*531*	*613*	*1648*

*Had either fillings or teeth taken out due to decay

Table 10.2a P-values for associations between sex and dental treatment, by age

	Age			
	3-7	8-11	12-17	All
Type of treatment for decay	0.451	0.736	0.277	0.919
All treatment for decay	0.942	0.488	0.698	0.709
Treatment to stop decay such as painting and/or sealing	0.586	0.636	0.270	0.287
Orthodontics	0.990	0.407	0.158	0.057
Any other treatment	0.795	0.565	0.892	0.695

Table 10.2b P-values for associations between age group and dental treatment, by sex

	Sex		
	Boys	Girls	Both boys & girls
Type of treatment for decay	**<0.001**	**<0.001**	**<0.001**
All treatment for decay	**<0.001**	**<0.001**	**<0.001**
Treatment to stop decay such as painting and/or sealing	**<0.001**	**<0.001**	**<0.001**
Orthodontics	**<0.001**	**<0.001**	**<0.001**
Any other treatment	**<0.001**	**0.003**	**<0.001**

Table 10.3 Attendance at dentist and dental treatment, by Scottish Index of Multiple Deprivation and sex

Attending dentist, type of dental treatment	Scottish Index of Multiple Deprivation					
	1st (Least deprived)	2nd	3rd	4th	5th (Most deprived)	*P-value**
	%	%	%	%	%	
Boys						
Never attended a dentist	2	4	3	2	4	*0.681*
Type of dental treatment						
Type of treatment for decay						***<0.001***
Fillings but no teeth taken out	28	37	35	29	29	
Teeth taken out but no fillings	2	3	8	9	14	
Both fillings and teeth taken out	4	15	14	25	27	
All treatment for decay†	35	55	57	63	71	***<0.001***
Treatment to stop decay such as painting and/or sealing	32	28	36	31	25	*0.256*
Orthodontics	19	18	7	16	8	***0.009***
Any other treatment	7	7	6	3	9	*0.319*
Girls						
Never attended a dentist	3	1	4	4	4	*0.564*
Type of dental treatment						
Type of treatment for decay						***<0.001***
Fillings but no teeth taken out	29	31	32	35	30	
Teeth taken out but no fillings	5	3	7	9	14	
Both fillings and teeth taken out	8	14	16	19	22	
All treatment for decay†	43	48	55	63	65	***<0.001***
Treatment to stop decay such as painting and/or sealing	34	36	28	36	30	*0.358*
Orthodontics	19	22	15	14	16	*0.303*
Any other treatment	5	10	6	9	5	*0.314*
All						
Never attended a dentist	2	3	3	3	4	*0.855*
Type of dental treatment						
Type of treatment for decay						***<0.001***
Fillings but no teeth taken out	29	34	34	31	30	
Teeth taken out but no fillings	4	3	7	9	14	
Both fillings and teeth taken out	6	14	15	23	24	
All treatment for decay†	39	52	56	63	68	***<0.001***
Treatment to stop decay such as painting and/or sealing	33	32	32	33	27	*0.451*
Orthodontics	19	20	11	15	12	***0.007***
Any other treatment	6	9	6	6	7	*0.728*
Bases (weighted):						
Boys	*186*	*161*	*160*	*175*	*183*	
Type of treatment for decay‡	*183*	*154*	*155*	*171*	*176*	
Girls	*172*	*159*	*143*	*149*	*208*	
Type of treatment for decay‡	*165*	*158*	*137*	*143*	*200*	
All	*358*	*320*	*302*	*324*	*391*	
Type of treatment for decay‡	*349*	*312*	*293*	*313*	*376*	
Bases (unweighted):						
Boys	*185*	*160*	*165*	*172*	*175*	
Type of treatment for decay‡	*182*	*154*	*160*	*168*	*168*	
Girls	*174*	*161*	*150*	*152*	*204*	
Type of treatment for decay‡	*167*	*159*	*145*	*146*	*197*	
All	*359*	*321*	*315*	*324*	*379*	
Type of treatment for decay‡	*349*	*313*	*305*	*314*	*365*	

*P-values for the association between Scottish Index of Multiple Deprivation quintile and attendance at dentist and dental treatment
†Had either fillings or teeth taken out due to decay. ‡Bases presented are for 'type of treatment for decay' and vary slightly (3 or less) for 'All treatment for decay', 'Treatment to stop decay' and 'Orthodontics/Any other treatment'.

