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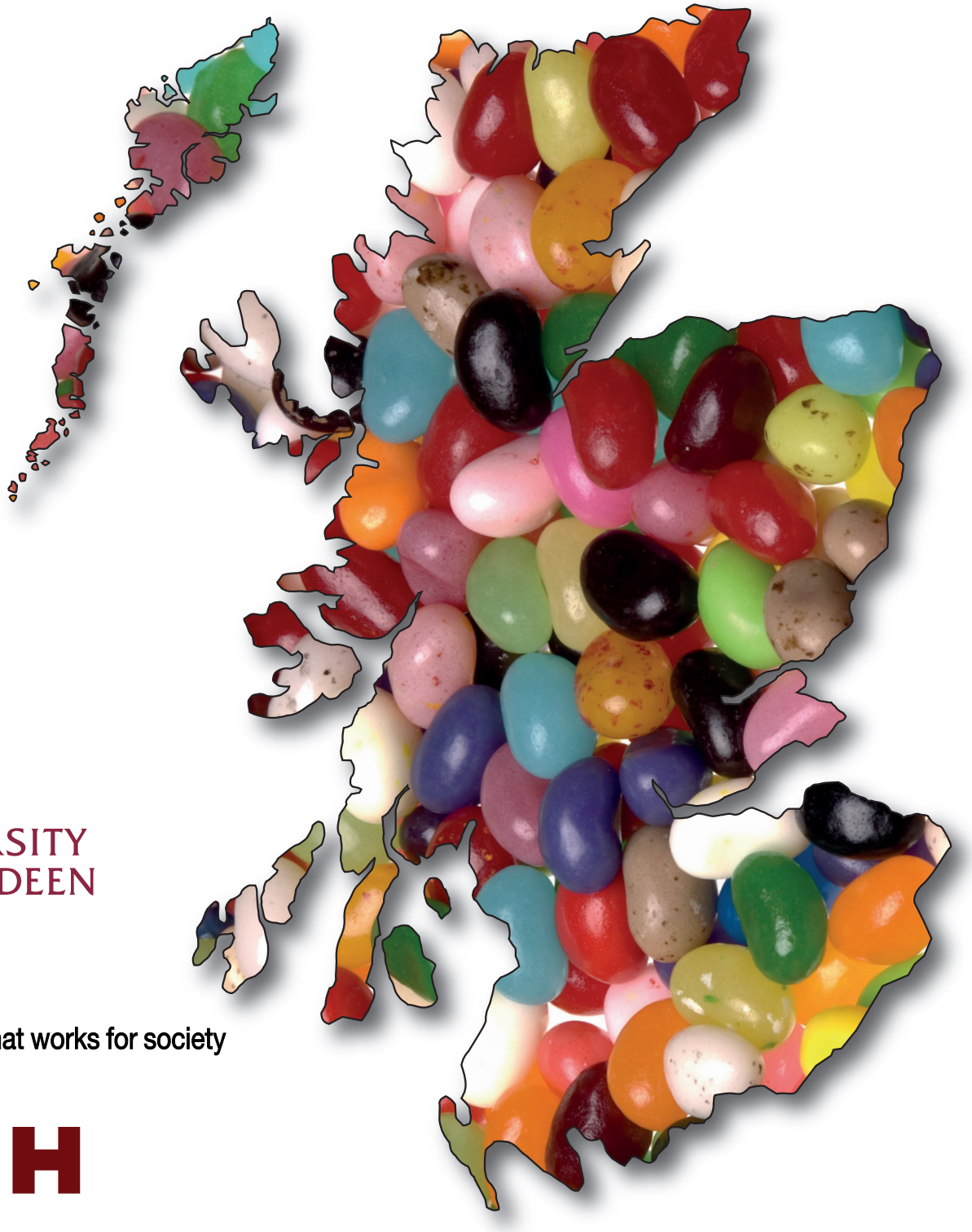
Survey of Diet Among Children in Scotland (2010)

Volume 1: Diet, Obesity and Physical Activity

Lindsey F Masson, Catherine Bromley, Jennie I Macdiarmid, Leone CA Craig, Wendy Wills, Sarah Tipping & Geraldine McNeill



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Volume 1: Diet, Obesity and Physical Activity

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Executive Summary

Introduction

This report contains the main findings from the Survey of Diet Among Children in Scotland (2010) regarding dietary intake, prevalence of overweight and obesity, and physical activity levels. Findings from the survey's food purchasing module are described in Volume 2: Food and Drink Purchases Around the School Day. The main aim of the survey was to estimate the intake of non-milk extrinsic sugars (NMES), total fat and saturated fatty acids (SFA) in a nationally representative sample of children aged 3-16 years living in Scotland. This survey continues the work of the 2006 Survey of Sugar Intake Among Children in Scotland[1] (carried out in children aged 3-17 years) to monitor progress towards the Scottish Dietary Target for NMES intake in children.

Children were recruited using the Child Benefit records held by HM Revenue and Customs, and fieldwork was carried out from June to November 2010. Diet was assessed by food frequency questionnaire (FFQ), and 1674 FFQs were available for analysis (response rate of 55%). Interviews, including measurements of height, weight and waist circumference (a new measurement for this survey), were conducted with 1906 respondents (response rate 63%).

The relative validity of the FFQ was assessed in the 2006 survey and has been previously described[1-2]. The mean intakes of foods and nutrients presented in this report should be viewed as estimates, and differences between groups defined by age, sex, and deprivation should be interpreted as indications of patterns rather than precise estimates of differences. Comparison of these estimates with recommended intakes should be interpreted with caution.

Main findings

Non-milk extrinsic sugars

- Between 2006 and 2010, mean NMES intake decreased from 17.4% to 15.6% food energy. The largest decrease occurred in 12-17 year olds (19.1% to 16.6% food energy).
- Mean NMES intake continued to exceed the UK recommended population average for adults (10% total energy or 11% food energy) and the Scottish Dietary Target for children (<10% total energy).
- Main contributors to NMES intake were non-diet soft drinks (16%), confectionery (13%), biscuits, cakes & pastries (12%), yoghurt & fromage frais (7%) and fruit juice (6%). These are the foods monitored in the Scottish Government's Obesity Route Map Action Plan, except for yoghurt & fromage frais and fruit juice.

Fat & saturated fatty acids

- Mean total fat intake of 32.7% food energy was below the UK recommended population average of 35% food energy and the Scottish Dietary Target of ≤35% food energy, and was similar to the mean intake of 32.9% in 2006.
- Mean SFA intake of 13.2% food energy was above the recommended level of 11% food energy in all age and sex groups, and was similar to the mean intake of 13.8% in 2006.

Food groups & supplements

- Between 2006 and 2010, the mean intake of biscuits, cakes & pastries increased slightly in 3-7 year olds, but decreased in 12-17 year olds. Milk & cream intake decreased in boys aged 3-7 and 12-17 years, but not in girls. Confectionery intake decreased in girls of all ages, but not in boys. Intake of non-diet soft drinks did not change.
- 11% of boys and 17% of girls aged 12-16 years reported consuming alcoholic drinks at least once a month, which is similar to results found in 2006.
- 17% of children used any dietary supplement in 2010 compared with 24% in 2006.

Overweight & obesity

- 31% of children were *overweight including obese*: 15% were *overweight but not obese*, 7% were *obese but not severely obese*, and 10% were *severely obese*.
- The prevalence of *overweight including obese* was higher in boys than girls (34% v. 28%), and lower in boys aged 3-7 years (27%) than boys aged 8-11 years (40%) or 12-16 years (36%). There was no difference between age groups in girls.
- In boys, the prevalence of *overweight including obese* increased (but not significantly) from 30% in 2006 to 34% in 2010. The increase was only significant in 8-11 year old boys (29% to 40%).
- In girls, the prevalence of *overweight including obese* decreased from 33% in 2006 to 28% in 2010. The decrease was not significant in any of the 3 age groups in girls.
- When children with a BMI >3 SD above the norm for their age were excluded (2%), consistent with SHeS methodology, the prevalence of *overweight including obese* of 29% in 3-15 year olds was similar to that of 30% in 2-15 year olds found in the 2010 SHeS.
- According to waist circumference measurements, 48% of all children had a waist circumference ≥85th percentile and 21% had a waist circumference ≥98th percentile. 31% of girls aged 12-16 years had a waist circumference ≥98th percentile.
- 28% of children with a *healthy weight* BMI had a waist circumference ≥85th percentile.

Physical activity
• 89% of boys and 83% of girls reported reaching the recommended activity level of ≥60 minutes on all 7 days. Only 67% of girls aged 12-16 years reporting meeting this recommendation. • Estimates of physical activity levels may have been influenced by the period of data collection which included summer months and summer holidays. • Boys spent more time sitting in front of a screen than girls (2.0 v. 1.8 hours/day). • Boys who were *overweight including obese* were less likely to report meeting the recommended level of physical activity and spent more time in front of a screen than boys who were *neither overweight nor obese*. There was no difference between these BMI groups in girls with regard to reported physical activity or sedentary behaviour.

Inequalities
• NMES intakes increased with deprivation, from 15.2% food energy in the least deprived quintile of the Scottish Index of Multiple Deprivation (SIMD) to 16.7% in the most deprived quintile of SIMD. • Total fat and SFA intakes as a percentage of food energy did not differ by SIMD quintile. • As level of deprivation increased, intakes of non-diet soft drinks increased, and intakes of fruit and vegetables decreased. • The percentage of children taking any type of dietary supplement was higher in the least deprived quintile of SIMD (22%) than in the most deprived quintile of SIMD (11%). • The prevalence of *overweight including obese* increased with deprivation, from 25% in the least deprived quintile of SIMD to 38% in the most deprived quintile of SIMD. • 18.1% of children in the least deprived quintile had a waist circumference ≥98th percentile compared with 28.2% in the most deprived quintile. • Average time spent in front of a screen increased with deprivation, but the proportion who reported meeting physical activity recommendations was similar between SIMD quintiles.

Conclusions and recommendations

Whilst it is encouraging that mean NMES intake as a percentage of food energy has decreased by almost 2% of food energy between 2006 and 2010, the mean intake is still considerably higher than recommended levels. The mean intakes of total fat and SFA as a percentage of food energy were similar to those found in 2006, but the mean SFA intake remained higher than recommended levels. Measures need to be taken to reduce the intake of NMES and SFA by reducing the intake of non-diet soft drinks, confectionery, and biscuits, cakes and pastries, and replacing some of the energy with complex carbohydrates and fruit and vegetables, and by encouraging the consumption of lower fat and sugar dairy products. These changes could also reduce energy intake and would therefore be beneficial for preventing weight gain and promoting weight loss in overweight and obese children. Although the prevalence of *overweight including obese* decreased between 2006 and 2010 in girls from 33% to 28%, it increased from 30% to 34% in boys, with an increase of 29% to 40% in boys aged 8-11 years. It will therefore be important to monitor the prevalence of overweight and obesity, especially in this group, in future surveys.

Recommendations

- Work on reducing the intake of foods highlighted in the Scottish Government's Obesity Route Map Action Plan should continue, with yoghurt and fromage frais also considered a potential target for reformulation to reduce NMES content.
- The implications for health of the high percentage of children, especially 12-16 year old girls, with a waist circumference ≥98th percentile is worth further investigation. Measurements of waist circumference should be included in future surveys of nutrition of children in Scotland.
- In order for the target of 80% of all children meeting physical activity recommendations to be met, physical activity needs to be promoted particularly in girls aged 12-16 years.
- Inequalities in dietary intake, sedentary activity and overweight/obesity between children living in less versus more deprived areas continue to need to be addressed.
- This survey should be repeated around 2014 to continue monitoring any changes in dietary intakes, physical activity and inactivity, and the prevalence of overweight and obesity in children in Scotland and the possible impact of population-wide interventions.

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Notes to tables

The following conventions have been used in tables:

1. Both the 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.

2. The statistical significance of differences between sub-groups is indicated by the p-value. P-values significant at the 5% level are presented. A p-value $\geq$0.05 is indicated by 'NS' for 'non-significant'.

3. [ ] are used to indicate small sample sizes, i.e. an unweighted base of less than 50 children. Statistical tests of significance were not carried out if the figure in a cell was based on an unweighted base of less than 50.

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

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

Notes to text

The following conventions have been used in the text:

1. The word 'significant' is used to refer to statistical significance only, and not nutritional or policy significance.

2. Associations/differences described as 'significant' are significant at the 5% ($p<0.05$) level.

1. Introduction

1.1 Background

1.1.1 Scottish Dietary Targets

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 in 1996 as part of the Scottish Diet Action Plan[2]. The targets were based on the UK Dietary Reference Values for selected nutrients[3] and on patterns of food consumption in Scotland which were derived from the National Food Survey data from 1989-1991. The targets are shown in Table 1.1.

Table 1.1 Scottish Dietary Targets[2]

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 cereals	Average intake to double from the present intake of 17g per day.
Fats	(i) Average intake of **total** fat to reduce from 40.7% to no more than 35% of food energy. (ii) 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	(i) Average intake of non-milk extrinsic sugars (NMES) in adults not to increase. (ii) Average intake of NMES 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	(i) White fish consumption to be maintained at current levels. (ii) 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 for achievement by 2005 but the timescale was extended to 2010 following a review of the progress in 2003.

In 2003 a working group was established to monitor progress towards the Scottish Dietary Targets and the suitability of existing datasets for monitoring progress was 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 and currently called the Living Costs and Food Survey. These surveys have been carried out annually since 1940 and collect information on food purchasing and expenditure which is converted to nutrient intake. However, the data in these surveys are collected at a household level and so cannot provide information on the intake of sub-groups such as children, and are based on purchase rather than consumption. A key recommendation of the report of the Working Group on Monitoring Scottish Dietary Targets was that '*where data is currently lacking, as is the case for the targets for sodium and non-milk extrinsic sugars in children, interim studies may need to be set up*'[4].

1.1.2 Survey of Sugar Intake Among Children in Scotland (2006)

The Survey of Sugar Intake Among Children in Scotland[5] was commissioned by the Food Standards Agency Scotland in 2005 to provide robust information on the diet of children in Scotland, with a particular focus on the intake of non-milk extrinsic sugars (NMES) and sugar-containing food and drinks. The survey was carried out through collaboration between four organisations: ScotCen Social Research (part of NatCen Social Research), the University of Aberdeen, the Rowett Research Institute in Aberdeen, and King's College London. Fieldwork was carried out between May and September 2006.

Face-to-face interviews were conducted with 1700 respondents and 1391 food frequency questionnaires (FFQs) were available for analysis. One randomly selected sub-sample completed a four day diet diary which was used to assess the relative validity of the FFQ. A second randomly selected sub-sample completed a single 24-hour multiple pass recall in order to provide comparability of the results with those obtained in other UK-wide dietary surveys which use the 24-hour recall method, and to give further insight into the relative validity of the nutrient estimates obtained from the FFQ. There was no significant difference between the intakes of NMES (% food energy) as recorded by the FFQ or the diet diary. The intakes of NMES as recorded by the FFQ and 24-hour recall were also similar, although the difference between methods was statistically significant. The FFQ provided similar intakes of total fat and saturated fatty acids (% food energy) to both the diet diary and 24-hour recall, and higher estimates of the intakes of energy and other nutrients[5-6].

The survey found that the mean intake of NMES in children aged 3-17 years was 17.4% of food energy, which was considerably higher than the Scottish Dietary Target of <10% total energy (<11% food energy), and similar to values from other surveys of UK children. The mean intake of total fat was 32.9% food energy which did not exceed the Scottish Dietary Target of ≤35% food energy. The mean intake of saturated fatty acids (13.8% food energy) exceeded the Scottish Dietary Target of ≤11% food energy and again was similar to values from other surveys of UK children. Overall, 15% of children were overweight (but not obese) and 17% were obese, which was consistent with other data from Scottish children[5].

1.1.3 Relevant initiatives in Scotland between 2006 and 2010

Between the last survey in 2006 and the current survey in 2010, several new or ongoing policies or initiatives have been introduced within Scotland focusing on improving nutrition and physical activity levels in children.

Hungry for Success[7] aimed to improve the nutritional content and uptake of school meals in Scotland. Launched in 2003, Hungry for Success was already implemented within primary and special schools at the time of the 2006 survey, but it was only beginning to be implemented within secondary schools. The Schools (Health Promotion and Nutrition) (Scotland) Act 2007[8] built on the work of health-promoting schools and Hungry for Success and, along with The Nutritional Requirements for Food and Drink in Schools (Scotland) Regulations 2008[9], made legally binding nutritional standards for food and drinks provided within schools. The Nutritional Requirements for Food and Drink in Schools (Scotland) Regulations 2008 commenced in primary schools on 4 August 2008. The regulations commenced in secondary schools on August 3, 2009.

Nutritional Guidance for Early Years[10], published in 2006, provided guidance for education and childcare settings to enable healthy food provision to children aged 1-5 years.

In response to UK Government concern, in 2007 Ofcom restricted the television advertising of food and drink to children[11]. High fat, salt and sugar (HFSS) foods and drinks were no longer to be advertised in or around programmes aimed at children aged under 16 years, and a restriction was placed on the use of licensed characters, celebrities, promotional offers and health claims in any advertisements for HFSS products aimed at children of primary school age or younger. These restrictions were to be fully implemented by 2009.

In December 2007, the health improvement, efficiency, access and treatment (HEAT) target (H3) to '*achieve agreed completion rates for child healthy weight intervention programmes by 2010/11*' was introduced by the Scottish Government[12]. NHS Boards across Scotland were tasked with the delivery of child healthy weight interventions to 13.5% of 5-15 year olds identified as overweight (between the 91st and 99.6th BMI centile based on UK 1990 charts) across Scotland over a 3 year period from April 2008 to March 2011. Interventions had to focus on both diet and physical activity, be underpinned by behavioural change and take a family-centred approach[13]. In order to achieve this target, Health Boards across Scotland implemented both targeted interventions focusing on only those children identified as meeting the criteria but many Health Boards also implemented whole class/school programmes[14].

In 2008, Scotland's first Healthier Scotland Cooking Bus was launched by the Scottish Government, aimed at teaching cooking and healthy eating skills to children, parents, teachers and community groups[15].

The Food Standards Agency ran a UK wide Saturated Fat and Energy Intake programme which aimed to reduce intakes of saturated fatty acids and contribute to helping consumers achieve and maintain energy balance. There were two phases of the saturated fat consumer awareness campaign, launched in February 2009 and January-February 2010. (http://www.food.gov.uk/scotland/scotnut/satfatenergy/)

In 2010, the Obesity Route Map[16] was published by the Scottish Government, highlighting the importance of the early years in establishing lifelong habits and had a key focus on preventative actions. Following on from this, the Obesity Route Map Action Plan[17] detailed actions to be taken forward by the Scottish Government to address the increasing prevalence of obesity in Scotland. Several action points were specifically aimed at children, building on many of the policies and initiatives already in place[7-10].

The Obesity Route Map Action Plan[17] raised the concept of 'Beyond the School Gate', and one action point specified 'exploring measures to restrict access by children to nutritionally inappropriate meals and high energy and energy dense foods from businesses located in the vicinity of schools'. In response to this action point, the 2010 Survey of Diet Among Children in Scotland also collected data on children's purchasing patterns outside of school, which will help inform policy in this area.

The Food Standards Agency has been working with the food industry to reduce salt, sugar and saturated fat through reformulation of products[18-19]. Following on from Hungry for Success[7], The Schools (Health Promotion and Nutrition) (Scotland) Act (2007)[8] and The Nutritional Requirements for Food and Drink in Schools (Scotland) Regulations 2008[9], the Scottish Government and Food Standards Agency Scotland have also been in talks with the food industry regarding reformulation of products to meet the Target Nutrient Specifications for manufactured products in schools and the possibility of updating these[17].

1.1.4 Survey of Diet Among Children in Scotland (2010)

The 2010 survey continued the work of the 2006 survey to monitor progress towards the Scottish Dietary Target for sugar intake in children. The survey also aimed to investigate the purchasing behaviours of children around the school day using a newly designed Food Purchasing Module (FPM). The survey was carried out by the University of Aberdeen, ScotCen Social Research, and the University of Hertfordshire. The fieldwork for the survey was carried out between June and November 2010. The aims of the 2010 survey are described below in section 1.2, and the methodology (including a comparison with the methodology for the 2006 survey), is described in chapter 2.

1.1.4.1 Development of the food purchasing module

The FPM was developed by the University of Aberdeen, ScotCen Social Research and the University of Hertfordshire, in discussion with Food Standards Agency Scotland. It was designed to assess food and drink purchasing behaviour at four time points around the school day: before school, break time (including free periods), lunch time, and after school.