Table 10.4 Attendance at dentist and dental treatment, by urban/rural classification and sex

Attending dentist, type of dental treatment	Urban/rural classification						P-value*
	Large urban areas	Other urban areas	Accessible small town	Remote small town	Accessible rural	Remote rural	
	%	%	%	%	%	%	
Boys							
Never attended a dentist	1	4	1	[5]	2	[16]	-
Type of dental treatment							
Type of treatment for decay							-
Fillings but no teeth taken out	32	33	25	[37]	33	[33]	
Teeth taken out but no fillings	8	8	10	[9]	3	[0]	
Both fillings and teeth taken out	19	19	13	[19]	13	[16]	
All treatment for decay†	58	60	47	[65]	49	[48]	-
Treatment to stop decay such as painting and/or sealing	27	34	22	[40]	34	[27]	-
Orthodontics	16	13	6	[7]	18	[11]	-
Any other treatment	6	5	11	[0]	9	[4]	-
Girls							
Never attended a dentist	2	6	1	[7]	1	[0]	-
Type of dental treatment							
Type of treatment for decay							-
Fillings but no teeth taken out	29	32	35	[36]	35	[28]	
Teeth taken out but no fillings	11	8	2	[9]	3	[0]	
Both fillings and teeth taken out	16	18	10	[19]	14	[31]	
All treatment for decay†	55	57	47	[64]	52	[59]	-
Treatment to stop decay such as painting and/or sealing	30	35	29	[32]	33	[46]	-
Orthodontics	20	16	18	[8]	19	[4]	-
Any other treatment	5	9	11	[7]	6	[0]	-
All							
Never attended a dentist	1	5	1	6	2	10	***0.011***
Type of dental treatment							
Type of treatment for decay							*0.330*
Fillings but no teeth taken out	30	32	30	36	34	30	
Teeth taken out but no fillings	9	8	6	9	3	0	
Both fillings and teeth taken out	17	18	11	19	13	23	
All treatment for decay†	56	59	47	64	50	53	*0.129*
Treatment to stop decay such as painting and/or sealing	29	35	26	36	34	36	*0.148*
Orthodontics	18	15	12	7	18	8	***0.033***
Any other treatment	6	7	11	3	8	2	*0.301*
Bases (weighted):							
Boys	*288*	*281*	*105*	*42*	*121*	*30*	
Type of treatment for decay‡	*284*	*269*	*104*	*40*	*118*	*25*	
Girls	*304*	*278*	*86*	*43*	*98*	*21*	
Type of treatment for decay‡	*299*	*261*	*86*	*40*	*97*	*21*	
All	*592*	*559*	*191*	*85*	*218*	*51*	
Type of treatment for decay‡	*583*	*530*	*189*	*80*	*215*	*46*	
Bases (unweighted):							
Boys	*270*	*283*	*108*	*41*	*123*	*32*	
Type of treatment for decay‡	*266*	*271*	*107*	*40*	*120*	*28*	
Girls	*293*	*286*	*89*	*47*	*103*	*23*	
Type of treatment for decay‡	*288*	*269*	*88*	*44*	*102*	*23*	
All	*563*	*569*	*197*	*88*	*226*	*55*	
Type of treatment for decay‡	*554*	*540*	*195*	*84*	*222*	*51*	

*P-values for the association between urban/rural classification and attendance at dentist and dental treatment. †Had either fillings or teeth taken out due to decay; not presented if unweighted base contains fewer than 50 observations. ‡Bases presented are for' type of treatment for decay' and vary slightly (3 or less) for 'All treatment for decay', 'Treatment to stop decay' and 'Orthodontics/Any other treatment'.

Table 10.5 **Intake of total sugars and non-milk extrinsic sugars (NMES), by age, treatment for decay, and sex**