The FPM consisted of an interview and a self-completion questionnaire. The interview was designed to be conducted with the parent/guardian of the primary school children, and with the secondary school children themselves. In addition, a self-completion questionnaire was completed by the secondary school children. The full report of the development, cognitive testing of the FPM questions and results can be found in Volume 2 of this report: Food and Drink Purchases Around the School Day.

1.2 Aims of the survey

The main aim of the survey was:

- To estimate the intake of NMES, total fat and saturated fatty acids and other nutrients and foods and drinks in a nationally representative sample of children aged 3-16 years living in Scotland in 2010.

Additional aims were:

- To estimate the intake of NMES and other macronutrients and micronutrients in all children and in sub-groups divided by age, sex, deprivation category and urban/rural residence.
- To estimate the prevalence of overweight and obesity in all children and in sub-groups divided by age, sex, deprivation category and urban/rural residence.
- To investigate associations between selected nutrients and foods and overweight and obesity in all children.
- To determine the levels of physical activity and inactivity in all children and in sub-groups divided by age, sex, deprivation category and urban/rural residence.
- To investigate associations between physical activity and inactivity and overweight and obesity in all children and in sub-groups divided by age and sex.
- To compare intakes of nutrients and foods, the prevalence of overweight and obesity, and levels of physical activity and inactivity with data from the 2006 survey.

The survey also aimed to investigate the food purchasing behaviours of children around the school day using a newly designed Food Purchasing Module (FPM). The research aims of the FPM were:

- To assess the opportunities for children to purchase food and drink outside of school.
- To estimate the proportion of children purchasing food and drink outside of school.
- To identify the types of foods and drinks children are purchasing outside of school.
- To explore the factors that influence whether children go outside of school to purchase food or drink.

1.3 Outline of the report

1.3.1 Volume 1

This report describes intakes of nutrients, food groups and supplements, results from height, weight and waist measurements, and levels of physical activity and inactivity. Results are presented for sub-groups of age, sex, deprivation level and urban/rural classification, and results are compared with findings of the 2006 survey.

Chapter 1 provides the background to the survey and the aims of the survey.

Chapter 2 describes the methodology, including a description of the sample, the FFQ and methods for data handling and analysis.

Chapter 3 describes the response to the interview, FFQ and physical measurements.

Chapter 4 reports on intakes of foods and drinks (including alcoholic drinks) and supplements.

Chapters 5 and 6 present mean intakes of nutrients and the contribution of food groups to nutrient intakes. Nutrient intakes are compared with Dietary Reference Values and Scottish Dietary Targets. Chapter 5 focuses on energy and sugars, and chapter 6 focuses on total fat, saturated fatty acids, protein, non-starch polysaccharides, iron and calcium.

Chapter 7 presents the anthropometric measures and estimates of the prevalence of overweight and obesity in children. The association between selected food groups and macronutrients and overweight and obesity are explored.

Chapter 8 examines children's participation in physical activity and the proportion of children meeting physical activity recommendations. Time spent sitting at a screen is presented as a measure of physical inactivity, and the association between physical activity/inactivity and overweight and obesity is explored.

Chapter 9 provides a discussion of the findings of the survey and implications for further research and health improvement.

Appendices to the report include the fieldwork documents (letters sent to parents/children), the FFQ, and face-to-face interview schedule.

1.3.2 Volume 2

The results on food purchasing behaviour are described in Volume 2: Food and Drink Purchases Around the School Day.

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2. Methods

2.1 The sample

The survey aimed to achieve a sample size of 1500 children, representative of the population aged 3-16 years residing at private addresses in Scotland. Since children were to be aged at least 3 years old and no more than 16 years old at the time of fieldwork (which ran from18th June until 8th November 2010), eligible children were defined as those born between 30th November 1993 and 12th July 2007. It was estimated (using past surveys) that parents of 3000 children needed to be contacted to meet this target. The sample was required to be representative of children living in Scotland with respect to sex, ethnicity, urban/rural distribution and age distribution.

The sample was drawn from the Child Benefit records held by HM Revenue and Customs (HMRC) in November 2009. The sample was drawn in two stages. At the first stage, 127 postcode sectors were sampled with probability proportional to the number of eligible children within them. Postcode sectors with fewer than 500 delivery points were merged with neighbouring sectors. The grouped sectors were treated as single areas. At the second stage, 24 eligible children were sampled from each selected postcode sector. This gave a sample of 3048 children aged between 3 and 16 years on 12th July 2010. One child per household was selected. Prior to selection, HMRC excluded any children that were flagged on their files as sensitive cases.

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 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. All those remaining in the sample after opt out were sent a second letter on behalf of the research team (Appendix A) with information sheets for the parents/guardians (Appendix B) and children (Appendix C). This letter asked recipients to complete the accompanying FFQ (Appendices D and E) and also invited them to take part in a face-to-face interview (Computer Assisted Personal Interview (CAPI)) (Appendix F). A high street shopping voucher (£5) was included with the letter of invitation and FFQ as an unconditional incentive to take part in the survey.

The interviewer collected the completed FFQ when they visited to conduct the interview. An initial check of the completed FFQ was made by the interviewer to ensure that there were no obvious missing data or errors. If the FFQ had not been completed when the interviewer visited, 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 it or had mislaid the original copy. Two reminders were sent out to those who had not returned the FFQ at 2 weeks and 4 weeks after the interview was conducted.

The face-to-face interview involved modules which are currently used for the Scottish Health Survey (SHeS). Information was collected on household composition and socio-demographic 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 collected on the child's physical activity levels over the previous week and food purchasing behaviour using a newly developed Food Purchasing Module (FPM) (see Volume 2). The FPM included CAPI questions and a self-completion questionnaire. Height, weight and waist circumference of the child were also measured.

There were two versions of the FFQ: one for children aged 3-11 years (Appendix D) and the other for children aged 12-16 years (Appendix E). A parent or guardian was asked to complete the FFQ and the interview on behalf of the children aged 3-11 years with help from the child where appropriate. Those aged 12 years and over were asked to complete the FFQ and the questions in the interview relating to physical activity and food purchasing behaviour with help from a parent or guardian as necessary. A parent or guardian was asked to respond to the socio-demographic questions in the interview.

A pilot study was carried out to test the administration of these methods and to help identify any potential problems so that they could be addressed before the mainstage survey. Pilot interviews were carried out with 22 children and no major problems were reported. The average interview length was under 40 minutes. Minor programming issues with the CAPI were fixed, and minor changes to the FPM were made.

2.3 Comparison with 2006 survey methodology

The methods used in the 2010 survey essentially replicated those used in the 2006 survey[1], with only minor differences as described below.

In the 2010 survey, dietary intake was assessed using an FFQ only. It was not considered necessary to repeat the use of the 4 day diet diaries and the multiple pass 24-hour recall which were used in 2006 to assess the relative validity of the FFQ.

The children's dental questions were discontinued in 2010. These questions were not included in the 2008-11 SHeS, therefore the 2003/4 dental module is the only applicable reference point. The new SHeS dental module is asked only of adults and the questions are not directly relevant to children's teeth.

Minor amendments were made to the SHeS physical activity module prior to the launch of the 2008-2011 continuous rolling SHeS. The original module did not include any activity undertaken as part of the school curriculum, but in 2008 activities were split by inside/outside school lessons. The school activity question in 2008 was added at the end and all the other items were asked in the same way as in 1998 and 2003. Therefore, this survey can produce two measures of physical activity: summary levels of activity outside school for comparability with the 2006 survey, and one that adds school activity as well.

The new food purchasing module (FPM) was incorporated into the 2010 survey in order to investigate food purchasing behaviour of school children around the school day. The questions were incorporated into the face-to-face interview for primary and secondary school children and a self-completion questionnaire specifically designed for secondary school children.

Waist circumference measurement was added in 2010 as a measure of abdominal obesity. Although it is currently unclear whether waist circumference can add information on risk over and above that provided by body mass index (BMI) in children[2], waist circumference is recommended for diagnosis of metabolic syndrome in children[3]. Also, data from the 1997 National Diet and Nutrition Survey (NDNS) of children and young people found that 11-17 year olds with high waist circumference and high BMI had higher systolic and diastolic blood pressure, higher plasma LDL-cholesterol and triglycerides and lower plasma HDL cholesterol than those with high BMI but normal waist circumference or high waist circumference and normal BMI[4]. Finally, BMI z-score was calculated to 6 decimal places in 2010, versus 2 decimal places in 2006 which may have affected classification due to rounding.

2.4 Dietary assessment method

2.4.1 Food frequency questionnaire

The FFQ used in this survey was based on the Scottish Collaborative Group (SCG) FFQ which has been widely used in epidemiological studies across Scotland and the rest of the UK (http://www.foodfrequency.org). Versions C2 and C3 of the FFQ were used:

- Version C2 for children aged 3-11 years includes instructions for completion by a parent or guardian with help from the child (Appendix D).
- Version C3 for young people aged 12-16 years includes instructions for completion by a young person with help from their parent or guardian (Appendix E).

These versions are the same as those used for the 2006 survey, although two foods (hummus and olives) were added to each version for this survey since previous studies found these foods to be reported relatively commonly in the 'Other Foods' section.

Version C2 lists 142 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 over the last 2-3 months 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 any foods consumed not listed in the FFQ.

Version C3 was very similar to version C2 except for 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 identical to those in version 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' for chicken nuggets), the weight used in the calculation of the nutrient intake was higher in version C3.

The completed FFQs were checked by interviewers and corrected for missing or ambiguous data (e.g. on brand of food supplement or cooking oil). Data from the completed FFQs were entered into an Access database file by two researchers. The quality of the data entry of a random 10% sub-sample of the FFQs was checked by a different researcher, and the overall error rate was found to be 0.15%, which was lower than the error rate from the 2006 survey of 0.45%.

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. Nutrient intakes include intakes from the 'Other Foods' section of the FFQ, where respondents were asked to enter details of any foods or drinks consumed at least once a week which were not included elsewhere in the FFQ. The most commonly reported 'other foods' were lucozade/sports drinks and avocados. For this survey, nutrient composition was derived from the NDNS nutrient databank[5].

2.4.2 National Diet and Nutrition Survey databank

The NDNS databank was used for the nutrient analysis of the FFQs for both the 2010 and 2006 surveys. The databank is updated yearly by formerly FSA and now Department of Health as part of the NDNS rolling programme and the current survey used an updated version of the databank from year 2 (2009) of the NDNS rolling programme. Changes to the databank since 2006 include the addition of new foods, revision of nutrient composition of existing foods, either at a group level following a programme of reanalysis or to take account of reformulation by manufacturers and changes in fortification practices, and removal of obsolete food codes, including many homemade recipe dishes[5]. The latest version of the databank contains information on over 5000 foods and drinks, including manufactured products, homemade recipe dishes and many dietary supplements.

Changes were made as necessary to the FFQ in-house calculation programme to reflect changes in the NDNS databank as many of the previous food codes used in 2006 were no longer present in the databank. The main changes were in the codes for pizza, spreads, crisps and savoury snacks. The impact of these changes on the estimates of nutrient intake was assessed, and this assessment is described in Appendix G.

2.5 Data handling

2.5.1 Defining age for data collection

Children were selected for inclusion in this survey based on their age on 12th July 2010. All children aged between 3 and 16 years on this date were eligible for selection. Interviews were conducted over a period of four and a half months, from 18th June until 8th November 2010. 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 all other analyses in the report use the age at interview due to the need to compare information on diet and height and weight with age-specific reference data.

Twenty FFQs were returned for which there was no corresponding face-to-face interview. For these respondents, it was possible to determine their age group at interview (3-7, 8-11 or 12-16 years) from their date of birth and assuming that FFQs were completed during the interview period.

2.5.2 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, and that respondents with extreme energy intakes (<2.5th centile or >97.5th centile of the distribution for energy) are excluded. This is consistent with procedures followed for analysis of the 2006 survey data. 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 the 1816 respondents who returned an FFQ, 56 (3%) had missed more than 10 lines and were excluded from the dietary analysis. Of the remaining 1760 respondents, 86 (5%) with extreme energy intakes for each age group (3-7, 8-11 or 12-16 years at interview) were also excluded. Therefore, 1674 FFQs were available for the dietary analysis.

2.6 Weighting

The approach used to generate weights was very similar to that used for the 2006 survey[1] in order to make the two samples as comparable as possible. Any differences between the two weighting schemes have been flagged and discussed.

2.6.1 Individual weights

A number of checks were carried out on the achieved sample to look for possible sources of bias. The checks indicated there were small differences between the age and sex breakdown of the sample and the population of children in Scotland aged 3-16 years. This is likely to be due to both the exclusions made by HMRC and the effects of non-response. There were also differences in the age profile of the mother, the local area type and level of urbanisation. Younger mothers and urban areas were under-represented. A set of non-response weights was generated to address these differences, and these are described in more detail below.

2.6.1.1 Selection weights

As in 2006, selection weights were not required because no groups or areas within the population were over-sampled. The sample was selected with equal probability.

2.6.1.2 Modelling household non-response

Logistic regression was used to model the response behaviour of the sample. This is the same method as that used in 2006. Logistic regression was used to model the relationship between a binary outcome variable (whether or not the respondent participated) and a set of predictor variables. The predictor variables were taken from the Child Benefit records, publicly available area-level data and interviewer observation variables. Area-level variables included the 2009 Scottish Index of Multiple Deprivation, region, the Office of National Statistics (ONS) local authority-level area classification, urban/rural indicators and data from the 2001 Census. Interviewer observation variables included dwelling type, whether there were barriers to entry and general condition of the selected address and surrounding area. Variables such as age and sex of the child and household size were taken from the Child Benefit records. Only variables significantly related to response were kept in the final model (see below).

The logistic regression model was used to generate the probability a respondent participates in the survey given their characteristics (based on the information available from the Child Benefit records, area and observation variables). Respondents with characteristics associated with non-response are under-represented in the sample and therefore receive a low predicted probability. These predicted probabilities were used to generate a set of individual non-response weights (w1); respondents with a low predicted probability get a larger weight, increasing their representation in the sample.

The model shows that households reluctant to take part in the survey tend to live in more densely populated areas, have younger mothers, have older children (of either sex), to live in flats and have larger households. The full model is given in Table 2.1.

Table 2.1

Similar variables were found to be significantly related to response in 2006. Households reluctant to take part in the 2006 survey were also more likely to contain older children (male or female), a younger recipient of child benefit and be in urban areas.

Table 2.1 The individual non-response model

	Variables in the Equation					
	B	S.E.	Wald	df	Sig.	Exp(B)
Population density (quintiles)			18.3	4	0.001	
Most dense (25.60 - 128.51)					(Baseline)	
(8.95 - 25.53)	0.06	0.11	0.3	1	0.582	1.06
(1.33 - 8.88)	0.30	0.12	6.6	1	0.010	1.35
(0.18 - 1.33)	0.46	0.13	12.2	1	0.000	1.58
Least dense (0 - 0.18)	0.27	0.19	2.2	1	0.142	1.31
Age of Child Benefit recipient (years)			22.0	4	0.000	
19-29					(Baseline)	
30-34	0.15	0.16	0.9	1	0.346	1.16
35-39	0.25	0.15	2.8	1	0.095	1.29
40-44	0.58	0.16	13.9	1	0.000	1.79
40+	0.55	0.17	10.4	1	0.001	1.73
Sex and age (years) of selected child			33.6	11	0.000	
Male 3-4					(Baseline)	
Male 5-7	-0.29	0.20	2.2	1	0.140	0.75
Male 8-9	-0.42	0.21	3.8	1	0.051	0.66
Male 10-11	-0.36	0.21	2.8	1	0.092	0.70
Male 12-14	-0.68	0.20	11.8	1	0.001	0.51
Male 15-16	-0.90	0.22	16.8	1	0.000	0.41
Female 3-4	-0.39	0.21	3.4	1	0.066	0.68
Female 5-7	-0.38	0.20	3.7	1	0.053	0.68
Female 8-9	-0.48	0.22	4.9	1	0.027	0.62
Female 10-11	-0.61	0.22	7.9	1	0.005	0.55
Female 12-14	-0.71	0.20	12.8	1	0.000	0.49
Female 15-16	-0.98	0.22	20.5	1	0.000	0.38
Dwelling type			31.7	3	0.000	
Detached house					(Baseline)	
Semi-detached house	0.41	0.11	13.2	1	0.000	1.51
Terraced house	-0.03	0.11	0.1	1	0.805	0.97
Flat/other	-0.26	0.12	4.9	1	0.027	0.77
Number of children in the household			21.2	3	0.000	
1					(Baseline)	
2	0.39	0.09	17.6	1	0.000	1.48
3	0.25	0.12	4.4	1	0.035	1.28
4+	-0.05	0.17	0.1	1	0.774	0.95
Constant	0.52	0.24	4.5	1	0.034	1.68

Notes:

1. The response is 1 = household response, 0 = household non-response.
2. Only variables that are significant at the 0.05-level are included in the model.
3. The model $R^2 = 0.046$ (Cox and Snells).
4. **B** is the estimate coefficient with standard error **S.E.** The **Wald**-test measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom **df**. If the test is significant (**sig** < 0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline category.

2.6.1.3 Calibration weighting

The final stage of the weighting was to adjust the individual non-response weight (w1) to make the age and sex profiles of the weighted sample match those of the population.

The age and sex profile of the sample (weighted by the individual non-response weight) was close to that of the population but did not match it exactly. This is because the model used to create the individual non-response weight adjusted the responding sample to look like the *issued* sample, rather than the population (only cases with household-level information can be included in the modelling – this restricts us to the issued sample). The profile of the issued sample was close to that of the population but there were some small differences due to the HMRC exclusions and to sampling error. This is shown in Table 2.2.

Table 2.2

To remove these differences, a further adjustment was made after the individual non-response weight was generated. The marginal age/sex distribution of the weighted sample was adjusted using raking-ratio (or rim) weighting. This made the weighted data exactly match the population of children in Scotland aged 3-16 years in terms of age and sex. This calibrated weight (wt_individual) was used to analyse the individual data.

Table 2.2 The age/sex breakdown of children in the sample and the population

Age and sex	Issued sample - all children sent to NatCen from HMRC (minus exclusions)	Unweighted respondents	Respondents weighted by individual non-response wt	Population (mid year 2009 from GROS)	Respondents weighted by final calibrated wt
	%	%	%	%	%
Male 3-4	7.1	7.8	7.0	7.2	7.1
Male 5-7	10.4	11.0	10.5	10.3	10.3
Male 8-9	7.3	7.6	7.3	6.9	6.9
Male 10-11	7.9	8.4	7.7	7.4	7.3
Male 12-14	11.7	11.3	11.9	11.5	11.5
Male 15-16	6.8	6.0	6.7	8.0	8.0
Female 3-4	6.7	6.6	6.6	6.8	6.8
Female 5-7	9.9	10.2	9.9	9.8	9.8
Female 8-9	6.6	7.0	6.7	6.6	6.6
Female 10-11	6.8	6.8	6.8	7.0	7.0
Female 12-14	11.4	11	11.6	10.9	10.9
Female 15-16	7.5	6.3	7.3	7.7	7.7
Total	3048	1906	1906	798708	1906

GROS, General Register Office for Scotland

2.6.2 Weighting the FPM self-completion questionnaire

The non-response to the FPM self-completion questionnaire within the interview was very low, and separate weights were not needed for this section. The calibrated individual weight (wt_individual) was used to analyse this data.

2.6.3 Weighting the Food Frequency Questionnaire

An additional set of weights were required for non-response to the FFQ. These weights were again generated using logistic regression. More information was available to model non-response behaviour to the FFQ, since information collected at the main questionnaire was available for both respondents and non-respondents and could be incorporated into the model. There were 20 cases that did not have household data, however these were kept in the sample and weights were developed for them based on the average weights in their age groups. The modelling included respondent age, sex and ethnicity, ethnicity of the main food provider, household tenure, activity (paid employment or other) and marital status of the household reference person, number of children in the household plus some area-level characteristics (2009 Scottish Index of Multiple Deprivation, region and the Office of National Statistics local authority-level area classification).

The variables significantly related to response were retained in the final model. Individuals who did not complete the FFQ tended to be living in rented accommodation, be living in households where the household reference person had never been married, not in paid work, living in households where the main food provider was from a non-white ethnic background, and living in costal or countryside (rural) areas. This is shown in Table 2.3.

Table 2.3

The predicted probabilities of response were used to generate the FFQ response weights (w2). The final weights for the FFQ data are the product of the calibrated individual weights and the FFQ response weights (wt_FFQ = wt_individual X w2). These weights were used for all analyses of the FFQ data.

This is the same approach to that used in 2006, with one difference: in 2006 the outcome for the FFQ response model was whether or not a FFQ was returned. Further investigation showed that a number of FFQs could not be included in the analysis because they were incomplete. The 2010 non-response model included these cases as non-response, which means the partially completed cases are accounted for in the weighting. The outcome variable in 2010 was therefore whether or not the FFQ provided *usable* data.

The change in methodology will improve the weights as the non-response model will account for differences due to partial (as well as complete) non-response. However, the impact of the changes is not thought to be large enough to affect comparability as the number of unusable FFQs was such a small proportion of the total. In 2006, 1512 respondents returned a FFQ, of whom 51 (3%) had missed more than 10 lines. This left 1461 respondents. Of these, 70 (5%) were excluded from the dietary analysis because they had extreme total energy intakes ($<2.5^{th}$ centile or $>97.5^{th}$ centile for each age group (3-7, 8-11 or 12-17 years at the interview)). This left 1391 useable FFQs (92% of all respondents who returned a FFQ).

In 2010, 1816 FFQs were received. A similar proportion were excluded because they had more than 10 missed lines (n=56, 3%) and a further 86 (5%) were excluded because they had extreme total energy intakes using the same methodology as in 2006. This left 1674 useable FFQs (92% of all respondents returning a FFQ).

Table 2.3 The FFQ non-response model

	Variables in the Equation					
	B	S.E.	Wald	df	Sig.	Exp(B)
Tenure			11.5	1	0.001	
Owner occupier					(baseline)	
Renting/other	-0.59	0.17	11.5	1	0.001	0.56
Marital status of HRP			5.1	2	0.076	
Single, never married					(baseline)	
Married and living as a couple	0.40	0.19	4.6	1	0.032	1.49
Separated, divorced or widowed	0.37	0.22	2.8	1	0.093	1.44
Ethnicity of Main Food Provider			33.7	2	0.000	
Scottish					(baseline)	
Other white	-0.35	0.20	3.2	1	0.073	0.70
Other non-white	-1.25	0.22	32.8	1	0.000	0.29
ONS Local Authority identifier (based on Census 2001 data)			12.5	3	0.006	
Cities and services					(baseline)	
Prospering UK	-0.07	0.34	0.0	1	0.829	0.93
Costal and Countryside	-0.56	0.20	7.8	1	0.005	0.57
Mining and manufacturing	0.02	0.18	0.0	1	0.915	1.02
Activity of the household reference person			3.3	1	0.071	
Other activity					(baseline)	
In paid work	0.32	0.18	3.3	1	0.071	1.38
Constant	1.89	0.26	54.4	1	0.000	6.60

Notes:

1. The response is 1 = FFQ provides usable data, 0 = Incomplete/missing FFQ.
2. Only variables that are significant at the 0.05-level are included in the model.
3. The model $R^2 = 0.041$ (Cox and Snells).
4. **B** is the estimate coefficient with standard error **S.E.** The **Wald**-test measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom **df**. If the test is significant (**sig** < 0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline category.

2.6.4 Sample precision

Weights should reduce bias in the sample whilst also keeping any reduction in precision to a minimum. If the weights are too variable the standard errors are inflated, which widens the confidence intervals around the survey estimates, making them less precise. To avoid this, very large (or small) weights produced by the non-response model were identified and trimmed (capped) to an appropriate level. Weights were checked using frequency tables and histograms. The highest 0.5% weights produced by the non-response models were trimmed, giving them the value of the 99.5th weight. The calibrated weights were not trimmed.

The effective sample size can be used to measure the impact of the weights on sample precision. The effective sample size is the size a simple random sample would have to be to give estimates of the same precision as the sample design in question. If the effective sample size is close to the actual sample size then the sample is efficient and there is little loss in precision due to the weights. The main sample had an effective sample size of 1821. The responding unweighted sample is 1906; this gives the sample an efficiency of 96%. The FFQ sample has an effective sample size of 1574 and an efficiency of 94%. The final weights are given in Table 2.4 below.

Table 2.4

Table 2.4 Final weights

	N	Minimum	Maximum	Mean	Std. Deviation
Weight for main stage analysis (main_wt)	1906	0.65	2.17	1.00	0.22
Weight for analyses of FFQ (FFQ_wt)	1674	0.62	2.15	1.00	0.25

2.7 Data analysis

Data analysis was carried out in Stata/SE 11.2 (Stata Corporation, College Station, TX, USA) using survey (svy) commands for complex survey data.

2.7.1 Food energy versus total energy

Macronutrient intakes were 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/g for total sugars, NMES, and intrinsic and milk sugars; 37kJ/g for total fat and saturated fatty acids; and 17kJ/g for protein.

2.7.2 Classification of overweight and obese

Body mass index (BMI) and BMI z-score were calculated for 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[6-7] were then used to classify children as shown in Table 2.5.

Table 2.5

Table 2.5 Definition of BMI classifications

BMI classification	Definition[1]
Underweight	BMI at or below the 5th percentile
Healthy weight	BMI above the 5th percentile and below the 85th percentile
Overweight but not obese	BMI at or above the 85th percentile and below the 95th percentile
Obese but not severely obese	BMI at or above the 95th percentile and below the 98th percentile
Severely obese	BMI at or above the 98th percentile

[1]Based on BMI z-score calculated to 6 decimal places

Mean waist circumference and waist circumference z-score were calculated for participants who had two successful waist circumference measurements that were within 2cm of each other. The UK waist circumference charts[8] were then used to classify children using the same percentile cut-offs as for the BMI classification (Table 2.6).

Table 2.6

Table 2.6 Cut-offs for waist circumference

Cut-off[1]
Below the 85th percentile
At or above the 85th percentile and below the 95th percentile
At or above the 95th percentile and below the 98th percentile
At or above the 98th percentile

[1]Based on waist circumference z-score calculated to 2 decimal places

2.7.3 Deviations from the normal distribution

All continuous variables 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 as close to zero as possible. Means and 95% confidence limits of the transformed variables were then converted back to the original scale. Therefore, the means presented in this report are not influenced by skewed data. Transformation of the data to achieve normality was also necessary to allow statistical testing of associations between variables.

The k statistics were different from those used for the 2006 data, reflecting small differences in the distributions of the variables. Use of different k values between 2006 and 2010 ensure that the means presented for 2010 are comparable with those presented for 2006 as they are both based on distributions with skewness values as close to zero as possible, rather than forcing the 2010 data to fit the distribution of the 2006 data by re-using the 2006 k statistics. If the 2006 k was used for the 2010 data, the mean NMES intake in 2010 would have been 0.2% of food energy higher, but mean total fat and SFA intakes would have been the same, demonstrating that the different k value between 2006 and 2010 would have had a very small influence on the results.

2.7.4 Tests of association

Associations between the percentages of children with a specified characteristic (e.g. percentage of consumers) and sex, age group, Scottish Index of Multiple Deprivation (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[9] and converted into an F-statistic. Differences between sexes in means of continuous variables (e.g. intakes of nutrients) were 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 quintile 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.

2.7.5 Comparison between 2006 and 2010

The sample in both 2006 and 2010 surveys were aged 3-16 years at the date of selection. In the 2006 survey however, some children had turned 17 years by the date of interview whereas all children in the 2010 survey were still aged 3-16 years at interview because the 2010 sample was designed to ensure that children were no more than 16 years old at the time of fieldwork (see Section 2.1), as required by FSA Scotland. For the purpose of comparison between the 2006 survey and the 2010 survey, the entire sample in both surveys was included in the analysis so that means and proportions for 2006 presented in this report match those presented in the report by Sheehy *et al*.[1]. The presence of children aged 17 years in the 2006 survey is unlikely to affect the comparison since 17 year olds accounted for only 1% of the whole sample, and 3% of children aged 12-17 years.

The difference between 2006 and 2010 in categorical variables was assessed using the Pearson chi-squared statistic which was then corrected for the survey design using the second-order correction of Rao and Scott[9] and converted into an F-statistic.

All continuous variables which were significantly skewed were transformed into a new variable (ln+/-(old variable) - k), as described in section 2.7.3. This method of transformation was used for both the 2006 and 2010 surveys. Since k was different between 2006 and 2010 for the same variable, it was not appropriate to test for the statistical significance of the difference in means as presented by Sheehy *et al*.[1] and in the current report. Statistically significant differences between 2006 and 2010 in continuous variables were assessed by transforming the raw dietary data for all 3065 children (1391 in 2006 and 1674 in 2010) together using the (ln+/-(old variable) - k) method. This resulted in a different k from the k used for the separate transformations of the 2006 and 2010 data. Therefore, the means and 95% confidence intervals for these analyses may differ slightly from those presented in this report and in the report describing the 2006 survey[1].

2.7.6 Scottish Index of Multiple Deprivation

The analysis was based on the 2009 version of the Scottish Index of Multiple Deprivation (SIMD)[10]. It is based on 38 indicators in seven individual domains of current income, employment, housing, health, education, skills and training, geographic access to services and crime. SIMD is calculated at data zone level, enabling small pockets of deprivation to be identified. The data zones are ranked from most deprived (1) to least deprived (6505) on the overall SIMD index. The result is a comprehensive picture of relative area deprivation across Scotland. The index was divided into quintiles for the presentation of analysis within the report (5^{th} (least deprived) to 1^{st} (most deprived) quintile). The full index is not available on the archived dataset due to concerns about its potential for identifying individual respondents or households.

2.7.7 Scottish Government Urban/Rural classification

Analysis was also conducted using the Scottish Government Urban/Rural classification. This classification uses settlement sizes and accessibility measures based on drive time data to classify areas of Scotland into six categories ranging from large urban to remote rural areas[11]. The six categories in the urban/rural classification are shown in Table 2.7.

Table 2.7

Table 2.7 Definition of urban/rural classifications

	Urban/rural classification	Definition
1.	Large urban areas	Settlements of over 125,000 people
2.	Other urban areas	Settlements of 10,000-125,000 people
3.	Accessible small towns	Settlements of 3,000-10,000 people within 30 minutes drive of a settlement of 10,000 or more
4.	Remote small towns	Settlements of 3,000-10,000 people with a drive time of over 30 minutes to a settlement of 10,000 or more
5.	Accessible rural	Settlements of fewer than 3,000 people within 30 minutes drive of a settlement of 10,000 or more
6.	Remote rural	Settlements of fewer than 3,000 people with a drive time of over 30 minutes to a settlement of 10,000 or more

Due to the small number (n=49, 3%) of respondents in the remote small towns category, statistical tests of significance were not carried out on differences between urban/rural categories. All tables with results presented by urban/rural classification are given in Appendix H.

2.8 Ethical approval

Ethical approval for the study was obtained from the NatCen Social Research Ethics Committee (Application: P7070 Scottish Children's Diet Survey 2010) (Appendix I).

2.9 References

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3. Response

The survey comprised two main components: a self-completion FFQ and a face-to-face interview. There was also a supplementary self-completion FPM questionnaire for secondary school pupils which was completed by almost all eligible children (see Volume 2). This chapter describes the response to the interview and FFQ (both separately and combined). As there were a few possible outcomes for this survey (Figure 3.1), a range of response rates are presented. Response is explored by age, sex, SIMD quintile and urban/rural classification, and co-operation rates for the height, weight and waist measurements are described. This chapter also compares response rates between 2006 and 2010.

Summary

- Interviews were carried out with 1906 children (or the parent/guardian for children aged under 12 years) which represents a response rate of 63%, based on all children initially selected for the study.
- 1819 respondents returned an FFQ (response of 60%). After excluding respondents who had returned 2 FFQs (n=3), had missed >10 lines (3%), and had extreme total energy intakes (5%), 1674 FFQs were available for dietary analysis (response of 55%), and 1657 FFQs were available with corresponding interview data (response of 54%).
- There were no significant differences in response by sex, but participation rates for the interview and the FFQ for 12-16 year olds were lower than in the other age groups.
- There was a high level of co-operation with physical measurements; 96% of respondents had their height and weight measured and 95% of respondents had their waist circumference measured. Response did not differ significantly by either sex or age group.
- Response to the main interview or physical measurements did not differ significantly by SIMD quintile. However, as area deprivation increased, there was a significant decline in the number of FFQs available for analysis with corresponding interview data.
- Response to the main interview was lowest in large urban areas and remote small towns, and highest in accessible and remote rural areas. However, the proportion of FFQs available for analysis was similar across all area types. Children in remote small towns and remote rural areas were less likely to participate in the physical measurements than children in other areas.
- Fewer families opted out in 2006, and response at all stages to the main interview was lower in 2010 than in 2006. The response to the FFQ was slightly higher in 2010, and the final response rate for interviews with corresponding FFQ data, based on all children selected for the study, was 55% in 2006 and 54% in 2010.

3.1 Response to survey for whole sample

The response rates presented in Table 3.1 show two sets of figures. The first are based on all 3048 children initially selected by HMRC for the study. Parents/guardians were offered the chance to opt out prior to being approached for the study, and 336 (11%) did so. A further 393 addresses were out of scope to interviewers in the field, because they were incorrect or ineligible, for example where families had moved away but could not be traced. Interviews were carried out with 1906 children (or the parent/guardian for children aged under 12 years), which represents a response rate of 63%, based on all children initially selected for the study by the HMRC.

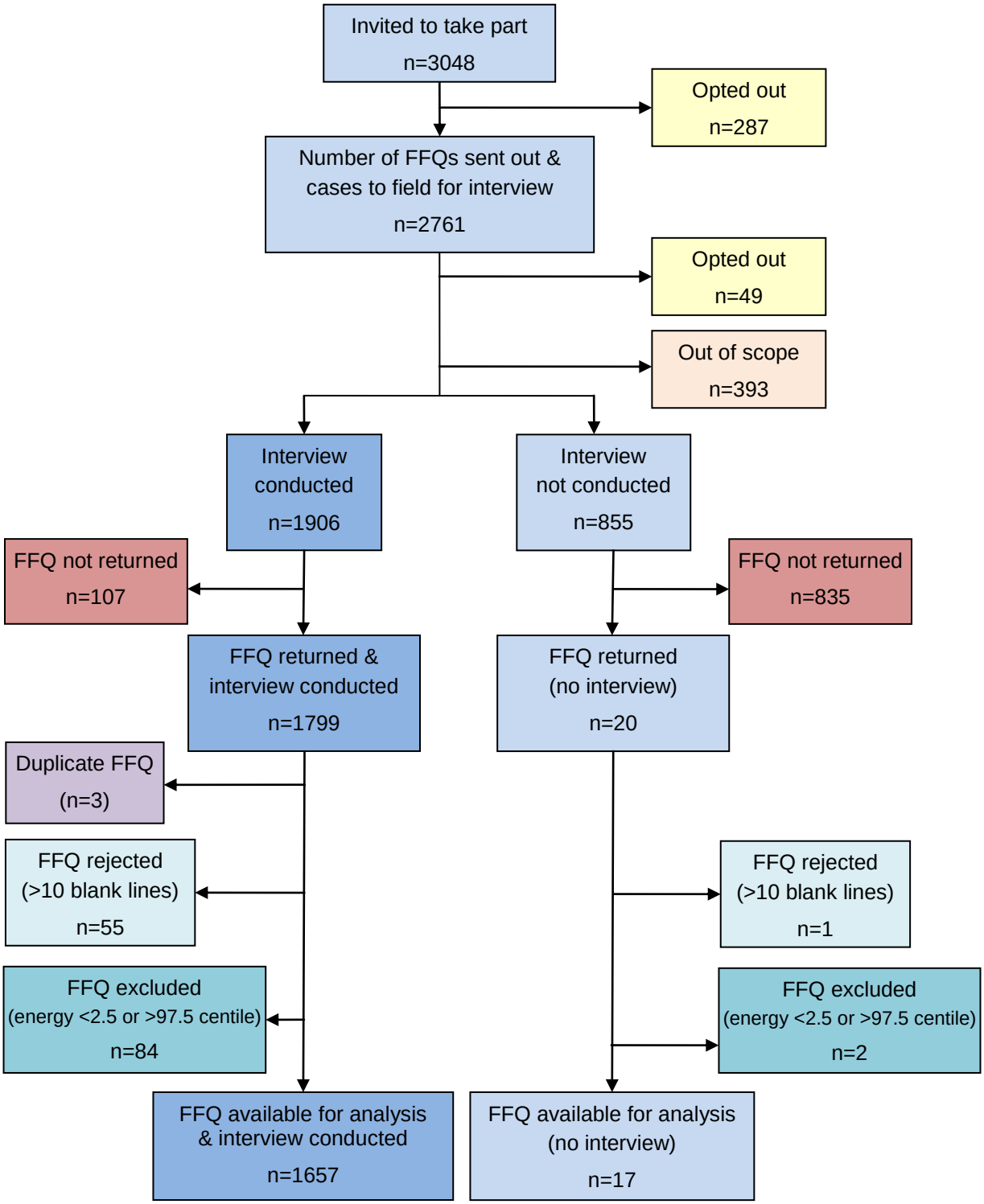
Of the 1906 respondents who were interviewed, 1783 FFQs (94%) were collected by the interviewers, 83 (4%) were asked to post the FFQ back to the office, 39 (2%) reported that they had already returned the FFQ, and 1 FFQ (0.05%) was not expected to be returned. 1819 FFQs were returned in total, including 20 FFQs for which there was no corresponding interview. Based on all children initially selected, the response rate for return of the FFQ was 60%.

Figure 3.1 details a number of exclusions for the FFQ data. Firstly, of the 1819 respondents who returned a FFQ, 3 respondents returned 2 FFQs and were excluded from the dietary analysis, leaving 1816 FFQs with unique serial numbers. Of the 1816 respondents who returned one FFQ, 56 (3%) had missed more than 10 lines and were therefore excluded from the dietary analysis. Of the remaining 1760 respondents, 86 (5%) with extreme total energy intakes for each age group (3-7, 8-11 or 12-16 years at the interview) were further excluded. Therefore, 1674 FFQs were available for the dietary analysis, which represents a response rate of 55%, and 1657 FFQs were available with corresponding interview data (response of 54%).

Table 3.1 also presents response rates based only on those cases ‘in scope’ to interviewers in the field. These figures exclude the families that opted out prior to the start of the study, and the addresses that were invalid. These response rates give an illustration of the fieldworkers’ performance, but they underestimate the potential bias in the sample as they exclude cases that were eligible for the study (such as the families who opted out), as well as cases for whom the eligibility was uncertain. It is impossible to know which of the out of scope addresses would have been valid had the family been traced (for example, families that had moved outwith Scotland would not have been eligible for the study so should not be included in the denominator for the response rate estimation). In reality therefore, the “true” response to the survey will lie somewhere between the two sets of figures presented in Table 3.1.

Figure 3.1 and Table 3.1

Figure 3.1 Response outcomes



3.1.1 Response to interview, FFQ and physical measurements by age and sex

Table 3.2 shows response by age group and sex. It should be noted that a parent or guardian was asked to respond for those children in the sample under 12 years of age while those aged 12 years and over were asked to complete the FFQ themselves with help from parents/guardians and respond to questions on physical activity in the face-to-face interview. A parent or guardian was asked to respond to the socio-economic questions. Completion of the interview for those aged 12-16 years therefore required input from both adult and child.

There were no significant differences in any of the responses by sex but some differences by age. Participation rates for the interview and the FFQ were generally higher for younger respondents; in particular, response rates for 12-16 year olds were low compared to the other groups. This difference was significant for the overall sample. This significant association with age group was found within the two sexes for response to the interview but not the FFQ.

All those taking part in the face-to-face interview were invited to have their height, weight and waist measurements taken. There was a high level of co-operation with physical measurements; 96% of respondents had their height and weight measured and 95% of respondents allowed their waist measurement to be taken. There were no significant differences in response to the physical measurements by either sex or age group.

Table 3.2

3.1.2 Response to interview, FFQ and physical measurements by SIMD quintile

Table 3.3 shows response by SIMD quintile. Response to the main interview and FFQ did not differ significantly by SIMD quintile. However, as area deprivation increased, there was a statistically significant decline in the number of FFQs available for analysis with corresponding interview data (i.e. after excluding FFQs with missed lines or extreme energy intakes). There were no significant differences in response to the physical measurements by SIMD quintile.