	Age											
	3-7			8-11			12-17			All		
	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†
Boys												
Total sugars (% of food energy)												
Mean	28.5	29.1	*0.498*	28.2	28.1	*0.967*	30.2	29.0	*0.256*	28.8	28.7	*0.907*
Lower 95% confidence limit	27.5	27.6		26.9	27.1		28.6	27.8		28.1	28.0	
Upper 95% confidence limit	29.4	30.6		29.5	29.3		31.8	30.3		29.5	29.5	
NMES (% of food energy)												
Mean	15.8	16.9	*0.153*	15.8	17.6	***0.015***	17.9	19.3	*0.203*	16.3	18.3	***<0.001***
Lower 95% confidence limit	14.9	15.6		14.9	16.7		16.3	18.1		15.7	17.6	
Upper 95% confidence limit	16.7	18.3		16.9	18.5		19.6	20.5		16.9	19.1	
Girls												
Total sugars (% of food energy)												
Mean	28.7	[28.5]	-	29.1	28.1	*0.271*	28.5	30.4	*0.067*	28.8	29.4	*0.210*
Lower 95% confidence limit	27.7	[26.7]		28.0	27.0		26.9	29.2		28.1	28.6	
Upper 95% confidence limit	29.7	[30.4]		30.4	29.4		30.3	31.6		29.5	30.3	
NMES (% of food energy)												
Mean	15.1	[17.1]	-	17.0	16.8	*0.755*	16.3	20.4	***<0.001***	15.9	18.8	***<0.001***
Lower 95% confidence limit	14.1	[15.3]		16.0	15.9		14.9	19.0		15.2	17.9	
Upper 95% confidence limit	16.1	[19.2]		18.0	17.6		17.9	21.9		16.6	19.8	
All												
Total sugars (% of food energy)												
Mean	28.6	28.8	*0.740*	28.7	28.1	*0.383*	29.3	29.7	*0.654*	28.8	29.1	*0.467*
Lower 95% confidence limit	27.9	27.7		27.8	27.4		27.9	28.8		28.3	28.5	
Upper 95% confidence limit	29.2	29.9		29.6	29.0		30.7	30.6		29.3	29.6	
NMES (% of food energy)												
Mean	15.4	17.0	***0.020***	16.4	17.2	*0.135*	17.1	19.8	***0.001***	16.1	18.5	***<0.001***
Lower 95% confidence limit	14.9	15.9		15.7	16.6		15.9	18.9		15.7	18.0	
Upper 95% confidence limit	16.0	18.2		17.2	17.9		18.3	20.8		16.5	19.1	
Base (weighted)												
Boys	*164*	*57*		*69*	*131*		*70*	*194*		*304*	*381*	
Girls	*139*	*44*		*75*	*104*		*79*	*190*		*293*	*338*	
All	*303*	*100*		*145*	*234*		*149*	*384*		*596*	*719*	
Base (unweighted)												
Boys	*167*	*56*		*81*	*145*		*67*	*171*		*315*	*372*	
Girls	*137*	*44*		*88*	*114*		*78*	*181*		*303*	*339*	
All	*304*	*100*		*169*	*259*		*145*	*352*		*618*	*711*	

*Had either fillings or teeth taken out due to decay. †P-values for differences in nutrient intakes between children who have never had treatment for decay and children who have had treatment for decay; not presented if unweighted base contains fewer than 50 observations

Table 10.6 Intake of selected food groups (grams/day), by age, treatment for decay, and sex

	Age											
	3-7			8-11			12-17			All		
	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†
Boys												
Biscuits, cakes & pastries												
Mean	34	37	*0.464*	34	41	*0.069*	34	44	*0.055*	34	42	***0.007***
Lower 95% confidence limit	30	32		28	36		27	38		31	38	
Upper 95% confidence limit	39	42		40	46		43	50		38	46	
Milk & cream												
Mean	290	261	*0.383*	254	244	*0.731*	255	260	*0.893*	273	254	*0.241*
Lower 95% confidence limit	255	215		214	210		206	222		250	232	
Upper 95% confidence limit	327	313		300	283		312	302		298	278	
Yogurt & fromage frais												
Mean	96	100	*0.755*	83	85	*0.840*	65	49	*0.134*	85	67	***0.001***
Lower 95% confidence limit	83	82		67	75		47	42		76	60	
Upper 95% confidence limit	110	121		102	96		87	58		95	74	
Crisps & savoury snacks												
Mean	16	20	***0.033***	19	25	***0.034***	13	22	***0.001***	16	23	***<0.001***
Lower 95% confidence limit	14	16		15	22		10	18		14	20	
Upper 95% confidence limit	18	25		24	30		16	26		18	26	
Fruit excluding fruit juice												
Mean	146	156	*0.631*	151	108	***0.005***	123	89	***0.028***	141	104	***<0.001***
Lower 95% confidence limit	124	126		128	91		95	75		128	94	
Upper 95% confidence limit	170	193		176	127		157	104		156	114	
Confectionery												
Mean	16	25	***0.013***	15	22	***0.005***	20	33	***0.002***	17	27	***<0.001***
Lower 95% confidence limit	14	19		12	19		15	28		15	25	
Upper 95% confidence limit	19	32		19	25		26	38		19	30	
Fruit juice, including smoothies												
Mean	51	35	*0.091*	55	38	*0.051*	88	44	***0.002***	59	41	***<0.001***
Lower 95% confidence limit	40	23		41	28		61	34		50	35	
Upper 95% confidence limit	64	51		73	51		126	56		70	47	

Table 10.6 continued **Intake of selected food groups (grams/day), by age, treatment for decay, and sex**