Table 3.3

3.1.3 Response to interview, FFQ and physical measurements by urban/rural classification

Table 3.4 shows response by Scottish Government urban/rural classification. Response to the main interview and completion of the FFQs varied significantly by area type. Response was generally lowest in large urban areas and remote small towns, and highest in accessible and remote rural areas. However, the figures show that participants in the very rural areas were the most likely to have FFQs that were excluded prior to the analysis. As a result, the proportion of FFQs available for analysis (with or without corresponding interview data) was similar across all area types. Response to the physical measurements also varied significantly by area type, but the pattern was the reverse of that seen for the main interview and FFQ. Children in remote small towns and remote rural areas were less likely to participate in the physical measurements than children in other areas. This will in part be due to a higher likelihood of the interview having to take place at a time when the child was not available. It is sometimes harder to schedule suitable interview times in remote areas because interviewers travel long distances to conduct fieldwork over short periods of time.

Table 3.4

3.2 Comparison with response in 2006

Tables 3.1 and 3.5 show response as a proportion of all cases invited to take part for 2010 and 2006 respectively. The tables show that fewer families opted out in 2006 and that response at all stages to the main interview was lower in 2010 than in 2006. However, the response to the FFQ was slightly higher in 2010 due to improvements in the collection arrangements and better phasing of the fieldwork. As a result, the final response rate for interviews with corresponding FFQ data, based on all children selected for the study, was comparable in both years (55% in 2006 and 54% in 2010).

More addresses were out of scope in 2010 which could in part be due to the fact that the Child Benefit records are now maintained by HMRC rather than the Department of Work and Pensions (DWP). The DWP used to cross refer the address information on the child benefit register with other DWP benefit databases to ensure addresses were up to date while HMRC does not do this.

Tables 3.1 and 3.5

In 2010, the response rate for interviews with corresponding FFQ data was slightly higher in younger children, and slightly lower in the older children compared with 2006: 65%, 66% and 57% in 3-7, 8-11 and 12-16 year old children respectively in 2010 (Table 3.2), and 62%, 65% and 59% respectively in 2006.

Table 3.2

Table 3.1 Response to 2010 survey for whole sample

			Response rate	
			% of all children selected by HMRC	% of all children 'in scope'[1]
		n	%	%
Cases invited to take part		3048	100	
Opted out	287			
Cases to field	All	2761	91	
Late opt outs	49			
Out of scope[1]	393			
Cases achievable or 'in scope'		2655	87	100
Cases achieved				
Interviews		1906	63	72
FFQs returned		1819	60	69
FFQs available for analysis		1674	55	63
Interview + FFQ returned		1799	59	68
Interview + FFQ available for analysis		1657	54	62

[1]Cases which were considered out of scope or unachievable included incorrect or ineligible addresses.

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

	Age				
	3-7y	8-11y	12-16y	All	*p*[1]
	%	%	%	%	
Boys					
Interviews	77	75	67	73	***0.021***
FFQs returned	71	73	64	69	*NS*
FFQs available for analysis	66	68	58	64	*NS*
Interview + FFQ returned	71	72	63	68	*NS*
Interview + FFQ available for analysis	66	67	58	63	*NS*
Height[2]	96	95	97	96	*NS*
Weight	98	95	96	96	*NS*
Waist	96	95	96	96	*NS*
Girls					
Interviews	75	73	65	71	***0.046***
FFQs returned	73	70	62	68	*NS*
FFQs available for analysis	65	65	58	62	*NS*
Interview + FFQ returned	72	70	61	67	*NS*
Interview + FFQ available for analysis	64	65	57	62	*NS*
Height[2]	96	97	95	96	*NS*
Weight	97	97	93	96	*NS*
Waist	95	96	94	95	*NS*
Both boys & girls					
Interviews	76	74	66	72	***0.000***
FFQs returned	72	72	63	68	***0.008***
FFQs available for analysis	65	66	58	63	***0.049***
Interview + FFQ returned	72	71	62	68	***0.004***
Interview + FFQ available for analysis	65	66	57	62	***0.034***
Height[2]	96	96	96	96	*NS*
Weight	97	96	95	96	*NS*
Waist	95	96	95	95	*NS*
P-values for difference between sexes in response					
Interviews	*NS*	*NS*	*NS*	*NS*	
FFQs returned	*NS*	*NS*	*NS*	*NS*	
FFQs available for analysis	*NS*	*NS*	*NS*	*NS*	
Interview + FFQ returned	*NS*	*NS*	*NS*	*NS*	
Interview + FFQ available for analysis	*NS*	*NS*	*NS*	*NS*	
Height[2]	*NS*	*NS*	*NS*	*NS*	
Weight	*NS*	*NS*	*NS*	*NS*	
Waist	*NS*	*NS*	*NS*	*NS*	
Bases (unweighted)					
Boys	*477*	*404*	*485*	*1366*	
Girls	*439*	*358*	*492*	*1289*	
Both boys & girls	*916*	*762*	*977*	*2655*	

[1]P-values for associations between age group and response

[2]Height, weight and waist measurements are taken as the % of those responding to the interview

NS, non-significant

Table 3.3 Response for whole sample (based on cases in scope), by SIMD quintile

	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p[1]
	%	%	%	%	%	
Interviews	75	74	72	70	68	*NS*
FFQs returned	73	69	67	67	65	*NS*
FFQs available for analysis	69	64	62	61	58	***0.003***
Interview + FFQ returned	72	69	66	66	64	*NS*
Interview + FFQ available for analysis	69	64	61	61	57	***0.002***
Height[2]	97	96	97	96	95	*NS*
Weight	97	96	97	96	94	*NS*
Waist	96	95	97	95	93	*NS*
Bases (unweighted)	*586*	*559*	*486*	*480*	*540*	

[1]P-values for the association between SIMD quintile and response
[2]Height, weight and waist measurements are taken as the % of those responding to the interview
NS, non-significant

Table 3.4 Response for whole sample (based on cases in scope), by urban/rural classification

	Large urban areas	Other urban areas	Accessible small towns	Remote small towns	Accessible rural	Remote rural	p[1]
	%	%	%	%	%	%	
Interviews	68	73	73	65	76	80	***0.004***
FFQs returned	65	71	69	64	69	74	***0.038***
FFQs available for analysis	61	65	65	61	65	62	*NS*
Interview + FFQ returned	64	71	68	62	69	74	***0.02***
Interview + FFQ available for analysis	60	65	65	59	65	62	*NS*
Height[2]	96	97	96	92	98	92	***0.016***
Weight	95	97	95	92	99	93	***0.010***
Waist	94	97	94	92	99	90	***0.001***
Bases (unweighted)	*1045*	*792*	*249*	*74*	*322*	*167*	

[1]P-values for the association between urban/rural classification and response
[2]Height, weight and waist measurements are taken as the % of those responding to the interview
NS, non-significant

Table 3.5 Response to 2006 survey for whole sample

			Response rate	
			% of all children selected by DWP	% of all children 'in scope'[1]
		n	%	%
Cases invited to take part		2498	100	
Opted out	146			
Cases to field		2352	94	
Late opt outs	65			
Out of scope[1]	253			
Cases achievable or 'in scope'		2245	90	
Cases achieved				
Interviews		1700	68	76
FFQ returned		1512	61	67
FFQs available for analysis		1391	56	62
Interview + FFQ returned		1491	60	66
Interview + FFQ available for analysis		1373	55	61

[1]Cases which were considered out of scope or unachievable included incorrect or ineligible addresses.

4. Intake of food groups and supplements

Chapters 4, 5 and 6 present data on food consumption, and intake of energy and nutrients based on information collected in the FFQs. This chapter describes the consumption of foods and drinks and use of dietary supplements for the 1674 children for whom an FFQ was available for analysis (see Section 3.1), and variation by age group, sex and deprivation level. The food groups were the same as those used for the 2006 survey[1]. A full list of the foods and drinks included in each food group is provided in Appendix J. The consumption of foods and drinks and use of supplements is also compared with that found in the 2006 survey[1].

Summary

Foods and drinks

- The mean intake of non-diet soft drinks did not change significantly between 2006 and 2010 in any age group in boys or in girls.
- Confectionery intake decreased statistically significantly in girls in all age groups between 2006 and 2010 but there was no significant change in boys.
- Between 2006 and 2010, the mean intake of biscuits, cakes and pastries increased slightly but statistically significantly in young children (3-7 years) but decreased significantly in older children (12-17 years).
- The mean intake of milk and cream decreased significantly between 2006 and 2010 in boys aged 3-7 and 12-17 years, but there was no significant change in girls.
- The mean intake of fruits (excluding fruit juice) was 128g/day in 2010, compared with 132g/d in 2006. The mean intake of vegetables (excluding potatoes and baked beans) was 59g/day in 2010, and 52g/day in 2006.
- Only 40% of children consumed oily fish at least once a month.
- 11% of boys and 17% of girls aged 12-16 years reported consuming alcoholic drinks at least once a month.
- There was no significant change between 2006 and 2010 in the proportion of young people aged 12-16 years who reported consuming alcoholic drinks at least once a month.

Supplements

- The percentage of children aged 3-16 years who reported taking dietary supplements was significantly lower in 2010 (17%) compared with 2006 (24%).
- The percentage of children taking any type of dietary supplement was highest in the least deprived areas (22%) and lowest in the most deprived areas (11%).
- Between 2006 and 2010 the proportion of children taking cod liver oil and other fish-based supplements decreased significantly from 10% to 6%, and the proportion taking other vitamins including multivitamins decreased significantly from 13% to 9%.

4.1 Consumption of foods and drinks

The proportion of children who consumed specific foods and drinks at least once a month and the mean consumption per day amongst these consumers is shown in Table 4.1. Almost all of the children (95% or more) consumed the following foods at least once a month:

- pasta, rice, pizza & other cereals
- bread (excluding wholemeal)
- biscuits, cakes & pastries
- milk & cream
- meat & meat dishes
- processed meat
- vegetables (excluding potatoes & baked beans)
- chips, fried & roast potatoes & potato products
- crisps & savoury snacks
- fruits (excluding fruit juice)
- confectionery
- soups & sauces

The milk and cream food group consisted of full fat cow's milk, semi-skimmed cow's milk, skimmed cow's milk, soya milk, flavoured milk, cream, and other milk described in the Other Foods section of the FFQ (goat's, rice and oat milk) (Appendix J). Overall, cow's milk (full fat, semi-skimmed and skimmed) contributed 98% to the total intake of milk and cream, and semi-skimmed cow's milk contributed 70% to the total intake of milk and cream.

89% of children consumed white fish, shellfish or fish dishes at least once a month, but only 40% of children consumed oily fish at least once a month. The mean intake of fruits (excluding fruit juice) was 128g/day, while the mean intake of vegetables (excluding potatoes and baked beans) was 59g/day.

Table 4.1

4.1.1 Consumption of foods and drinks by age

The proportion of children who consumed breakfast cereals, yoghurt and fromage frais; ice cream; white fish and fish dishes; baked beans, and fruits (excluding fruit juice) decreased with age while the proportion of children consuming eggs and egg dishes; nuts and seeds; diet soft drinks; tea, coffee and water, and powdered beverages increased with age.

The amount (g/day) of the following foods consumed increased with age:

- bread (excluding wholemeal bread)
- chips, fried & roast potatoes & potato products
- crisps & savoury snacks
- confectionery
- non-diet soft drinks
- tea, coffee & water

The amount (g/day) of the following foods consumed decreased with age:

- wholemeal bread
- unsweetened breakfast cereals
- biscuits, cakes & pastries
- puddings
- milk & cream
- cheese
- yoghurt & fromage frais
- fats & oils
- processed meat
- white fish, shellfish & fish dishes
- baked beans
- fruits (excluding fruit juice)
- nuts & seeds
- table sugar & preserves
- diet soft drinks

The amount (g/day) of vegetables (excluding potatoes and baked beans) and oily fish consumed did not change with age.

In interpreting these patterns it should be borne in mind that in children aged 3-11 years the FFQ was completed by the parent/guardian with input from the child while in those aged 12-16 years the FFQ was completed by the young person themselves with input from the parent/guardian. Comparison between the FFQ and either 4-day non-weighed diet diary or a 24 hour recall in a subsample of the children surveyed in 2006 suggested that food intake may have been overestimated by the FFQ in children aged 3-11 years[1].

Table 4.1

4.1.2 Consumption of foods and drinks by sex

Differences between boys and girls in the proportion who consumed foods or drinks once a month or more were generally small. Boys consumed significantly greater amounts of many foods than girls, particularly bread (excluding wholemeal); milk and cream; meat and meat dishes, and processed meats. The only foods which were consumed in greater amounts in girls than in boys were cheese and tea, coffee and water, and this difference was seen in 3-7 year olds only.

Table 4.1

4.1.3 Consumption of foods and drinks by SIMD quintile

There were few differences between SIMD quintiles in the proportions of children consuming foods at least once a month. The proportion of children who consumed wholemeal bread; oily fish; vegetables (excluding potatoes and baked beans); fruits (excluding fruit juice); fruit juice (including smoothies), and tea, coffee and water at least once a month was significantly lower among children living in more deprived areas but the differences were very small.

Differences between SIMD quintiles in the amount of foods or drinks consumed per day (by those who consumed them) were also generally small, though for drinks the differences were larger. Significant differences in the daily amounts of foods consumed between SIMD quintiles are summarised below. In children living in the least deprived areas, consumption of diet and non-diet soft drinks may be replaced by fruit juice, tea, coffee and water.

Higher intakes in more deprived areas	Higher intakes in less deprived areas
Bread (excluding wholemeal)	Pasta, rice, pizza & other cereals
Sweetened breakfast cereals	Wholemeal bread
Ice cream	Meats & meat dishes
Eggs & egg dishes	White fish, shellfish & fish dishes
Processed meat	Vegetables
Baked beans	Fruits
Chips, fried & roast potatoes & potato products	Fruit juice (including smoothies)
Crisps & savoury snacks	Tea, coffee & water
Confectionery	
Non-diet soft drinks	
Diet soft drinks	

Table 4.2

4.2 Consumption of alcoholic drinks

4.2.1 Consumption of alcoholic drinks by sex

Among the young people aged 12-16 years, 14% reported consuming alcoholic drinks (alcopops, lager or beer, cider, wine, spirits or liqueurs) at least once a month, with a higher proportion of consumers among girls compared to boys. For those who reported consuming alcoholic drinks at least once a month, the mean amount consumed was 30g/day. The mean amount of alcoholic drinks consumed was higher among boys than girls but comparison is limited due to the low numbers in these sub-groups.

Table 4.3

4.2.2 Consumption of alcoholic drinks by SIMD quintile

The proportion of children aged 12-16 years who reported consuming alcoholic drinks at least once a month did not follow a linear trend across SIMD quintiles: the proportion was lowest in the 3rd quintile and highest in the 5th quintile, i.e. those living in the least deprived areas. The mean amount consumed per day is difficult to compare across deprivation groups due to the small numbers of children who reported consuming alcohol at least once a month.

Table 4.4

4.3 Use of dietary supplements

4.3.1 Use of supplements by age and sex

Among the whole population, 17% of children reported taking dietary supplements, with vitamins, including multivitamins, and fish oil-based supplements the most common types taken. The proportion taking supplements decreased with age among girls but not boys. The proportion of children taking minerals or other supplements was very low.

Table 4.5

4.3.2 Use of supplements by SIMD quintile

The proportion of children taking any supplement was highest among those living in the least deprived areas (22%) and lowest in those living in the most deprived areas (11%). This pattern was particularly evident for fish-oil based supplements but was also seen for other vitamins, including multivitamins.

Table 4.6

4.4 Comparison with consumption of food groups and supplements in 2006

4.4.1 Comparison with consumption of foods and drinks in 2006

4.4.1.1 Proportion of children consuming foods and drinks

There were few significant differences in the proportion of children consuming foods and drinks at least once a month between 2006 (Table 5.1 in Sheehy *et al*.[1]) and 2010 (Table 4.1) by sex and age group (see Appendix K). The proportion of consumers did not differ significantly between 2006 and 2010 for the following food groups:

- pasta, rice, pizza & other cereals
- bread (excluding wholemeal)
- unsweetened breakfast cereals
- biscuits, cakes & pastries
- puddings
- ice cream
- eggs & egg dishes
- meats & meat dishes
- oily fish & dishes
- vegetables
- chips, fried & roast potatoes & potato products
- other potatoes, potato salads & dishes
- crisps & savoury snacks
- fruits
- table sugar & preserves
- confectionery
- fruit juice
- non-diet soft drinks
- diet soft drinks
- tea, coffee & water
- powdered beverages
- soups & sauces

Between 2006 and 2010 there were significant increases in the proportion of boys aged 3-7 years consuming sweetened breakfast cereals (61% to 73%), milk and cream (96% to 99%), and baked beans (75% to 81%) at least once a month. In boys aged 8-11 years, the proportion consuming wholemeal bread increased from 50% to 60%, and the proportion consuming white fish, shellfish and fish dishes increased from 85% to 93%. In the oldest boys (12-17 years), the proportion consuming processed meat increased significantly from 96% to 99%. There were no significant decreases in the proportion of boys consuming specific foods and drinks at least once a month.

In girls, the proportion consuming dairy products at least once a month decreased significantly between 2006 and 2010: milk and cream consumption decreased in 8-11 year olds (99 to 96%) and 12-17 year olds (98 to 94%), cheese consumption decreased in 8-11 year olds (94% to 84%), and yoghurt and fromage frais consumption decreased in 12-17 year olds (95% to 87%). In girls aged 3-7 years, the proportion consuming white fish, shellfish and fish dishes decreased significantly by 5% (98% to 93%) whereas the proportion consuming nuts and seeds increased by 8% (23% to 31%).

4.4.1.2 Mean intakes of foods and drinks

Descriptive comparison

This section gives a descriptive comparison of the mean intakes of foods and drinks in consumers (those who consumed the food or drink at least once a month) in 2006 as presented by Sheehy *et al*.[1] and in 2010 as it was not possible to assess the statistical significance of the difference in these means (see section 2.7.5).

The majority of differences in mean intakes of foods and drinks between 2006 (Table 5.1 in Sheehy *et al*.[1]) and 2010 (Table 4.1) were relatively small (≤5g/day). Between 2006 and 2010 there was a decrease of more than 5g/day in the mean intakes of:

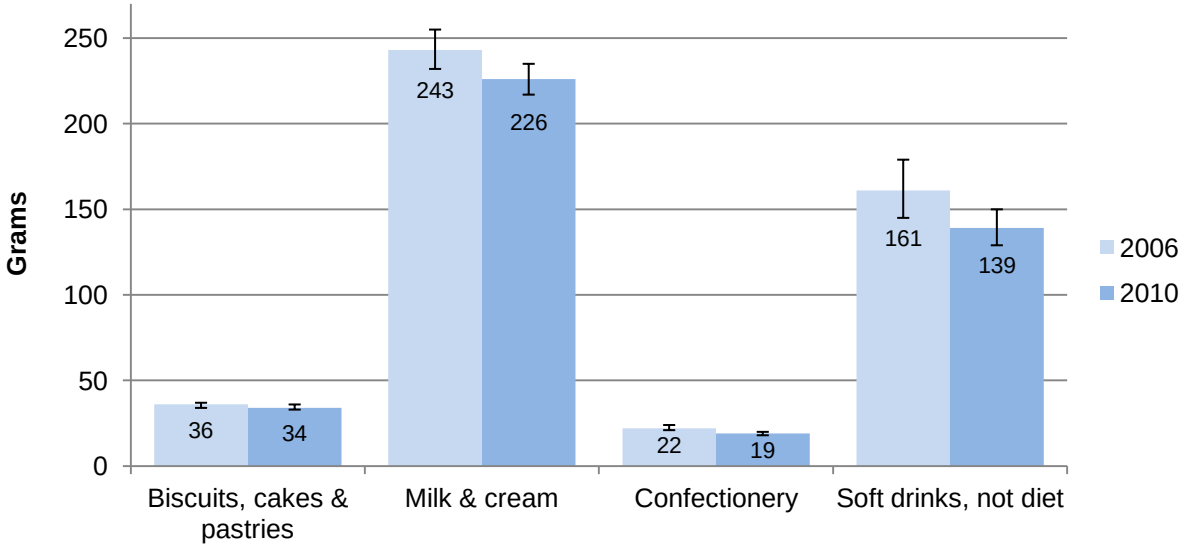
- bread (excluding wholemeal) in 3-7 year olds
- biscuits, cakes & pastries in 12-17 year olds
- milk & cream in all age groups
- yoghurt & fromage frais in 8-11 and 12-17 year olds
- crisps & savoury snacks in 8-11 year olds
- fruit juice in 8-11 and 12-17 year olds
- non-diet soft drinks in all age groups
- diet soft drinks in 3-7 and 12-17 year olds
- tea, coffee & water in all age groups

In contrast, the mean intake of vegetables increased slightly between 2006 and 2010 in all age groups by 6-9g/day. Mean fruit intake increased from 156 to 172g/day in 3-7 year old boys, but decreased in all age groups in girls.

Figure 4.1 compares the mean intakes of biscuits, cakes and pastries; milk and cream; confectionery; and non-diet soft drinks in consumers between 2006 and 2010 in children aged 3-17 years, as presented by Sheehy *et al*.[1] and in chapter 4. These food groups contributed at least 10% to the total intake of NMES (see section 5.2) or saturated fatty acids (see section 6.2). Intakes of these food groups decreased between 2006 and 2010, although these decreases were relatively small for biscuits, cakes and pastries and confectionery.

Figure 4.1

Figure 4.1 Mean (95% CI) daily intake of food groups that contributed ≥10% to the intake of NMES or saturated fatty acids in consumers* in 2006 and 2010



*Children who consume at least once a month

Statistical comparison

Tables 4.7 to 4.10 show the p-values for differences in the mean intakes of biscuits, cakes and pastries; milk and cream; confectionery; and non-diet soft drinks in consumers between 2006 and 2010. The means and 95% confidence intervals differ slightly from those presented earlier in this chapter and in the report describing the 2006 survey[1] because the raw data for all 3065 children (1391 in 2006 and 1674 in 2010) were transformed together using the (ln+/-(old variable) - k) method in order to allow statistical testing of the difference in means between 2006 and 2010, and k was different from the k used for the separate transformations of the 2006 and 2010 data.

The mean intake of biscuits, cakes and pastries increased statistically significantly, but by a relatively small amount (3g/day), between 2006 and 2010 in children aged 3-7 years, but decreased significantly by 6g/day in children aged 12-17 years (Table 4.7). In boys aged 3-7 and 12-17 years, mean intake of milk and cream decreased significantly by 42g/day and 39g/day respectively, but there was no change in the intake of milk and cream in girls (Table 4.8).

Tables 4.7 and 4.8

The mean intake of confectionery decreased significantly in girls in all age groups by 4 to 5g/day, but there was no significant change in the intake of confectionery in boys (Table 4.9). The mean intake of non-diet soft drinks did not change significantly between 2006 and 2010 in any of the age or sex groups (Table 4.10).

Tables 4.9 and 4.10

4.4.2 Comparison with consumption of alcoholic drinks in 2006

There was no significant difference between 2006 and 2010 in the proportion of children aged 12 years and over who reported consuming alcoholic drinks at least once a month: 12% in 2006 versus 11% in 2010 in boys, and 20% in 2006 versus 17% in 2010 in girls. The mean intake of alcoholic drinks in consumers was slightly lower (by 3g/day) in 2010 (30g/day) than in 2006 (33g/day).

4.4.3 Comparison with use of supplements in 2006

Table 4.11 compares the percentage of children using supplements between 2006 and 2010 by sex and age group. The percentage of children using supplements in 2006 presented by Sheehy *et al*.[1] was based on all children who returned an FFQ, whereas the same percentage in 2010 was based on all children who returned an FFQ *that was available for analysis* (after excluding duplicate FFQs, incomplete FFQs, and FFQs with extreme energy intakes). The percentages presented in Table 4.11 are based on all children who returned an FFQ *that was available for analysis*, and therefore the percentages for 2006 may differ slightly (up to 2%) from those presented by Sheehy *et al*.[1]. The percentages presented in Table 4.11 for 2010 are the same as those presented in Table 4.5, but are included in Table 4.11 for the purpose of comparison.

The proportion of children using any supplement decreased significantly from 24% in 2006 to 17% in 2010. This significant decrease in supplement use was evident for cod liver oil and other fish-based supplements (10% in 2006 and 6% in 2010) and other vitamins including multivitamins (13% in 2006 and 9% in 2010). These significant decreases were seen in boys aged 3-7 and 8-11 years, but not in older boys or in girls.

Table 4.11

4.5 References

1. Sheehy C, McNeill G, Masson L, Craig L, Macdiarmid J, Holmes B & Nelson M. (2008) *Survey of sugar intake among children in Scotland*. Aberdeen, Food Standards Agency Scotland. http://www.food.gov.uk/multimedia/pdfs/sugarintakescot2008rep.pdf

Table 4.1 Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Pasta, rice, pizza & other cereals																						
Consumers (%)[3]	99	100	99	99	*NS*		99	99	99	99	*NS*		100	100	99	100	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	46	47	44	48	*NS*	*NS*	48	47	43	52	***0.005***	***0.016***$^{\uparrow}$	45	47	45	44	*NS*	*NS*	*NS*	*NS*	*NS*	***0.002***
Lower limit	45	45	42	45			45	44	40	48			43	44	42	41						
Upper limit	48	49	46	50			50	50	46	57			47	51	48	47						
Bread, excluding wholemeal																						
Consumers (%)[3]	99	99	99	99	*NS*		99	99	100	99	*NS*		99	100	99	99	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	49	44	51	51	***0.002***	***0.003***$^{\uparrow}$	52	44	54	59	***<0.001***	***<0.001***$^{\uparrow}$	45	45	48	43	*NS*	*NS*	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	46	42	47	47			49	40	49	53			42	41	43	40						
Upper limit	51	47	55	54			55	48	60	65			48	48	53	47						
Wholemeal bread																						
Consumers (%)[3]	58	62	56	56	*NS*		58	63	60	53	***0.047***		57	62	51	58	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	8	10	7	7	***<0.001***	***0.001***$^{\downarrow}$	8	11	7	7	***0.025***	***0.019***$^{\downarrow}$	8	9	7	7	***0.028***	***0.014***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Lower limit	7	9	6	6			7	9	6	6			7	7	6	6						
Upper limit	9	12	8	8			10	14	9	9			9	11	9	8						
Unsweetened breakfast cereals including museli																						
Consumers (%)[3]	85	91	85	79	***<0.001***		87	91	86	84	***0.034***		83	92	84	74	***<0.001***		***0.049***	*NS*	*NS*	***0.006***
Mean intake (g/day)[4]	15	17	15	13	***<0.001***	***<0.001***$^{\downarrow}$	16	19	16	15	***0.035***	***0.012***$^{\downarrow}$	13	16	14	10	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	***0.027***	*NS*	***<0.001***
Lower limit	14	16	13	11			15	17	14	13			12	14	12	9						
Upper limit	15	19	16	14			18	21	18	17			14	18	16	12						
Sweetened breakfast cereals																						
Consumers (%)[3]	69	70	76	64	***<0.001***		72	73	77	68	*NS*		66	67	75	59	***0.002***		***0.004***	*NS*	*NS*	***0.015***
Mean intake (g/day)[4]	7	6	7	7	*NS*	*NS*	7	6	7	7	*NS*	*NS*	7	7	7	6	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	6	6	6	6			6	5	6	6			6	6	6	5						
Upper limit	7	7	8	7			7	7	8	9			7	8	8	7						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Biscuits, cakes & pastries																						
Consumers (%)[3]	99	99	99	99	*NS*		99	99	99	99	*NS*		99	100	99	99	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	34	37	38	30	***<0.001***	***<0.001***$^{\downarrow}$	36	38	38	34	*NS*	*NS*	32	35	38	26	***<0.001***	***<0.001***$^{\downarrow}$	***0.001***	*NS*	*NS*	***<0.001***
Lower limit	33	35	35	28			34	35	35	30			30	33	34	24						
Upper limit	36	39	40	32			38	41	41	37			34	38	42	29						
Puddings																						
Consumers (%)[3]	83	85	84	80	*NS*		83	82	84	82	*NS*		83	88	83	79	***0.028***		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	10	11	10	8	***0.002***	***0.001***$^{\downarrow}$	10	12	10	9	*NS*	***0.036***$^{\downarrow}$	9	10	10	7	***0.001***	***0.004***$^{\downarrow}$	***0.015***	*NS*	*NS*	***0.012***
Lower limit	9	10	9	8			10	10	9	8			8	9	9	7						
Upper limit	10	12	11	9			11	13	11	11			10	12	12	8						
Milk & cream																						
Consumers (%)[3]	97	98	97	96	*NS*		98	99	98	98	*NS*		96	98	96	94	*NS*		***0.006***	*NS*	*NS*	***0.022***
Mean intake (g/day)[4]	226	250	227	205	***<0.001***	***<0.001***$^{\downarrow}$	248	263	248	235	*NS*	***0.049***$^{\downarrow}$	204	237	206	176	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*NS*	***0.003***	***<0.001***
Lower limit	217	237	212	191			235	245	227	214			193	216	187	158						
Upper limit	235	265	242	221			261	283	269	258			216	260	226	197						
Cheese																						
Consumers (%)[3]	87	87	85	88	*NS*		86	86	86	87	*NS*		87	88	84	88	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	10	12	9	9	***<0.001***	***<0.001***$^{\downarrow}$	10	11	9	10	*NS*	*NS*	10	14	9	8	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	***0.024***	*NS*	***0.048***
Lower limit	10	11	9	8			9	10	8	9			9	12	8	7						
Upper limit	11	13	10	10			11	13	11	11			11	15	11	9						
Yoghurt & fromage frais																						
Consumers (%)[3]	93	98	95	88	***<0.001***		94	99	95	89	***<0.001***		93	97	96	87	***<0.001***		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	71	100	75	48	***<0.001***	***<0.001***$^{\downarrow}$	77	102	78	58	***<0.001***	***<0.001***$^{\downarrow}$	65	98	72	39	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	67	93	69	43			72	92	69	51			60	89	64	34						
Upper limit	75	108	81	53			82	112	88	66			70	109	80	44						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Ice cream																						
Consumers (%)[3]	89	92	92	84	***<0.001***		89	92	91	85	***0.024***		89	92	93	83	***<0.001***		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	11	12	12	10	*NS*	*NS*	12	11	12	13	*NS*	*NS*	10	12	12	9	***<0.001***	***<0.001***$^{\downarrow}$	***0.011***	*NS*	*NS*	***<0.001***
Lower limit	11	11	11	10			11	10	10	11			10	11	10	8						
Upper limit	12	13	13	11			13	13	13	14			11	13	13	10						
Eggs & egg dishes																						
Consumers (%)[3]	76	72	77	79	***0.016***		74	70	74	78	*NS*		78	73	81	80	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	10	10	10	10	*NS*	*NS*	11	10	11	11	*NS*	*NS*	10	11	9	9	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	10	10	9	9			10	9	10	9			9	10	8	8						
Upper limit	11	11	11	11			11	11	12	12			10	13	11	10						
Fats & oils																						
Consumers (%)[3]	92	91	91	92	*NS*		91	90	90	91	*NS*		93	92	92	94	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	4	5	5	4	***0.041***	***0.025***$^{\downarrow}$	5	5	5	4	*NS*	*NS*	4	5	4	4	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	4	4	4	4			4	4	4	4			4	4	4	4						
Upper limit	5	5	5	5			5	5	6	5			5	5	5	5						
Meats & meat dishes, excluding processed meat																						
Consumers (%)[3]	97	96	97	97	*NS*		97	96	97	99	*NS*		96	97	96	96	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	28	27	29	28	*NS*	*NS*	30	27	29	33	***<0.001***	***<0.001***$^{\uparrow}$	26	27	28	23	***<0.001***	***0.001***$^{\downarrow}$	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	27	26	27	26			28	25	27	30			25	26	26	21						
Upper limit	29	28	30	29			31	28	32	35			27	29	31	25						
Processed meat, including sausages, burgers, coated chicken																						
Consumers (%)[3]	98	98	98	98	*NS*		99	99	99	99	*NS*		97	97	98	97	*NS*		***0.002***	*NS*	*NS*	***0.011***
Mean intake (g/day)[4]	28	30	28	26	***0.012***	***0.003***$^{\downarrow}$	31	31	32	32	*NS*	*NS*	25	29	25	21	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*NS*	***0.001***	***<0.001***
Lower limit	27	28	26	25			30	29	29	29			23	26	22	20						
Upper limit	29	32	30	28			33	33	35	35			26	32	28	23						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
White fish, shellfish & fish dishes																						
Consumers (%)[3]	89	93	90	83	***<0.001***		91	93	93	87	***0.018***		86	93	87	79	***<0.001***		***0.003***	*NS*	***0.031***	***0.011***
Mean intake (g/day)[4]	13	15	12	12	***<0.001***	***<0.001***↓	13	14	12	13	***0.040***	*NS*	13	15	11	11	***<0.001***	***<0.001***↓	*NS*	*NS*	*NS*	*NS*
Lower limit	12	14	11	11			13	13	11	12			12	14	10	10						
Upper limit	14	16	13	13			14	16	14	15			13	17	13	13						
Oily fish & dishes																						
Consumers (%)[3]	40	40	36	42	*NS*		37	34	33	43	***0.027***		43	46	40	41	*NS*		***0.019***	***0.002***	*NS*	*NS*
Mean intake (g/day)[4]	6	6	5	6	*NS*	*NS*	6	5	5	6	*NS*	*NS*	6	6	5	5	*NS*	*NS*	*NS*	*NS*	*NS*	***0.034***
Lower limit	5	5	5	5			5	4	4	5			5	5	5	5						
Upper limit	6	7	6	6			6	6	6	8			6	7	7	6						
Vegetables, excluding potatoes & baked beans																						
Consumers (%)[3]	95	96	94	95	*NS*		94	95	93	93	*NS*		96	96	96	97	*NS*		***0.041***	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	59	62	56	60	*NS*	*NS*	58	59	53	60	*NS*	*NS*	61	66	58	59	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	56	57	51	55			54	53	46	54			57	59	52	52						
Upper limit	62	68	61	65			62	66	60	66			65	73	66	67						
Baked beans																						
Consumers (%)[3]	74	79	70	73	***<0.001***		77	81	74	75	*NS*		72	78	66	71	***0.010***		***0.023***	*NS*	***0.023***	*NS*
Mean intake (g/day)[4]	7	8	7	6	***<0.001***	***<0.001***↓	8	8	8	7	*NS*	*NS*	7	8	7	5	***<0.001***	***<0.001***↓	***0.038***	*NS*	*NS*	***0.001***
Lower limit	7	8	7	6			7	7	7	6			6	8	6	5						
Upper limit	8	9	8	7			8	9	9	8			7	10	8	6						
Chips, fried & roast potatoes & potato products																						
Consumers (%)[3]	97	97	98	97	*NS*		97	96	98	97	*NS*		97	97	97	97	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	22	21	22	24	***0.017***	***0.004***↑	24	22	23	26	***0.013***	***0.003***↑	21	20	22	22	*NS*	*NS*	***0.010***	*NS*	*NS*	***0.024***
Lower limit	21	20	21	22			22	20	21	23			20	18	20	20						
Upper limit	23	22	24	26			25	24	25	29			23	22	24	24						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Other potatoes, potato salads & dishes																						
Consumers (%)[3]	92	90	93	94	*NS*		90	88	90	91	*NS*		95	93	95	96	*NS*		***<0.001***	***0.047***	***0.047***	***0.026***
Mean intake (g/day)[4]	20	20	23	18	***<0.001***	*NS*	21	19	23	20	***0.042***	*NS*	19	20	23	17	***<0.001***	***0.017***$^{\downarrow}$	*NS*	*NS*	*NS*	***0.015***
Lower limit	19	18	21	17			19	17	21	18			18	18	20	15						
Upper limit	21	21	25	20			22	21	25	23			20	22	25	18						
Crisps & savoury snacks																						
Consumers (%)[3]	97	97	98	96	*NS*		96	96	97	95	*NS*		98	98	98	97	*NS*		***0.045***	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	17	15	19	17	***<0.001***	***0.033***$^{\uparrow}$	17	15	20	18	***<0.001***	***0.023***$^{\uparrow}$	17	15	18	16	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	16	14	18	16			16	13	18	16			15	14	17	14						
Upper limit	18	16	21	19			18	16	22	20			18	17	21	19						
Fruits, excluding fruit juice																						
Consumers (%)[3]	98	99	99	96	***0.025***		97	98	98	96	*NS*		98	99	99	97	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	128	167	133	98	***<0.001***	***<0.001***$^{\downarrow}$	129	172	124	100	***<0.001***	***<0.001***$^{\downarrow}$	128	162	142	95	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Lower limit	122	157	123	90			121	157	112	90			119	149	127	84						
Upper limit	134	177	143	106			137	187	137	111			137	175	159	107						
Nuts & seeds																						
Consumers (%)[3]	36	29	34	43	***<0.001***		34	28	30	41	***0.006***		38	31	38	45	***0.008***		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	2	3	2	2	***<0.001***	***0.019***$^{\downarrow}$	2	3	2	2	*NS*	*NS*	2	3	2	2	***0.008***	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	2	2	2	2			2	2	2	2			2	2	1	2						
Upper limit	2	3	2	2			3	3	3	3			2	3	2	2						
Table sugar & preserves																						
Consumers (%)[3]	84	83	86	85	*NS*		84	84	84	85	*NS*		84	82	87	85	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	3	3	3	2	***0.002***	***0.001***$^{\downarrow}$	3	3	3	3	*NS*	*NS*	2	3	3	2	***<0.001***	***<0.001***$^{\downarrow}$	***0.002***	*NS*	***0.046***	***0.001***
Lower limit	3	3	3	2			3	3	3	2			2	3	2	2						
Upper limit	3	3	3	3			3	3	4	3			3	3	3	2						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Confectionery																						
Consumers (%)[3]	99	98	99	98	*NS*		98	98	99	98	*NS*		99	98	99	99	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	19	15	17	25	***<0.001***	***<0.001***$^{\uparrow}$	20	15	18	28	***<0.001***	***<0.001***$^{\uparrow}$	18	15	15	23	***<0.001***	***<0.001***$^{\uparrow}$	***0.006***	*NS*	*NS*	***0.006***
Lower limit	18	14	15	23			19	13	16	25			17	14	13	20						
Upper limit	20	16	18	27			22	17	21	32			19	17	17	25						
Fruit juice, including smoothies																						
Consumers (%)[3]	89	89	88	90	*NS*		88	89	86	89	*NS*		89	89	89	90	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	57	59	54	56	*NS*	*NS*	58	62	54	58	*NS*	*NS*	55	56	55	54	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	53	53	49	50			54	55	47	50			50	47	47	47						
Upper limit	60	65	60	62			63	70	62	67			60	67	63	63						
Soft drinks, not diet																						
Consumers (%)[3]	91	90	92	91	*NS*		91	90	90	92	*NS*		91	89	93	91	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	139	112	140	165	***<0.001***	***<0.001***$^{\uparrow}$	140	102	142	182	***<0.001***	***<0.001***$^{\uparrow}$	137	123	137	149	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	129	100	124	147			128	86	122	159			123	105	116	124						
Upper limit	150	125	156	185			155	121	165	208			152	144	162	180						
Soft drinks, diet																						
Consumers (%)[3]	88	86	88	91	***0.046***		88	85	88	91	*NS*		89	87	89	91	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	212	227	230	190	***0.011***	***0.011***$^{\downarrow}$	229	251	246	201	***0.047***	***0.024***$^{\downarrow}$	196	204	214	179	*NS*	*NS*	***0.018***	***0.047***	*NS*	*NS*
Lower limit	199	204	208	171			209	218	212	173			179	175	185	153						
Upper limit	227	252	254	211			251	289	286	233			216	237	248	208						
Tea, coffee & water																						
Consumers (%)[3]	87	87	83	90	***0.019***		87	88	82	91	***0.023***		86	86	85	88	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	209	187	206	231	***0.016***	***0.004***$^{\uparrow}$	198	171	202	221	***0.031***	***0.012***$^{\uparrow}$	221	207	210	241	*NS*	*NS*	*NS*	***0.020***	*NS*	*NS*
Lower limit	198	171	186	210			185	151	175	194			201	182	181	209						
Upper limit	221	205	228	253			212	192	232	252			242	234	244	277						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 4.1 continued. Consumption of foods and drinks, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Powdered beverages[5]																						
Consumers (%)[3]	46	38	50	50	***<0.001***		44	38	48	48	***0.031***		48	38	53	53	***<0.001***		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	3	4	4	3	*NS*	*NS*	3	3	4	3	*NS*	*NS*	4	4	4	3	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	3	3	3	3			3	2	3	2			3	2	3	2						
Upper limit	4	4	5	4			4	4	5	3			4	5	5	4						
Soups & sauces																						
Consumers (%)[3]	98	98	98	99	*NS*		98	97	97	99	*NS*		99	99	99	99	*NS*		*NS*	*NS*	*NS*	*NS*
Mean intake (g/day)[4]	43	45	43	42	*NS*	*NS*	44	45	44	44	*NS*	*NS*	42	45	42	39	*NS*	***0.044***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Lower limit	42	42	40	40			42	40	40	41			40	41	38	36						
Upper limit	45	48	46	44			47	49	49	48			44	49	46	43						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]P-values for the association between age group and the proportion of consumers, and for the overall association between age group and the intake of food groups