	Age											
	3-7			8-11			12-17			All		
	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†
Soft drinks, not diet												
Mean	83	110	*0.319*	110	147	*0.130*	118	221	***0.004***	96	174	***<0.001***
Lower 95% confidence limit	66	68		79	118		80	175		82	147	
Upper 95% confidence limit	103	172		150	184		169	278		112	206	
Girls												
Biscuits, cakes & pastries												
Mean	30	[39]	-	32	35	*0.365*	31	32	*0.759*	31	34	*0.172*
Lower 95% confidence limit	26	[32]		27	31		25	28		28	30	
Upper 95% confidence limit	34	[47]		38	41		38	36		34	37	
Milk & cream												
Mean	280	[198]	-	219	209	*0.630*	200	168	*0.150*	241	184	***<0.001***
Lower 95% confidence limit	245	[147]		191	179		167	144		221	167	
Upper 95% confidence limit	319	[259]		250	243		238	195		262	203	
Yogurt & fromage frais												
Mean	95	[89]	-	88	78	*0.419*	55	45	*0.146*	81	59	***<0.001***
Lower 95% confidence limit	82	[71]		71	64		44	39		72	52	
Upper 95% confidence limit	109	[110]		108	94		68	53		90	67	
Crisps & savoury snacks												
Mean	18	[24]	-	22	24	*0.283*	13	23	***<0.001***	17	24	***<0.001***
Lower 95% confidence limit	15	[19]		19	21		10	20		15	21	
Upper 95% confidence limit	21	[29]		26	28		18	27		20	26	
Fruit excluding fruit juice												
Mean	183	[159]	-	159	142	*0.400*	129	100	*0.088*	161	119	***<0.001***
Lower 95% confidence limit	161	[127]		133	118		101	84		145	106	
Upper 95% confidence limit	208	[198]		188	170		163	119		178	133	
Confectionery												
Mean	17	[30]	-	20	18	*0.385*	22	30	***0.018***	19	26	***<0.001***
Lower 95% confidence limit	14	[25]		17	15		18	26		17	23	
Upper 95% confidence limit	19	[37]		23	21		27	34		21	29	

Table 10.6 continued **Intake of selected food groups (grams/day), by age, treatment for decay, and sex**

	Age											
	3-7			8-11			12-17			All		
	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†
Fruit juice, including smoothies												
Mean	45	[37]	-	63	46	*0.050*	59	45	*0.116*	53	44	*0.069*
Lower 95% confidence limit	37	[23]		50	36		42	38		46	38	
Upper 95% confidence limit	56	[57]		79	59		82	54		61	51	
Soft drinks, not diet												
Mean	77	[151]	-	120	131	*0.633*	83	196	***<0.001***	88	168	***<0.001***
Lower 95% confidence limit	56	[109]		95	103		58	153		72	139	
Upper 95% confidence limit	103	[208]		152	164		116	250		108	201	
All												
Biscuits, cakes & pastries												
Mean	32	38	*0.052*	33	38	*0.053*	32	38	*0.081*	32	38	***0.005***
Lower 95% confidence limit	29	34		29	34		27	34		30	35	
Upper 95% confidence limit	35	42		38	43		38	41		35	40	
Milk & cream												
Mean	285	232	*0.054*	235	228	*0.676*	225	211	*0.422*	257	219	***<0.001***
Lower 95% confidence limit	261	192		210	205		197	190		241	206	
Upper 95% confidence limit	311	277		263	253		256	234		274	234	
Yogurt & fromage frais												
Mean	95	95	*0.927*	86	82	*0.625*	60	47	*0.052*	83	63	***<0.001***
Lower 95% confidence limit	86	82		75	74		47	43		76	59	
Upper 95% confidence limit	106	109		97	91		74	52		91	68	
Crisps & savoury snacks												
Mean	17	22	***0.003***	21	25	***0.013***	13	22	***<0.001***	17	23	***<0.001***
Lower 95% confidence limit	15	19		18	22		10	20		15	21	
Upper 95% confidence limit	19	26		24	28		16	25		18	25	
Fruit excluding fruit juice												
Mean	162	158	*0.762*	155	122	***0.011***	127	94	***0.006***	151	111	***<0.001***
Lower 95% confidence limit	144	139		137	108		104	83		140	102	
Upper 95% confidence limit	182	179		175	139		153	107		163	120	

Table 10.6 continued **Intake of selected food groups (grams/day), by age, treatment for decay, and sex**

	Age											
	3-7			**8-11**			**12-17**			**All**		
	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†	Never treated for decay	Treated* for decay	*p-value*†
Confectionery												
Mean	16	27	***<0.001***	17	20	*0.142*	21	31	***<0.001***	18	26	***<0.001***
Lower 95% confidence limit	14	23		15	18		18	28		16	25	
Upper 95% confidence limit	18	32		20	22		25	34		19	29	
Fruit juice, including smoothies												
Mean	49	36	*0.068*	59	42	***0.004***	72	45	***<0.001***	56	42	***<0.001***
Lower 95% confidence limit	42	27		48	34		56	38		50	38	
Upper 95% confidence limit	56	47		72	51		91	52		63	47	
Soft drinks, not diet												
Mean	80	127	***0.006***	115	140	*0.112*	98	209	***<0.001***	92	171	***<0.001***
Lower 95% confidence limit	67	94		97	117		77	175		82	149	
Upper 95% confidence limit	95	169		136	166		124	249		104	196	
Base (weighted)												
Boys	*164*	*57*		*69*	*131*		*70*	*194*		*304*	*381*	
Girls	*139*	*44*		*75*	*104*		*79*	*190*		*293*	*338*	
All	*303*	*100*		*145*	*234*		*149*	*384*		*596*	*719*	
Base (unweighted)												
Boys	*167*	*56*		*81*	*145*		*67*	*171*		*315*	*372*	
Girls	*137*	*44*		*88*	*114*		*78*	*181*		*303*	*339*	
All	*304*	*100*		*169*	*259*		*145*	*352*		*618*	*711*	

*Had either fillings or teeth taken out due to decay

†P-values for differences in nutrient intakes between children who have never had treatment for decay and children who have had treatment for decay; not presented if unweighted base contains fewer than 50 observations

11 DISCUSSION AND RECOMMENDATIONS

This chapter reviews the design and results of the study and their implications for future research and for health improvement in Scottish children.

11.1 Survey methodology

11.1.1 Survey population

The Child Benefit records used as the sampling frame for this survey provided a valuable opportunity to approach a nationally representative sample of children in Scotland. The final sample size was close to the intended target figure of 1,600 children, which was chosen to allow robust estimates of variables for sub-groups defined by age, sex and socio-economic deprivation. However, due to the small proportion of the population in remote and rural areas the ability of the survey to detect differences between children living in these areas compared to those in urban areas was limited.

The overall response of 66% achieved in this survey suggests that the method used to contact the children and parents was acceptable to the majority of those approached. There was no evidence of response bias by socio-economic deprivation (as defined by quintile of the Scottish Index of Multiple Deprivation or SIMD) for the interview but for the FFQ there was some evidence of response bias by socio-economic deprivation, with lower response from children in areas of greater deprivation. In spite of this a total of 295 children in the most deprived quintile of SIMD completed an FFQ, allowing confidence to be placed in weighted estimates of food and nutrient intake for this group.

11.1.2 Dietary assessment methods

This survey was the first national survey in the UK to use FFQs as the primary dietary assessment method. The agreement between the FFQ and the diet diary and 24-hour recall in the sub-samples suggest that the values of NMES, total fat and saturated fatty acids as % energy provided by the FFQ could be used for comparison with targets and with data collected using other methods for these nutrients.

The FFQ was chosen as it required much less staff time for coding the foods and drinks and estimating the weight of each item than the diet diary or 24-hour recall.

During the interview the instruction for the completion of the diet diaries took around 5 minutes while the median time taken for collection of a single 24-hour recall was 25 minutes. The diet diaries then required 1 hour or more of experienced nutritionists' time to code and enter the data per day of data collected while the 24-hour recall required around 1.5 hours for coding and entry due to the greater use of recipes and the collection of more qualitative information. By contrast each FFQ could be entered by data entry clerks in under 15 minutes with less than a third of the FFQs needing further time (on average 5 minutes) for a trained nutritionist to code additional foods listed by the respondents. Checking of the completed FFQs prior to the face to face home interview by the trained field workers reduced the problem of missing data and ensured that the quality of the data collected was high.

For energy and other nutrients there was evidence of over-estimation by the FFQ which varied between the nutrients. There was some evidence for greater over-estimation in the younger children, in whom the FFQs were usually completed by the parent, which limited comparisons of energy and other nutrients by age sub-groups. The sub-groups used in the validation studies were not large enough to assess whether the validity of the FFQs differed by socio-economic deprivation level. For this reason the comparisons of the FFQ derived food and nutrient intake between the deprivation categories should be seen as an indication of broad patterns rather than precise estimates of the differences.