[2]P-values for the linear association between age group and the intake of food groups

[3]% who consume at least once a month

[4]In consumers only

[5]Variable not normally distributed

$^{\uparrow}$Intake increases with age group

$^{\downarrow}$Intake decreases with age group

CI, confidence interval

NS, non-significant

Table 4.2 Consumption of foods and drinks, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Pasta, rice, pizza & other cereals							
Consumers (%)[3]	99	100	100	100	98	*NS*	
Mean intake (g/day)[4]	48	49	45	45	45	*NS*	***0.031***↓
Lower limit	46	46	41	41	42		
Upper limit	50	53	48	48	48		
Bread, excluding wholemeal							
Consumers (%)[3]	99	99	100	99	99	*NS*	
Mean intake (g/day)[4]	47	45	47	51	52	*NS*	***0.012***↑
Lower limit	43	42	43	47	47		
Upper limit	50	50	52	55	58		
Wholemeal bread							
Consumers (%)[3]	67	70	61	50	42	***<0.001***	
Mean intake (g/day)[4]	8	10	8	8	6	***0.004***	***0.026***↓
Lower limit	7	8	6	6	5		
Upper limit	10	11	9	10	7		
Unsweetened breakfast cereals including muesli							
Consumers (%)[3]	86	87	86	83	83	*NS*	
Mean intake (g/day)[4]	15	14	15	15	15	*NS*	*NS*
Lower limit	14	13	13	13	13		
Upper limit	17	16	17	16	16		
Sweetened breakfast cereals							
Consumers (%)[3]	70	69	67	69	70	*NS*	
Mean intake (g/day)[4]	6	7	7	8	7	***0.018***	***0.027***↑
Lower limit	5	6	6	7	6		
Upper limit	6	8	8	9	8		
Biscuits, cakes & pastries							
Consumers (%)[3]	99	100	99	99	98	*NS*	
Mean intake (g/day)[4]	36	34	34	35	32	*NS*	*NS*
Lower limit	33	31	31	31	29		
Upper limit	39	38	37	38	35		
Puddings							
Consumers (%)[3]	84	84	84	83	80	*NS*	
Mean intake (g/day)[4]	9	10	10	9	10	*NS*	*NS*
Lower limit	8	9	9	8	9		
Upper limit	9	11	12	11	12		
Milk & cream							
Consumers (%)[3]	98	96	97	96	98	*NS*	
Mean intake (g/day)[4]	218	229	217	238	228	*NS*	*NS*
Lower limit	200	209	198	217	207		
Upper limit	238	252	237	260	251		
Cheese							
Consumers (%)[3]	87	89	88	87	83	*NS*	
Mean intake (g/day)[4]	10	10	11	10	9	*NS*	*NS*
Lower limit	9	9	10	9	8		
Upper limit	12	11	12	11	11		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

Table 4.2 continued. Consumption of foods and drinks, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Yoghurt & fromage frais							
Consumers (%)[3]	93	93	92	95	93	*NS*	
Mean intake (g/day)[4]	67	71	72	74	72	*NS*	*NS*
Lower limit	61	64	63	65	63		
Upper limit	75	78	81	84	82		
Ice cream							
Consumers (%)[3]	90	91	89	86	88	*NS*	
Mean intake (g/day)[4]	10	11	11	12	13	***0.017***	***0.001***↑
Lower limit	9	10	10	11	11		
Upper limit	11	12	12	14	14		
Eggs & egg dishes							
Consumers (%)[3]	76	78	78	75	73	*NS*	
Mean intake (g/day)[4]	8	10	10	11	12	***<0.001***	***0.001***↑
Lower limit	7	9	9	10	11		
Upper limit	9	11	11	13	13		
Fats & oils							
Consumers (%)[3]	93	92	91	94	90	*NS*	
Mean intake (g/day)[4]	4	4	5	5	5	*NS*	*NS*
Lower limit	4	4	4	4	4		
Upper limit	5	5	5	5	5		
Meats & meat dishes, excluding processed meat							
Consumers (%)[3]	98	98	96	97	96	*NS*	
Mean intake (g/day)[4]	30	28	28	29	25	***0.002***	***0.006***↓
Lower limit	28	26	26	27	23		
Upper limit	32	30	29	31	27		
Processed meat, including sausages, burgers, coated chicken							
Consumers (%)[3]	99	99	97	97	99	*NS*	
Mean intake (g/day)[4]	24	25	26	31	35	***<0.001***	***<0.001***↑
Lower limit	22	23	24	29	33		
Upper limit	26	26	28	34	38		
White fish, shellfish & fish dishes							
Consumers (%)[3]	90	90	87	88	87	*NS*	
Mean intake (g/day)[4]	14	14	12	14	11	***<0.001***	***0.003***↓
Lower limit	13	13	10	13	10		
Upper limit	15	15	13	15	13		
Oily fish & dishes							
Consumers (%)[3]	51	46	40	34	27	***<0.001***	
Mean intake (g/day)[4]	5	6	6	6	6	*NS*	*NS*
Lower limit	4	5	5	5	5		
Upper limit	6	7	7	8	8		
Vegetables, excluding potatoes & baked beans							
Consumers (%)[3]	98	98	96	95	90	***<0.001***	
Mean intake (g/day)[4]	67	68	59	53	50	***<0.001***	***<0.001***↓
Lower limit	62	61	53	48	44		
Upper limit	72	76	67	58	56		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

Table 4.2 continued. Consumption of foods and drinks, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Baked beans							
Consumers (%)[3]	75	75	71	78	72	*NS*	
Mean intake (g/day)[4]	6	7	7	9	9	***<0.001***	***<0.001***↑
Lower limit	5	6	6	8	8		
Upper limit	6	8	8	10	10		
Chips, fried & roast potatoes & potato products							
Consumers (%)[3]	97	95	97	98	97	*NS*	
Mean intake (g/day)[4]	18	21	22	24	28	***<0.001***	***<0.001***↑
Lower limit	17	19	21	21	26		
Upper limit	20	23	24	26	31		
Other potatoes, potato salads & dishes							
Consumers (%)[3]	93	94	92	93	89	*NS*	
Mean intake (g/day)[4]	19	20	20	21	19	*NS*	*NS*
Lower limit	18	18	19	19	17		
Upper limit	21	22	22	23	22		
Crisps & savoury snacks							
Consumers (%)[3]	97	98	95	98	96	*NS*	
Mean intake (g/day)[4]	14	15	16	18	23	***<0.001***	***<0.001***↑
Lower limit	13	13	15	16	21		
Upper limit	16	16	18	20	25		
Fruits, excluding fruit juice							
Consumers (%)[3]	99	99	98	96	96	***0.020***	
Mean intake (g/day)[4]	135	137	127	127	117	*NS*	***0.009***↓
Lower limit	126	125	112	115	105		
Upper limit	145	149	143	139	130		
Nuts & seeds							
Consumers (%)[3]	38	37	38	34	33	*NS*	
Mean intake (g/day)[4]	2	2	2	2	2	*NS*	*NS*
Lower limit	2	2	2	2	2		
Upper limit	2	3	3	3	3		
Table sugar & preserves							
Consumers (%)[3]	83	86	79	88	85	*NS*	
Mean intake (g/day)[4]	2	3	3	3	3	***0.013***	*NS*
Lower limit	2	2	2	3	2		
Upper limit	3	3	3	4	3		
Confectionery							
Consumers (%)[3]	99	99	98	99	97	*NS*	
Mean intake (g/day)[4]	16	18	17	20	23	***0.001***	***<0.001***↑
Lower limit	15	16	15	18	21		
Upper limit	18	20	19	23	26		
Fruit juice, including smoothies							
Consumers (%)[3]	93	92	89	89	81	***<0.001***	
Mean intake (g/day)[4]	74	59	54	54	43	***<0.001***	***<0.001***↓
Lower limit	65	53	46	47	37		
Upper limit	84	66	62	61	50		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

Table 4.2 continued. Consumption of foods and drinks, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Soft drinks, not diet							
Consumers (%)[3]	90	90	88	91	95	*NS*	
Mean intake (g/day)[4]	111	119	115	164	195	***<0.001***	***<0.001***↑
Lower limit	96	103	100	141	170		
Upper limit	127	137	133	190	224		
Soft drinks, diet							
Consumers (%)[3]	88	88	87	90	89	*NS*	
Mean intake (g/day)[4]	187	207	204	233	235	*NS*	***0.029***↑
Lower limit	159	182	176	202	201		
Upper limit	219	235	235	268	275		
Tea, coffee & water							
Consumers (%)[3]	90	91	86	86	81	***<0.001***	
Mean intake (g/day)[4]	217	229	221	203	177	*NS*	***0.010***↓
Lower limit	195	204	198	178	153		
Upper limit	242	257	246	232	204		
Powdered beverages[5]							
Consumers (%)[3]	50	50	40	48	41	***0.018***	
Mean intake (g/day)[4]	3	3	5	3	3	*NS*	*NS*
Lower limit	2	3	4	2	2		
Upper limit	4	4	6	4	4		
Soups & sauces							
Consumers (%)[3]	99	99	97	99	98	*NS*	
Mean intake (g/day)[4]	39	46	43	45	43	***0.039***	*NS*
Lower limit	37	42	39	42	40		
Upper limit	42	50	46	48	47		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]P-values for the association between SIMD quintile and the proportion of consumers, and for the overall association between SIMD quintile and the intake of food groups

[2]P-values for the linear association between SIMD quintile and the intake of food groups

[3]% who consume at least once a month

[4]In consumers only

[5]Variable not normally distributed

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

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

CI, confidence interval

NS, non-significant

Table 4.3 Consumption of alcoholic drinks in children aged 12-16 years, by sex

Mean and 95% CI	Both boys & girls	Boys	Girls	p^1
Consumers (%)[2]	14	11	17	***0.041***
Mean intake (g/day)[3]	30	[50]	[22]	
Lower limit	23	[33]	[15]	
Upper limit	39	[76]	[31]	
Base (weighted)	*613*	*312*	*301*	
Base (unweighted)	*560*	*280*	*280*	

[1]P-value for difference between sexes in the proportion of consumers
[2]% who consume at least once a month
[3]In consumers only
CI, confidence interval

Table 4.4 Consumption of alcoholic drinks in children aged 12-16 years, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1
Consumers (%)[2]	19	16	8	10	14	*NS*
Mean intake (g/day)[3]	[33]	[33]	[24]	[54]	[20]	
Lower limit	[23]	[21]	[15]	[26]	[9]	
Upper limit	[46]	[50]	[37]	[111]	[42]	
Base (weighted)	*136*	*133*	*98*	*105*	*141*	
Base (unweighted)	*138*	*127*	*95*	*92*	*108*	

[1]P-value for the association between SIMD quintile and the proportion of consumers
[2]% who consume at least once a month
[3]In consumers only
CI, confidence interval
NS, non-significant

Table 4.5 Proportion of children taking supplements, by sex and age group

	Both boys & girls					Boys					Girls					*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y
	%	%	%	%		%	%	%	%		%	%	%	%					
Any supplement	17	18	19	14	*NS*	16	16	17	16	*NS*	17	20	21	12	***0.007***	*NS*	*NS*	*NS*	*NS*
Cod liver oil & other fish based supplements	6	5	7	5	*NS*	5	5	5	6	*NS*	6	6	8	4	*NS*	*NS*	*NS*	*NS*	*NS*
Vitamin C only	1	<1	1	2	***0.004***	2	1	1	3	***0.004***	1	<1	1	2	*NS*	*NS*	*NS*	*NS*	*NS*
Other vitamins, including multivitamins	9	11	11	7	*NS*	9	9	11	7	*NS*	10	12	11	7	*NS*	*NS*	*NS*	*NS*	*NS*
Vitamins with minerals, including iron	2	3	2	2	*NS*	2	3	2	2	*NS*	2	3	3	1	*NS*	*NS*	*NS*	*NS*	*NS*
Minerals only, including iron	<1	<1	0	<1	*NS*	0	0	0	0	-	<1	<1	0	<1	*NS*	*NS*	*NS*	-	*NS*
Other	1	<1	1	1	*NS*	<1	0	<1	<1	*NS*	1	1	1	1	*NS*	***0.023***	*NS*	*NS*	*NS*
Base (weighted)	*1674*	*558*	*474*	*642*		*853*	*285*	*242*	*325*		*821*	*273*	*231*	*317*					
Base (unweighted)	*1674*	*581*	*505*	*588*		*871*	*307*	*272*	*292*		*803*	*274*	*233*	*296*					

[1]P-value for the association between age group and the proportion taking supplements

NS, non-significant

Table 4.6 Proportion of children taking supplements, by SIMD quintile

	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p[1]
	%	%	%	%	%	
Any supplement	22	19	19	13	11	***0.002***
Cod liver oil & other fish based supplements	9	5	7	3	4	***0.021***
Vitamin C only	2	1	1	1	1	*NS*
Other vitamins, including multivitamins	11	12	10	9	6	***0.047***
Vitamins with minerals, including iron	3	3	3	2	2	*NS*
Minerals only, including iron	<1	0	0	0	<1	*NS*
Other	1	1	1	0	0	*NS*
Base (weighted)	*370*	*337*	*292*	*307*	*368*	
Base (unweighted)	*409*	*355*	*305*	*291*	*314*	

[1]P-value for the association between SIMD quintile and the proportion taking supplements

NS, non-significant

Table 4.7 Comparison between 2006 and 2010 in the intake of biscuits, cakes and pastries (g/day) in consumers*, by sex and age group

Mean and 95% CI	All ages			3-7y			8-11y			12-17y		
	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1
Both boys & girls												
Mean	35	34	*NS*	34	37	***0.041***	37	38	*NS*	36	30	***0.002***
Lower limit	34	33		32	35		34	35		33	28	
Upper limit	37	36		36	39		40	40		40	32	
Boys												
Mean	38	36	*NS*	35	38	*NS*	38	38	*NS*	41	34	***0.018***
Lower limit	36	34		31	35		35	35		36	30	
Upper limit	41	38		39	41		42	41		47	37	
Girls												
Mean	33	32	*NS*	33	36	*NS*	35	38	*NS*	32	26	***0.013***
Lower limit	31	31		30	33		32	34		28	24	
Upper limit	35	34		36	39		39	42		36	29	
Base (weighted)												
Both boys & girls	*1367*	*1658*		*433*	*553*		*383*	*469*		*551*	*636*	
Boys	*714*	*845*		*232*	*281*		*202*	*241*		*280*	*322*	
Girls	*653*	*814*		*201*	*272*		*182*	*228*		*270*	*313*	
Base (unweighted)												
Both boys & girls	*1380*	*1660*		*434*	*577*		*434*	*501*		*512*	*582*	
Boys	*714*	*864*		*235*	*304*		*228*	*271*		*251*	*289*	
Girls	*666*	*796*		*199*	*273*		*206*	*230*		*261*	*293*	

* Children who consume at least once a month

[1]P-value for difference between 2006 and 2010

CI, confidence interval; NS, non-significant

Table 4.8 Comparison between 2006 and 2010 in the intake of milk and cream (g/day) in consumers*, by sex and age group

Mean and 95% CI	All ages			3-7y			8-11y			12-17y		
	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1
Both boys & girls												
Mean	242	227	***0.039***	284	253	***0.010***	233	224	*NS*	220	205	*NS*
Lower limit	231	218		265	239		217	209		202	190	
Upper limit	253	236		304	267		249	240		239	220	
Boys												
Mean	278	247	***0.004***	309	267	***0.011***	255	245	*NS*	271	232	***0.043***
Lower limit	261	234		283	248		233	226		240	211	
Upper limit	295	260		337	286		279	266		305	254	
Girls												
Mean	209	205	*NS*	259	239	*NS*	210	203	*NS*	176	178	*NS*
Lower limit	196	193		231	217		190	185		157	159	
Upper limit	223	217		290	263		231	223		197	199	
Base (weighted)												
Both boys & girls	*1344*	*1624*		*424*	*549*		*381*	*458*		*539*	*617*	
Boys	*693*	*838*		*224*	*283*		*198*	*237*		*271*	*319*	
Girls	*651*	*786*		*200*	*266*		*183*	*221*		*267*	*298*	
Base (unweighted)												
Both boys & girls	*1355*	*1625*		*425*	*573*		*430*	*488*		*500*	*564*	
Boys	*693*	*855*		*227*	*304*		*223*	*265*		*243*	*286*	
Girls	*662*	*770*		*198*	*269*		*207*	*223*		*257*	*278*	

* Children who consume at least once a month

[1]P-value for difference between 2006 and 2010

CI, confidence interval; NS, non-significant

Table 4.9 Comparison between 2006 and 2010 in the intake of confectionery (g/day) in consumers*, by sex and age group

Mean and 95% CI	All ages			3-7y			8-11y			12-17y		
	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1
Both boys & girls												
Mean	22	19	***<0.001***	18	15	***0.006***	19	17	***0.024***	29	25	***0.037***
Lower limit	21	18		16	14		18	15		26	23	
Upper limit	24	20		20	16		21	18		31	27	
Boys												
Mean	22	20	*NS*	17	15	*NS*	19	18	*NS*	30	28	*NS*
Lower limit	20	19		15	13		17	16		27	25	
Upper limit	24	22		20	17		21	21		34	32	
Girls												
Mean	22	18	***<0.001***	19	15	***0.017***	20	15	***0.001***	28	23	***0.017***
Lower limit	21	16		16	14		18	14		25	20	
Upper limit	24	19		22	17		22	17		31	25	
Base (weighted)												
Both boys & girls	*1354*	*1650*		*431*	*548*		*381*	*470*		*543*	*632*	
Boys	*705*	*840*		*230*	*280*		*202*	*241*		*273*	*319*	
Girls	*650*	*810*		*201*	*268*		*179*	*229*		*270*	*313*	
Base (unweighted)												
Both boys & girls	*1367*	*1650*		*432*	*571*		*430*	*501*		*505*	*578*	
Boys	*706*	*858*		*233*	*302*		*228*	*270*		*245*	*286*	
Girls	*661*	*792*		*199*	*269*		*202*	*231*		*260*	*292*	

* Children who consume at least once a month

[1]P-value for difference between 2006 and 2010

CI, confidence interval; NS, non-significant

Table 4.10 Comparison between 2006 and 2010 in the intake of non-diet soft drinks (g/day) in consumers*, by sex and age group

Mean and 95% CI	All ages			3-7y			8-11y			12-17y		
	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1
Both boys & girls												
Mean	159	140	*NS*	120	113	*NS*	153	141	*NS*	200	167	*NS*
Lower limit	143	130		103	101		136	126		173	149	
Upper limit	177	151		138	126		171	158		232	187	
Boys												
Mean	165	142	*NS*	121	103	*NS*	154	143	*NS*	218	183	*NS*
Lower limit	146	129		102	87		130	123		180	161	
Upper limit	187	156		143	122		183	166		263	209	
Girls												
Mean	152	138	*NS*	118	124	*NS*	151	138	*NS*	183	151	*NS*
Lower limit	132	125		93	106		132	117		149	125	
Upper limit	176	153		148	146		174	163		225	182	
Base (weighted)												
Both boys & girls	*1250*	*1522*		*380*	*500*		*355*	*435*		*515*	*588*	
Boys	*651*	*777*		*199*	*258*		*187*	*219*		*265*	*300*	
Girls	*599*	*745*		*181*	*242*		*168*	*216*		*250*	*288*	
Base (unweighted)												
Both boys & girls	*1257*	*1513*		*381*	*515*		*400*	*461*		*476*	*537*	
Boys	*648*	*788*		*201*	*274*		*211*	*245*		*236*	*269*	
Girls	*609*	*725*		*180*	*241*		*189*	*216*		*240*	*268*	

* Children who consume at least once a month

[1]P-value for difference between 2006 and 2010

CI, confidence interval

NS, non-significant

Table 4.11 Comparison between 2006 and 2010 in the proportion of children taking supplements, by sex and age group

	Both boys & girls				Boys				Girls			
	All	3-7y	8-11y	12-17y	All	3-7y	8-11y	12-17y	All	3-7y	8-11y	12-17y
	%	%	%	%	%	%	%	%	%	%	%	%
Any supplement												
2006	24	29	27	17	27	34	31	18	20	24	24	15
2010	17	18	19	14	16	16	17	16	17	20	21	12
p-value for difference	***<0.001***	***<0.001***	***0.003***	*NS*	***<0.001***	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*	*NS*
Cod liver oil & other fish based supplements												
2006	10	12	11	7	12	15	13	8	7	8	9	5
2010	6	5	7	5	5	5	5	6	6	6	8	4
p-value for difference	***<0.001***	***<0.001***	***0.019***	*NS*	***<0.001***	***<0.001***	***0.002***	*NS*	*NS*	*NS*	*NS*	*NS*
Vitamin C only												
2006	2	1	2	3	2	2	2	2	2	<1	3	3
2010	1	<1	1	2	2	1	1	3	1	<1	1	2
p-value for difference	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	***0.046***	*NS*	*NS*	*NS*
Other vitamins, including multivitamins												
2006	13	18	15	7	14	20	18	6	12	16	12	8
2010	9	11	11	7	9	9	11	7	10	12	11	7
p-value for difference	***0.007***	***0.001***	*NS*	*NS*	***0.003***	***<0.001***	***0.019***	*NS*	*NS*	*NS*	*NS*	*NS*
Vitamins with minerals, including iron												
2006	2	1	2	3	3	2	2	4	2	1	2	2
2010	2	3	2	2	2	3	2	2	2	3	3	1
p-value for difference	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Minerals only, including iron												
2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	0
2010	<1	<1	0	<1	0	0	0	0	<1	<1	0	<1
p-value for difference	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Other												
2006	1	1	2	2	1	1	1	2	1	<1	3	1
2010	1	<1	1	1	<1	0	<1	<1	1	1	1	1
p-value for difference	***0.021***$^{\downarrow}$	*NS*	*NS*	*NS*	***0.004***	*NS*	*NS*	***0.032***	*NS*	*NS*	*NS*	*NS*
Base (weighted)	*3053*	*994*	*862*	*1197*	*1572*	*519*	*446*	*607*	*1481*	*475*	*416*	*590*
Base (unweighted)	*3065*	*1018*	*944*	*1103*	*1590*	*544*	*502*	*544*	*1475*	*474*	*442*	*559*

$^{\downarrow}$Decreased between 2006 and 2010

NS, non-significant

5. Intake of energy and sugars

This chapter describes the intake of energy and sugars (total sugars, NMES, intrinsic and milk sugars, and sucrose) in all children, and variations by age group, sex and deprivation. The contribution of specific food groups to the intakes of energy and sugars is also presented. Intakes are also compared with the Dietary Reference Values[1-2] and Scottish Dietary Targets[3], and with the intakes of energy and sugars found in the 2006 survey[4].

Summary

Energy

- Between 2006 and 2010, mean energy intake decreased in all age groups in both boys and girls.
- Biscuits, cakes and pastries, and bread (excluding wholemeal) remained the largest contributors to energy intake in 2010: 9% and 8% respectively in 2006, and both 8% in 2010.

NMES

- Mean intake of NMES in children aged 3-16 years was 15.6% of food energy: considerably higher than the recommended population average (11% of food energy) and the Scottish Dietary Target for children of <10% of total energy.
- Mean NMES intake (expressed as a % of food energy) increased with age: 14.6% in 3-7 year olds, 15.6% in 8-11 year olds, and 16.6% in 12-16 year olds, but did not differ between sexes.
- Mean NMES intake (expressed as a % of food energy) increased linearly with level of deprivation: 15.2% in the least deprived quintile and 16.7% in the most deprived quintile.
- The largest contributors to NMES intake were non-diet soft drinks (16%), confectionery (13%), biscuits, cakes and pastries (12%), yoghurt and fromage frais (7%) and fruit juice (6%).
- Intake of NMES was significantly lower in 2010 (15.7% food energy) compared with 2006 (17.3% food energy), and this significant trend was seen in all age groups in boys and in girls aged 8-11 and 12-17 years.
- Non-diet soft drinks were the largest contributor to NMES in both 2006 (17%) and 2010 (16%).

5.1 Intake of energy and sugars

5.1.1 Intake of energy and sugars by age and sex

The intakes of energy and sugars for all children and by age group and sex are shown in Tables 5.1, 5.2 and 5.3.

Boys had a significantly higher energy intake than girls. This difference was significant in children aged 8-11 years and 12-16 years, but there was no significant difference between the sexes in children aged 3-7 years. These patterns were also seen in the 2006 survey[4]. There was a significant increase in energy intake with age in boys, consistent with results from the 2006 survey[4], and a significant decrease in energy intake with age in girls which contrasts with the results of the 2006 survey in which no significant association between energy intake and age group was found in girls.

Comparison between children aged 3-11 years and those aged 12-16 years should take account of the fact that the difference in energy intakes between the FFQ and diet diaries completed as part of the 2006 survey was greater for the C2 FFQ (for children aged 3-11 years and designed for completion by the parents) than the C3 FFQ (for young people aged 12-16 years and designed for completion by the young person themselves)[4].

Total sugars contributed on average 27.3% to food energy intake in children overall. The percentage contribution of total sugars to food energy decreased significantly with age in boys, but there was no significant association with age in girls. There was no significant difference in total sugars intake as a percentage of food energy between boys and girls in the two younger age groups, however girls aged 12-16 years had a higher percentage contribution of total sugars to food energy intake (27.9% of food energy) than boys aged 12-16 years (26.7% of food energy).

NMES contributed on average 15.6% to food energy intake in children overall, and there was a significant increase in the percentage contribution with age: the mean percentage contribution was 14.6% in 3-7 year olds, 15.6% in 8-11 year olds, and 16.6% in 12-16 year olds. This increase with age was significant in both boys and girls. There were no significant differences between boys and girls in the percentage contribution of NMES to food energy in any of the age groups.

Intrinsic and milk sugars contributed on average 10.7% to food energy in children overall, and there was a highly significant association with age in the opposite direction to that seen for NMES: the mean percentage of food energy from intrinsic and milk sugars was 12.3% in the 3-7 year olds and 9.5% in the 12-16 year olds. The percentage contribution of intrinsic and milk sugars to food energy did not differ between boys and girls in any of the age groups.

Sucrose contributed on average 12.9% 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 was no significant difference between boys and girls in the percentage contribution of sucrose to food energy.

Table 5.1

When expressed as grams per day (g/day), the intakes of total sugars, NMES, intrinsic and milk sugars, and sucrose were significantly higher in boys than girls overall, reflecting the higher energy intake in boys. These significant differences between boys and girls were seen in the 12-16 year age group only. Intakes of total sugars decreased significantly with age in girls, but not in boys, whereas intakes of NMES and sucrose increased significantly with age in boys but not in girls. Intakes of intrinsic and milk sugars decreased significantly with age in both boys and girls.

Table 5.2

Table 5.3 shows the intake of NMES, intrinsic and milk sugars and sucrose expressed as a percentage of total sugars intake. In all children, NMES contributed on average 58.7% and intrinsic and milk sugars contributed 41.1% of total sugars intake. The mean contribution of sucrose to total sugars intake was 47.5%. There were significant associations with age such that the percentage contribution of NMES and sucrose to total sugars increased significantly with age whereas the percentage contribution of intrinsic and milk sugars decreased significantly with age. There were no significant differences between boys and girls in these percentage contributions.

Table 5.3

5.1.2 Intake of energy and sugars by SIMD quintile

The intakes of energy and sugars by SIMD quintile are shown in Tables 5.4 and 5.5. 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 percentage of food energy from total sugars and SIMD quintile, but there were significant associations with the intakes of NMES, intrinsic and milk sugars and sucrose. The contribution of NMES and sucrose to food energy was higher in the more deprived quintiles, whereas the contribution of intrinsic and milk sugars to food energy was lower in the more deprived quintiles. When sugars were expressed as g/day, the intakes of total sugars, NMES and sucrose were significantly associated with increasing deprivation, but there was no association between intrinsic and milk sugars and SIMD quintile.

Table 5.4

There were significant associations between SIMD quintile and intakes of NMES, intrinsic and milk sugars, and sucrose expressed as a percentage of total sugars. NMES and sucrose comprised a higher proportion of total sugars in the more deprived quintiles, but intrinsic and milk sugars comprised a higher proportion of total sugars in the less deprived quintiles.

Table 5.5

5.2 Contribution of food groups to intake of energy and sugars

Table 5.6 shows the mean percentage contribution of food groups contributing 5% or more to the intake of energy and sugars. The food groups providing the highest proportion of total energy intake were bread (excluding wholemeal) (8%) and biscuits, cakes and pastries (8%). Fruit provided the highest proportion of total sugars (15%). The largest contributors to NMES intake were non-diet soft drinks (16%), confectionery (13%), biscuits, cakes and pastries (12%), and yoghurt and fromage frais (7%). Over half (54%) of intrinsic and milk sugars were obtained from fruit (34%) and milk and cream (20%). The food groups contributing the highest proportion of sucrose intake were biscuits, cakes and pastries (13%), fruit (12%) and confectionery (12%). The full list of food groups and their contribution to energy, total sugar and NMES is given in Appendix L.

Table 5.6

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

There were several significant associations between age group and the percentage contribution of food groups to energy and sugars intake. As age increased, there was a decrease in the percentage contribution of biscuits, cakes and pastries; milk and cream; yogurt and fromage frais, and fruit to energy, total sugars, NMES and sucrose intake. Conversely, the percentage contribution of confectionery and non-diet soft drinks to total sugars, NMES and sucrose intake increased with age.

The differences between boys and girls in the percentage contribution of food groups to energy and sugars intake were relatively small (up to 2%). The exceptions to this were that girls had a lower contribution of milk and cream to intrinsic and milk sugars intake than boys (18% versus 22%), but a higher contribution of fruit to intrinsic and milk sugars intake than boys (36% versus 33%).

Table 5.6

5.2.2 Contribution of food groups to intake of energy and sugars by SIMD quintile

Table 5.7 shows the contribution of food groups to the intakes of energy, total sugars, NMES, intrinsic and milk sugars and sucrose by SIMD quintile. Children in the more deprived quintiles derived a lower proportion of energy from pasta, rice, pizza and other cereals, and biscuits, cakes and pastries than children in the less deprived quintiles. Children from more deprived areas also derived a lower proportion of total sugars from biscuits, cakes and pastries, and fruit, but a higher proportion of total sugars from confectionery and non-diet soft drinks than children in the less deprived quintiles.

The largest difference between SIMD quintiles was for the percentage contribution of non-diet soft drinks to NMES intake: 13% in the least deprived quintile versus 21% in the most deprived quintile. The differences between SIMD quintiles in the percentage contribution of other food groups to NMES intake were smaller (up to 4% difference).

Table 5.7

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

The Estimated Average Requirement (EAR) for energy represents 'the level of energy intake required to maintain a healthy body weight in otherwise healthy people at existing levels of physical activity and to allow for any special additional needs (growth, pregnancy and lactation)'[2]. The EARs published by the Scientific Advisory Committee on Nutrition (SACN)[2] in 2011 supersede those published by the Department of Health[1] in 1991. Energy intake expressed as a percentage of the SACN EAR was calculated for each participant using the EAR, calculated with the median physical activity level value adjusted for growth, appropriate for their age and sex[2].

The recommended population average intake of NMES for adults should not exceed 60g/day or 10% of total energy (11% of food energy). No value is given for children[1]. The Scottish Dietary Target for children is <10% of total energy[3]. In the current survey, the percentage of food energy and the percentage of 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.

5.3.1 Comparison of intake of energy and sugars with Dietary Reference Values and Scottish Dietary Targets by age and sex

Table 5.8 shows the mean energy intake expressed as MJ/day and as a percentage of the SACN[2] EAR for the age groups: 4-6, 7-10, 11-14 and 15-16 years. Energy intake as a percentage of the EAR was highest in the youngest age group of 4-6 years (118% in boys and 122% in girls) and lowest in the oldest age group of 15-16 years (66% in boys and 65% in girls). When the Department of Health[1] EAR was used, energy intake as a percentage of the EAR was also highest in the youngest age group (102% in boys and 108% in girls) and lowest in the oldest age group of 15-16 years (69% in boys and 74% in girls).

Intake of NMES as a percentage of food energy was considerably higher than the recommended population average for adults and the Scottish Dietary Target for children in all four age groups. The highest mean intakes were in the 15-16 year age group: 16.8% of food energy in both boys and girls (152% of the recommended population average).

Table 5.8

5.3.2 Comparison of intake of energy and sugars with Dietary Reference Values and Scottish Dietary Targets by SIMD quintile

Both energy intake and NMES expressed as a percentage of food energy were higher in children in the more deprived quintiles. Consequently, the mean intakes of energy expressed as a percentage of the SACN[2] EAR and NMES expressed as a percentage of the recommended population average were also highest in children in the more deprived quintiles (Table 5.9). The mean energy intakes expressed as a percentage of the SACN[2] EAR in each of the SIMD quintiles were very similar (no more than 1 percentage point difference) to the mean energy intakes calculated using the EARs published by the Department of Health[1].

Table 5.9

5.4 Comparison with intake of energy and sugars in 2006

5.4.1 Comparison with daily intakes of energy and sugars in 2006

Descriptive comparison

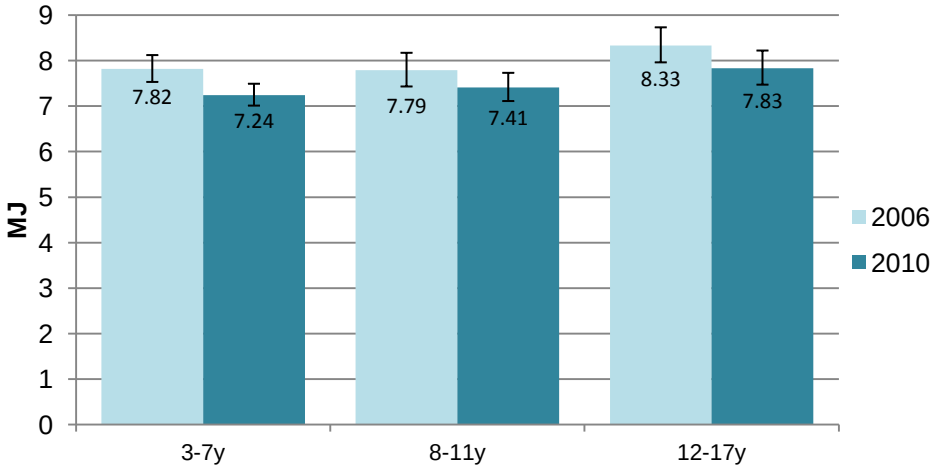
This section gives a descriptive comparison of the mean energy and sugar intakes between 2006, as presented by Sheehy *et al*.[4], and 2010, as presented in Section 5.1.

Figure 5.1 shows the mean and 95% confidence intervals (CIs) for daily energy intake in 2006 and 2010 by age group in boys and girls separately. Mean energy intake decreased in all age groups in both boys and girls. The largest decrease in mean energy intake occurred in girls aged 12-17 years: 7.28 MJ/day in 2006 versus 6.33 MJ/day in 2010.

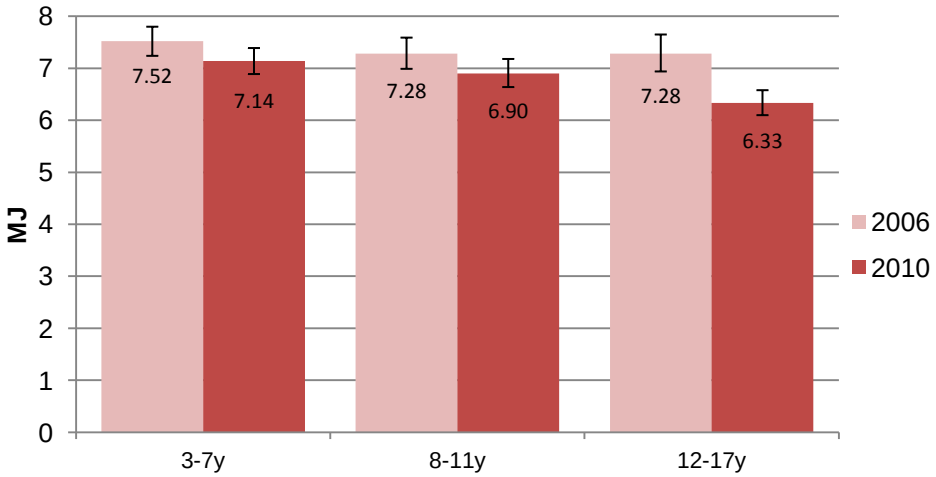
Figure 5.1

Figure 5.1 Mean (95% CI) daily intake of energy in 2006 and 2010, by age group

A. Boys



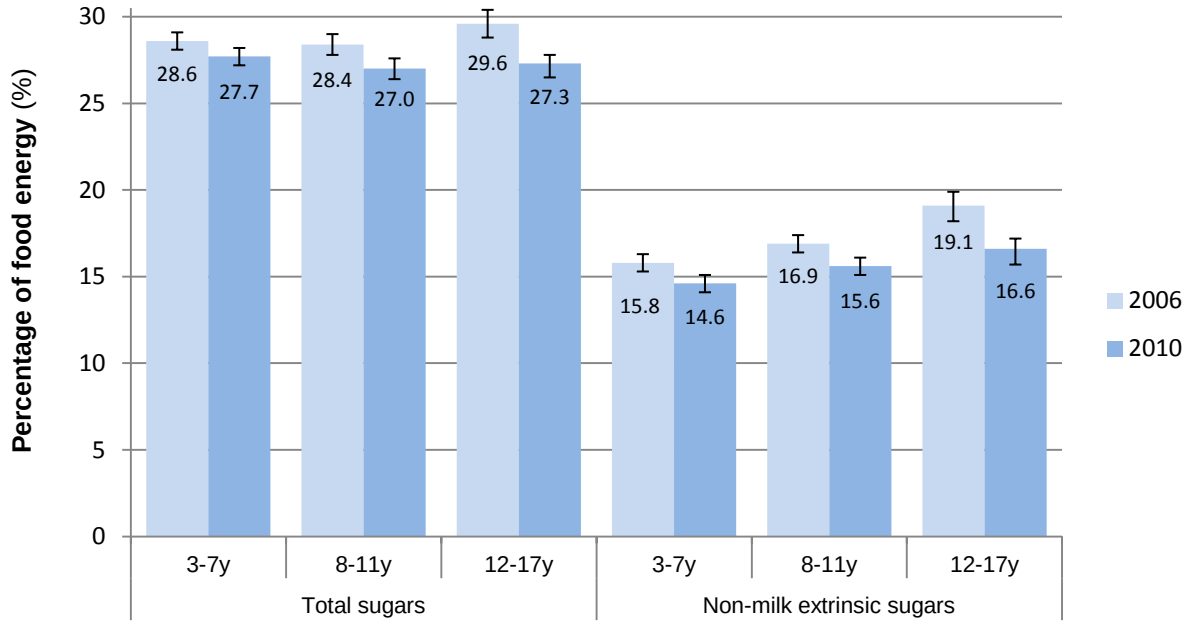
B. Girls



Overall, total sugars contributed a slightly smaller proportion to food energy in 2010 compared with 2006: 27.3% versus 28.9%. The contribution of NMES to food energy was also lower in 2010 compared with 2006: 15.6% versus 17.4%. These trends were seen in all age groups and in both boys and girls. The largest reduction in the intake of total sugars and NMES was observed in 12-17 year olds (Figure 5.2). There was little change between 2006 and 2010 in the percentage contribution of intrinsic and milk sugars to food energy (10.5% in 2006 versus 10.7% in 2010). The mean percentage contribution of sucrose to food energy decreased slightly between 2006 and 2010 (13.4% versus 12.9% respectively). The largest decrease in the percentage contribution of sucrose to food energy was in the oldest age group: 14.2% in 2006 versus 13.2% in 2010.

Figure 5.2

Figure 5.2 Mean (95% CI) daily intake of total sugars and NMES in 2006 and 2010, by age group



The intakes of total sugars, NMES, intrinsic and milk sugars and sucrose, expressed as g/day, decreased between 2006 and 2010 in both boys and girls. These decreases may partly reflect the reduction in reported total energy intake between 2006 and 2010.

The contribution of NMES to total sugars intake decreased from 61.8% in 2006 to 58.7% in 2010. Correspondingly, the contribution of intrinsic and milk sugars increased from 38.2% in 2006 to 41.1% in 2010. These trends were evident in all age groups and in both boys and girls. There was little difference between 2006 and 2010 in the percentage contribution of sucrose to total sugars: 46.9% in 2006 and 47.5% in 2010.