There was little evidence of response bias by socio-economic deprivation for the 24-hour recall but the response to the diet diary was much lower in children in the more deprived areas. This suggests that surveys using diet diaries need to ensure that sample size is sufficient to provide a reasonable number of subjects in more deprived areas and to use weighting methods to derive estimates of population intakes where the sample size in the sub-groups is not in proportion with the size of the sub-groups in the total population.

11.1.3 Anthropometric measurements

The measurement of height and weight by field workers in the home was acceptable to the majority of the children, with only 4% refusing the measurements. The BMI obtained was compared with UK reference data[1] rather than international reference data[2] which uses cut-off points closer to the UK 89th and 99th centiles for overweight and obesity respectively and hence provides lower estimates of the prevalence, particularly for obesity, than those based on the UK data.

11.1.4 Physical activity

Although the same questions were used to assess the proportion of children who met the recommended physical activity levels in the present survey as in the 2003 Scottish Health Survey, the proportion of children meeting the recommendations was considerably higher in the present survey (86% of the children in the present survey compared with 74% of boys and 63% of girls aged 2-15 years in the 2003 Scottish Health Survey[3] (SHS)). A possible explanation is that in the present survey data was collected in the summer months (May – September) when children are likely to be more active, whereas in the SHS data was collected continuously over a 19-month period. This suggests that future surveys of activity in children in Scotland may need to take seasonal variation in activity into account.

Due to the high proportion of children meeting the recommended level of activity in the present survey, sub-group analyses of this variable were limited by the low numbers of children in each sub-group who did not meet the recommendation.

11.1.5 Dental health

The questions on dental health used in the present survey were also the same as those used in the 2003 SHS. These questions relied on the accuracy of recall by the parents or children of dental treatment received and may therefore differ from figures based on dental records. The questions do not therefore provide reliable estimates of the proportion of children who had caries as the questions only asked about treatment for caries: mild forms of caries or caries in children who had not visited a dentist were not included so the true prevalence of caries will have been higher than the figures reported here. There was also no assessment of the severity of caries in those who had had treatment.

Key points

- Child Benefit Records provided a very effective sampling frame for the survey.
- 66% of respondents completed the FFQ and face to face interview
- There was some evidence of lower response to the FFQ in areas of greater socio-economic deprivation.
- Although the sample was representative of urban, rural and remote sub-groups of the Scottish population, comparisons between these sub-groups were limited by the low numbers of children in rural and remote areas.
- The FFQ provided similar estimates of NMES, total fat and saturated fatty acids (as % energy) to the diet diary and 24-hour recall, but required much less trained staff time.
- For energy and many other nutrients the FFQ overestimated the intake by varying amounts.
- Levels of physical activity recorded may have been influenced by the fact that the survey was carried out in summer months only.
- Estimates of dental caries relied on parent- or child-reported treatment for caries and therefore did not include mild or untreated caries.

Recommendations

Use of the Child Benefit records as the sampling frame should be considered in any future study monitoring children's diets.

The FFQ as used in this study proved to be a cost effective and robust method for measuring intake of NMES and fat and saturated fatty acid as percentage food energy. It is recommended that this method be considered in monitoring the intake of these nutrients.

11.2 Survey results

11.2.1 Intake of foods and nutrients

The FFQ provided evidence that the majority of children consumed a wide range of foods: of the 32 food groups, foods from each group were consumed once a month or more by at least two thirds of the participants apart from wholemeal bread, white fish, shell fish and dishes, nuts and seeds and powdered beverages.

There were clear relationships for many of the food groups between the amount of food consumed among consumers and SIMD, with more pasta, rice, vegetables, fruit and fruit juice consumed by children in less deprived areas and more eggs, processed meats, chips, crisps, confectionery and soft drinks consumed by children in more deprived areas. In spite of these differences the trends in energy, NMES, total fat and saturated fatty acids were not marked. This unexpected finding may be the result of the fact that some food groups which were major contributors to energy and fat intake such as biscuits, cakes and pastries and milk and cream were consumed in similar amounts in all SIMD quintiles. However, for NMES the greater fruit juice consumption in the children in less deprived areas compensated for the lower non-diet soft drink intake. It is also important to highlight the fact that the present survey was not designed to provide accurate estimates of vitamin and mineral intake which are likely to differ more widely with deprivation level as a result of the differences in food groups consumed.

There was clear evidence that the intake of NMES was considerably higher than the Scottish Dietary Target of ≤ 10% in all children and in all sub-groups. The average intake of total sugar was 138g per day, of which 64g per day (approximately 13 teaspoons) was sucrose. The overall mean intake of NMES if of 17.4% of food energy was similar to the values of 16.7% in boys and 16.4% in girls in the NDNS survey of UK children aged 4-18[4] carried out in 1997 and to the value of 17.1% in boys and 16.5% in girls aged 2-18 in the Low Income Diet and Nutrition Survey[5] (LIDNS) carried out in 2004, suggesting that this is a UK-wide problem. The high intake of NMES in Scottish children is consistent with the findings of the Health and Behaviour in School-age Children (HBSC) survey[6] which found that Scotland ranked second highest of 35 countries for consumption of sweet drinks and third highest for frequent consumption of sweets.

The main sources of NMES in the present survey were non-diet soft drinks, biscuits, cakes and pastries and confectionery, which is consistent with the patterns seen in both the NDNS and LIDNS. Soft drinks and confectionery are inexpensive, highly palatable and widely available and are therefore likely to be consumed between meals, thereby adding to the risk of dental disease. However it is also worth pointing out that in the present survey 13% of NMES was derived from fruit juice including smoothies (6%) and yogurt and fromage frais (7%), which may be considered to be healthier alternatives to biscuits and confectionery. The fact that fruit juice and smoothies may be less beneficial for dental and metabolic health than whole fruit may need to be highlighted in future health messages.

The average intake of total fat of 32.9% food energy in the present survey was below the DRV population average of 35% and the Scottish Dietary Target of ≤35%. The value was also a little lower than the values of 35.4% in boys and 35.9% in girls reported in the NDNS and lower than the values of 36.1% in boys and 35.7% in girls aged 2-18 reported in the LIDNS. The average saturated fatty acid intake of 13.8% food energy was higher than the DRV population average of 11 % food energy and the Scottish Dietary Target of ≤11% food energy but similar to the values of 14.2% in boys and 14.3% of girls in the NDNS and 14.2% in boys and 14.0% in girls aged 2-18 in the LIDNS. The leading sources of saturated fatty acids were milk and cream and biscuits, cakes and pastries, which suggests that these foods need to be targeted in healthy eating messages to reduce saturated fatty acid intake in children.

11.2.2 Overweight and obesity

The prevalence of overweight and obesity in the present survey of 14% and 17% respectively was higher than the expected distribution based on the centile cut-offs used (10% lying between ≥85th and <95th centile and 5% 95th centile). The values were very similar to the figures of 16% for overweight and 16% for obesity in children aged 2-15 years in the 2003 SHS. As in the SHS there was no clear evidence of a linear association with deprivation. There was also little evidence for differences in the intake of foods or nutrients between the children who were *neither overweight nor obese* and the overweight or obese children. However this type of cross-sectional analysis may well have been affected by differential reporting bias, with the overweight and obese children under-reporting high sugar, high fat foods, or by dietary restraint in the overweight and obese groups.

11.2.3 Physical activity

The results of the present survey provide some support for an association between physical activity and overweight and obesity. The proportion of *overweight including obese* children who met the physical activity recommendations of at least 60 minutes on all 7 days was lower in these children than in the non-overweight children while the proportion spending two or more hours sitting at a screen on an average day was significantly higher in the *overweight including obese* children than in the neither overweight nor obese children. However, these cross-sectional associations cannot provide evidence of a causal link between physical activity and overweight, since overweight and obese children may be less active as a result of their greater weight.

11.2.4 Dental health

The fact that there was no association between total sugars intake and treatment for decay but there was a clear association with NMES intake suggests that this component of foods contributes to the risk of dental decay and also suggests that the FSA's current sugars classification is useful in identifying the components of the diet which adversely affect dental health. Children who had had treatment for decay consumed almost twice the amount of non-diet soft drinks and 50% more confectionery than children who had not had treatment for decay, but also consumed less fruit juice and yogurt which also contribute to NMES.

There were clear differences in the proportion of children who had had treatment for dental decay by socio-economic status, ranging from 39% in the least deprived quintile to 68% in the most deprived quintile. The fact that the intake of foods differed by socio-economic status while there was little difference in the intake of NMES suggests that the type, timing and frequency of consumption of foods may also be important in determining risk of dental disease.

Key points

- The intake of NMES as % food energy was 17.4%, considerably higher than the Scottish Dietary Target of ≤ 10% total energy but similar to values from other surveys of UK children.
- The intake of total fat as % food energy was 32.9%, which met the Scottish Dietary Target of ≤ 35% and was a little lower than values from other surveys of UK children.
- The intake of saturated fatty acids as % food energy was 13.8%, which was higher than the Scottish Dietary Target of ≤ 11% but similar to values from other surveys of UK children.
- Despite clear associations between the consumption of many foods and drinks and socio-economic deprivation, differences in energy intake and NMES, total fat and saturated fatty acids as % energy between the socio-economic sub-groups were small.
- Overall 15% of children were overweight and 17% were obese, which is consistent with other data from Scottish children.
- There was no evidence for associations between food or nutrient intake and overweight or obesity, but this could have been due to dietary restraint or under-reporting by overweight and obese children.
- There was some evidence for an association between physical activity and overweight and obesity in the expected direction.
- There was clear evidence for an association between NMES intake and dental caries, though this was not seen for total sugars.

Recommendation

Measures need to be taken to reduce the high intake of the main sources of NMES identified in this survey, namely non-diet soft drinks, biscuits, cakes and pastries and confectionery. Such measures should be directed at all children.

11.3 Implications

11.3.1 Implications for further research

This survey provides a robust baseline for future studies of NMES and fat intake in Scottish children, which could be used for monitoring the impact of policy initiatives aimed at improving children's diet, such as Hungry for Success[7] and the Schools (Health Promotion and Nutrition) (Scotland) Act 2007.[8]

The results could also provide baseline data for longitudinal studies of diet and health in the participants in the present survey which could provide more useful information on the relationship between diet and the development of overweight and obesity. To resolve the question of whether the energy intake of overweight and obese children is under-reported to a greater extent than *neither overweight nor obese* children would require objective estimates of energy intake e.g. using doubly labelled water to measure habitual energy expenditure.

The possibility of an association between physical activity (or inactivity) and intake of energy, NMES, total fat and saturated fatty acids could be explored. However, more detailed information on the type, intensity and duration of activities would be beneficial.

Longitudinal studies of the present survey population could also investigate whether low physical activity precedes or succeeds weight gain.

11.3.2 Secondary analysis

The survey has provided the opportunity for further secondary analysis of the data. This will include:

- Analysis of dietary patterns (using principal component analysis) and exploration of their possible relationships with age, sex, socio-economic deprivation and overweight and obesity
- Analysis of meal and snack patterns of the children, including an estimation of the contribution of meals vs. snacks to nutrient intake
- Analysis of the nutrient content of packed lunches versus. school meals.
- The relationship between meal and snack frequency and dental health
- Association between the educational level of the main food provider and nutrient intake in the children

These studies have been funded by the FSAS.

11.3.3 Implications for health improvement

The main finding of the present survey was that the intake of NMES as % food energy was much higher than recommended levels in the whole population and in all sub-groups. However, the foods consumed varied with socio-economic status, suggesting that different approaches may be needed to reduce the levels of NMES intake in different sectors of the population.

The results of the present survey can also be used to estimate the magnitude of dietary change needed to reach the dietary targets for NMES, total fat and saturated fatty acids. To meet the current dietary recommendations the intake of NMES (g/d) would have to decrease by 40% of present levels and the intake of saturated fatty acids (g/d) by 20% of present levels. To achieve this in the children in the present survey it would be necessary not only to remove all non-diet soft drinks, biscuits cakes and pastries and confectionery from the diet but also to replace most of the energy provided by these foods by increasing the intake of other energy-providing foods, particularly foods rich in complex carbohydrate such as bread, potatoes, rice, and pasta. This would require major behaviour change in terms of meal composition, which would need to be supported by a wide range of initiatives addressing marketing and catering practices and nutrition knowledge and cooking skills of parents and children.

Key points

- The impact of initiatives to improve the diet of Scottish children on NMES and total fat and saturated fatty acid intake could be monitored using the present survey data as a baseline
- Longitudinal studies in the participants in the present survey could help to identify whether higher intake of specific foods or of energy, sugar or fat increases the risk of weight gain.
- Longitudinal studies could also assess whether physical inactivity is a cause or a result of weight gain.
- While non-diet soft drinks, biscuits, cakes and pastries and confectionery are obvious targets for dietary change designed to reduce the intake of NMES and saturated fatty acids, increasing intake of foods rich in complex carbohydrates will also be needed.
- The types of interventions which will be needed to tackle the poor diet of children cover all links in the food chain, from production through marketing and food choice through to food preparation and meal patterns.

Recommendations

Consideration should be given to repeating this survey at regular intervals to provide data on ongoing progress made towards Scottish Dietary targets for NMES and fat intake. Such a survey would also serve to evaluate the impact of policy initiatives directed at improving children's diet.

Research is needed to develop interventions to reduce intake of NMES and saturated fatty acids in children's diets to reach the Scottish Dietary Targets. In addition, measures need to be taken to ensure that a reduction in NMES and saturated fatty acids is complemented by an increase in foods rich in complex carbohydrate to provide a healthy, balanced diet.

11.4 References

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