Statistical comparison

Table 5.10 shows the p-values for differences in mean NMES intake, expressed as a percentage of food energy, between 2006 and 2010. The means and 95% confidence intervals differ slightly from those presented in chapter 5 and in the report describing the 2006 survey[4] because the raw data for all 3065 children (1391 in 2006 and 1674 in 2010) were transformed together using the (ln+/-(old variable) - k) method in order to allow statistical testing of the difference in means between 2006 and 2010, and k was different from the k used for the separate transformations of the 2006 and 2010 data (see Section 2.7.5).

The mean percentage contribution of NMES to food energy intake decreased significantly from 17.3% in 2006 to 15.7% in 2010. This significant decrease occurred in all age groups and in both boys and girls, except in girls aged 3-7 years for whom the decrease was non-significant.

Table 5.10

5.4.2 Comparison with the contribution of food groups to energy and sugars in 2006

There was very little difference between 2006 and 2010 in the mean percentage contributions of food groups to energy and sugar intakes. The differences between 2006 and 2010 ranged from <1 to 5 percentage points in the various age/sex groups, however most of the differences were not more than 1 percentage point.

Biscuits, cakes and pastries, and bread (excluding wholemeal) remained the largest contributors to energy intake in 2010: contributing 9% and 8% respectively of energy intake in 2006, and both 8% in 2010. Fruit remained the largest contributor to the intakes of total sugar (14% in 2006 and 15% in 2010), and intrinsic and milk sugars (35% in 2006 and 34% in 2010). Non-diet soft drinks were the largest contributor to NMES in both 2006 (17%) and 2010 (16%), and biscuits, cakes and pastries were the largest contributors to sucrose intake in both 2006 and 2010 (13% in both years).

5.5 References

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3. The Scottish Office Department of Health. (1996) *Eating for Health: a Diet Action Plan for Scotland*. Edinburgh.

4. Sheehy C, McNeill G, Masson L, Craig L, Macdiarmid J, Holmes B & Nelson M. (2008) *Survey of sugar intake among children in Scotland*. Aberdeen, Food Standards Agency Scotland. http://www.food.gov.uk/multimedia/pdfs/sugarintakescot2008rep.pdf

Table 5.1 Daily intake of energy and sugars (% of food energy), by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Energy (MJ)																						
Mean	7.12	7.19	7.16	7.04	*NS*	*NS*	7.51	7.24	7.41	7.83	***0.037***	***0.013***	6.75	7.14	6.90	6.33	***<0.001***	***<0.001***	***<0.001***	*NS*	***0.016***	***<0.001***
Lower limit	7.00	7.03	6.96	6.83			7.33	7.01	7.11	7.47			6.60	6.89	6.64	6.10						
Upper limit	7.25	7.36	7.36	7.26			7.70	7.49	7.73	8.22			6.91	7.39	7.18	6.58						
Energy (kcal)																						
Mean	1691	1706	1699	1671	*NS*	*NS*	1782	1719	1759	1859	***0.036***	***0.013***	1602	1694	1639	1503	***<0.001***	***<0.001***	***<0.001***	*NS*	***0.016***	***<0.001***
Lower limit	1662	1669	1652	1621			1739	1662	1687	1772			1566	1636	1577	1448						
Upper limit	1720	1745	1748	1724			1827	1778	1835	1950			1639	1755	1704	1562						
% of food energy																						
Total sugars																						
Mean	27.3	27.7	27.0	27.3	*NS*	*NS*	27.1	28.0	26.8	26.7	***0.011***	***0.010***	27.6	27.4	27.2	27.9	*NS*	*NS*	*NS*	*NS*	*NS*	***0.028***
Lower limit	27.1	27.2	26.4	26.7			26.7	27.3	26.0	26.0			27.1	26.8	26.4	27.1						
Upper limit	27.6	28.2	27.6	27.8			27.6	28.6	27.6	27.4			28.0	28.1	28.1	28.8						
Non-milk extrinsic sugars																						
Mean	15.6	14.6	15.6	16.6	***<0.001***	***<0.001***	15.5	14.6	15.4	16.5	***<0.001***	***<0.001***	15.8	14.7	15.7	16.8	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*
Lower limit	15.3	14.2	15.1	16.1			15.1	14.0	14.8	15.8			15.3	14.1	15.0	15.9						
Upper limit	16.0	15.1	16.1	17.2			16.0	15.2	16.2	17.2			16.2	15.3	16.4	17.7						
Intrinsic & milk sugars																						
Mean	10.7	12.3	10.7	9.5	***<0.001***	***<0.001***	10.7	12.6	10.5	9.3	***<0.001***	***<0.001***	10.8	12.0	10.9	9.7	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*
Lower limit	10.5	12.0	10.4	9.1			10.4	12.1	10.1	8.9			10.4	11.6	10.4	9.1						
Upper limit	10.9	12.6	11.0	9.8			10.9	13.0	10.9	9.7			11.1	12.4	11.4	10.3						
Sucrose																						
Mean	12.9	12.6	12.9	13.2	***0.020***	***0.006***	12.8	12.6	12.7	13.1	*NS*	*NS*	13.0	12.6	13.1	13.4	***0.041***	***0.020***	*NS*	*NS*	*NS*	*NS*
Lower limit	12.7	12.3	12.5	12.9			12.5	12.1	12.3	12.6			12.7	12.2	12.6	12.9						
Upper limit	13.1	12.9	13.3	13.6			13.1	13.0	13.2	13.6			13.3	13.0	13.6	13.9						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Overall association with age group; [2]Linear association with age group; CI, confidence interval; NS, non-significant

Table 5.2 Daily intake of sugars (grams), by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Grams																						
Total sugars																						
Mean	122	125	121	121	*NS*	*NS*	128	127	124	131	*NS*	*NS*	117	123	118	111	***0.030***	***0.008***	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	120	121	117	116			124	122	119	124			113	117	112	105						
Upper limit	125	129	126	125			131	133	131	139			120	128	124	117						
Non-milk extrinsic sugars																						
Mean	70	66	70	73	***0.006***	***0.002***	73	66	72	81	***<0.001***	***<0.001***	66	66	68	66	*NS*	*NS*	***0.001***	*NS*	*NS*	***<0.001***
Lower limit	68	63	67	70			70	62	67	75			64	62	64	61						
Upper limit	72	69	73	77			76	70	76	86			69	69	72	71						
Intrinsic & milk sugars																						
Mean	48	56	48	42	***<0.001***	***<0.001***	50	57	49	46	***<0.001***	***<0.001***	46	54	48	39	***<0.001***	***<0.001***	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	47	54	46	40			49	55	46	43			44	51	45	36						
Upper limit	49	58	50	44			52	61	52	49			48	57	51	41						
Sucrose																						
Mean	57	56	58	58	*NS*	*NS*	60	57	59	64	***0.034***	***0.010***	55	56	56	52	*NS*	*NS*	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	56	54	55	55			58	54	55	60			53	53	53	49						
Upper limit	59	58	60	61			62	60	62	68			57	59	59	56						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Overall association with age group

[2]Linear association with age group

CI, confidence interval

NS, non-significant

Table 5.3 Daily intake of sugars (% of total sugars), by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
% of total sugars																						
Non-milk extrinsic sugars																						
Mean	58.7	54.1	58.7	62.6	***<0.001***	***<0.001***	58.7	53.5	58.8	63.1	***<0.001***	***<0.001***	58.7	54.8	58.6	62.2	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*
Lower limit	57.9	53.0	57.7	61.3			57.7	51.9	57.3	61.5			57.6	53.3	57.1	60.2						
Upper limit	59.5	55.3	59.8	64.0			59.7	55.1	60.3	64.7			59.9	56.3	60.2	64.2						
Intrinsic & milk sugars																						
Mean	41.1	45.7	41.1	37.1	***<0.001***	***<0.001***	41.1	46.3	41.0	36.7	***<0.001***	***<0.001***	41.1	45.0	41.2	37.6	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*
Lower limit	40.3	44.6	40.0	35.8			40.1	44.7	39.5	35.1			39.9	43.6	39.6	35.6						
Upper limit	41.9	46.8	42.2	38.5			42.2	47.9	42.5	38.4			42.2	46.5	42.7	39.6						
Sucrose																						
Mean	47.5	45.6	48.0	48.7	***<0.001***	***<0.001***	47.5	45.2	47.7	49.3	***<0.001***	***<0.001***	47.5	46.0	48.2	48.2	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	*NS*
Lower limit	47.1	45.0	47.3	48.0			46.9	44.3	46.8	48.3			46.9	45.2	47.2	47.2						
Upper limit	47.9	46.2	48.6	49.5			48.1	46.1	48.6	50.3			48.1	46.8	49.2	49.1						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Overall association with age group

[2]Linear association with age group

CI, confidence interval

NS, non-significant

Table 5.4 Daily intake of energy and sugars, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Energy (MJ)							
Mean	6.78	7.07	6.87	7.32	7.58	***<0.001***	***<0.001***↑
Lower limit	6.58	6.84	6.61	7.06	7.32		
Upper limit	7.00	7.32	7.15	7.59	7.87		
Energy (kcal)							
Mean	1610	1679	1632	1737	1800	***<0.001***	***<0.001***↑
Lower limit	1561	1623	1569	1677	1737		
Upper limit	1661	1736	1698	1800	1867		
% of food energy							
Total sugars							
Mean	27.4	27.3	27.0	27.3	27.7	*NS*	*NS*
Lower limit	26.9	26.6	26.5	26.6	26.9		
Upper limit	27.8	27.9	27.6	28.1	28.6		
Non-milk extrinsic sugars							
Mean	15.2	15.3	15.0	16.1	16.7	***0.004***	***0.001***↑
Lower limit	14.7	14.7	14.5	15.4	15.8		
Upper limit	15.6	15.9	15.6	16.7	17.7		
Intrinsic & milk sugars							
Mean	11.4	11.0	11.0	10.4	9.9	***<0.001***	***<0.001***↓
Lower limit	10.9	10.6	10.6	10.0	9.4		
Upper limit	11.8	11.5	11.5	10.8	10.3		
Sucrose							
Mean	12.5	12.8	12.7	13.1	13.4	***0.039***	***0.004***↑
Lower limit	12.2	12.4	12.4	12.7	12.9		
Upper limit	12.8	13.3	13.0	13.5	14.0		
Grams							
Total sugars							
Mean	116	121	117	125	132	***<0.001***	***<0.001***↑
Lower limit	112	116	111	119	126		
Upper limit	120	126	122	132	138		
Non-milk extrinsic sugars							
Mean	64	67	65	73	79	***<0.001***	***<0.001***↑
Lower limit	61	64	61	69	74		
Upper limit	67	71	68	78	85		
Intrinsic & milk sugars							
Mean	49	49	48	48	47	*NS*	*NS*
Lower limit	46	47	45	45	44		
Upper limit	51	52	51	50	50		
Sucrose							
Mean	53	56	55	60	63	***<0.001***	***<0.001***↑
Lower limit	51	54	52	56	59		
Upper limit	55	59	57	63	67		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]Overall association with SIMD quintile

[2]Linear association with SIMD quintile

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

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

CI, confidence interval; NS, non-significant

Table 5.5 Daily intake of sugars (% of total sugars), by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
% of total sugars							
Non-milk extrinsic sugars							
Mean	56.7	57.5	57.2	60.0	61.9	***<0.001***	***<0.001***↑
Lower limit	55.3	56.1	55.6	58.7	60.1		
Upper limit	58.1	59.0	58.7	61.3	63.8		
Intrinsic & milk sugars							
Mean	43.1	42.3	42.6	39.8	37.9	***<0.001***	***<0.001***↓
Lower limit	41.7	40.8	41.1	38.5	36.1		
Upper limit	44.5	43.7	44.2	41.1	39.8		
Sucrose							
Mean	46.0	47.4	47.4	48.1	48.6	***<0.001***	***<0.001***↑
Lower limit	45.3	46.6	46.6	47.3	47.7		
Upper limit	46.7	48.2	48.2	48.9	49.5		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]Overall association with SIMD quintile

[2]Linear association with SIMD quintile

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

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

CI, confidence interval

Table 5.6 Mean percentage contributions of food groups[1] to energy and sugar intake, by sex and age group

	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y
Energy																						
Pasta, rice, pizza & other cereals	5	5	5	5	***0.009***	*NS*	5	5	5	5	*NS*	*NS*	5	5	5	5	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Bread, excluding wholemeal	8	7	9	8	***<0.001***	***0.001***$^{\uparrow}$	8	7	9	9	***<0.001***	***<0.001***$^{\uparrow}$	8	8	8	8	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Biscuits, cakes & pastries	8	9	9	8	***<0.001***	***<0.001***$^{\downarrow}$	9	9	9	8	***0.002***	***0.002***$^{\downarrow}$	8	9	10	7	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Milk & cream	7	8	7	6	***<0.001***	***<0.001***$^{\downarrow}$	7	8	7	7	***<0.001***	***<0.001***$^{\downarrow}$	6	8	6	6	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*0.084*	***0.019***	***0.009***
Total sugars																						
Biscuits, cakes & pastries	8	8	9	7	***<0.001***	***0.001***$^{\downarrow}$	8	8	9	8	***0.030***	*NS*	8	8	9	7	***<0.001***	***0.007***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Milk & cream	9	10	9	8	***<0.001***	***<0.001***$^{\downarrow}$	9	10	9	8	***0.009***	***0.002***$^{\downarrow}$	8	9	8	9	***0.002***	***0.001***$^{\downarrow}$	***0.001***	*NS*	***0.008***	***0.019***
Yogurt & fromage frais	7	10	7	4	***<0.001***	***<0.001***$^{\downarrow}$	7	10	7	5	***<0.001***	***<0.001***$^{\downarrow}$	6	9	7	4	***<0.001***	***<0.001***$^{\downarrow}$	***0.014***	*NS*	*NS*	***0.005***
Fruit, excluding fruit juice	15	19	15	11	***<0.001***	***<0.001***$^{\downarrow}$	14	19	14	11	***<0.001***	***<0.001***$^{\downarrow}$	15	19	16	12	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	***0.031***	*NS*
Confectionery	8	6	7	12	***<0.001***	***<0.001***$^{\uparrow}$	8	6	8	12	***<0.001***	***<0.001***$^{\uparrow}$	8	6	7	12	***<0.001***	***<0.001***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Soft drinks, not diet	9	6	9	11	***<0.001***	***<0.001***$^{\uparrow}$	8	6	8	11	***<0.001***	***<0.001***$^{\uparrow}$	9	7	9	10	***0.002***	***0.001***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Non-milk extrinsic sugars																						
Biscuits, cakes & pastries	12	13	14	11	***<0.001***	***<0.001***$^{\downarrow}$	13	14	14	11	***<0.001***	***<0.001***$^{\downarrow}$	12	13	14	10	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Yogurt & fromage frais	7	11	7	4	***<0.001***	***<0.001***$^{\downarrow}$	7	11	7	4	***<0.001***	***<0.001***$^{\downarrow}$	6	10	7	3	***<0.001***	***<0.001***$^{\downarrow}$	***0.012***	*NS*	*NS*	***0.003***
Confectionery	13	10	12	18	***<0.001***	***<0.001***$^{\uparrow}$	14	10	12	19	***<0.001***	***<0.001***$^{\uparrow}$	13	10	11	18	***<0.001***	***<0.001***$^{\uparrow}$	*NS*	*NS*	***0.042***	*NS*
Fruit juice including smoothies	6	6	6	6	*NS*	*NS*	6	7	6	5	***0.038***	***0.032***$^{\downarrow}$	6	6	6	6	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Soft drinks, not diet	16	13	16	18	***<0.001***	***<0.001***$^{\uparrow}$	15	12	15	19	***<0.001***	***<0.001***$^{\uparrow}$	16	14	16	18	***0.011***	***0.006***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Intrinsic & milk sugars																						
Milk & cream	20	20	20	20	*NS*	*NS*	22	21	22	22	*NS*	*NS*	18	19	18	18	*NS*	*NS*	***<0.001***	*NS*	***0.001***	***0.003***
Yogurt & fromage frais	7	9	8	5	***<0.001***	***<0.001***$^{\downarrow}$	7	9	8	6	***<0.001***	***<0.001***$^{\downarrow}$	7	8	8	5	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	***0.038***
Fruit, excluding fruit juice	34	39	35	30	***<0.001***	***<0.001***$^{\downarrow}$	33	39	33	28	***<0.001***	***<0.001***$^{\downarrow}$	36	39	38	31	***<0.001***	***<0.001***$^{\downarrow}$	***0.011***	*NS*	***0.010***	*NS*
Sucrose																						
Biscuits, cakes & pastries	13	13	14	11	***<0.001***	***<0.001***$^{\downarrow}$	13	14	14	12	***0.002***	***0.004***$^{\downarrow}$	13	13	14	11	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Yogurt & fromage frais	7	11	8	4	***<0.001***	***<0.001***$^{\downarrow}$	8	12	8	5	***<0.001***	***<0.001***$^{\downarrow}$	7	11	8	4	***<0.001***	***<0.001***$^{\downarrow}$	***0.015***	*NS*	*NS*	***0.008***
Fruit, excluding fruit juice	12	16	12	9	***<0.001***	***<0.001***$^{\downarrow}$	12	17	11	9	***<0.001***	***<0.001***$^{\downarrow}$	12	16	13	10	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Confectionery	12	9	10	18	***<0.001***	***<0.001***$^{\uparrow}$	12	9	11	18	***<0.001***	***<0.001***$^{\uparrow}$	12	9	9	17	***<0.001***	***<0.001***$^{\uparrow}$	*NS*	*NS*	***0.030***	*NS*
Soft drinks, not diet	10	8	10	12	***<0.001***	***<0.001***$^{\uparrow}$	10	7	10	12	***<0.001***	***0.016***$^{\uparrow}$	10	9	11	11	***0.029***	***0.016***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Food groups contributing ≥5% in all participants; [2]Overall association with age group; [3]Linear association with age group; $^{\uparrow}$Increases with age group; $^{\downarrow}$Decreases with age group

Table 5.7 Mean percentage contributions of food groups[1] to energy and sugar intake, by SIMD quintile

	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^2	p^3
Energy							
Pasta, rice, pizza & other cereals	5	5	5	5	5	***0.018***	***0.001***↓
Bread excluding wholemeal	8	8	8	8	8	*NS*	*NS*
Biscuits, cakes & pastries	9	9	9	8	7	***<0.001***	***<0.001***↓
Milk & cream	7	7	7	7	7	*NS*	*NS*
Total sugars							
Biscuits, cakes & pastries	9	8	8	8	7	***<0.001***	***<0.001***↓
Milk & cream	9	8	9	9	8	*NS*	*NS*
Yogurt & fromage frais	7	7	7	7	6	*NS*	*NS*
Fruit, excluding fruit juice	16	16	15	14	12	***<0.001***	***<0.001***↓
Confectionery	8	8	8	8	9	*NS*	***0.015***↑
Soft drinks, not diet	7	8	7	10	12	***<0.001***	***<0.001***↑
Non-milk extrinsic sugars							
Biscuits, cakes & pastries	14	13	13	12	10	***<0.001***	***<0.001***↓
Yogurt & fromage frais	7	7	7	7	6	*NS*	*NS*
Confectionery	13	13	13	13	14	*NS*	*NS*
Fruit juice including smoothies	8	7	6	5	4	***<0.001***	***<0.001***↓
Soft drinks, not diet	13	14	13	17	21	***<0.001***	***<0.001***↑
Intrinsic & milk sugars							
Milk & cream	20	19	20	21	21	*NS*	***0.039***↑
Yogurt & fromage frais	6	7	7	7	7	*NS*	*NS*
Fruit, excluding fruit juice	36	36	35	34	32	***0.007***	***<0.001***↓
Sucrose							
Biscuits, cakes & pastries	14	13	13	12	11	***<0.001***	***<0.001***↓
Yogurt & fromage frais	7	7	8	7	7	*NS*	*NS*
Fruit, excluding fruit juice	13	13	13	11	10	***<0.001***	***<0.001***↓
Confectionery	12	12	12	12	13	*NS*	*NS*
Soft drinks, not diet	8	9	8	11	14	***<0.001***	***<0.001***↑
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]Food groups contributing ≥5% in all participants

[2]Overall association with SIMD quintile

[3]Linear association with SIMD quintile

↑Percentage increases from 5th (least deprived) to 1st (most deprived) quintile

↓Percentage decreases from 5th (least deprived) to 1st (most deprived) quintile

NS, non-significant

Table 5.8 Daily intake of energy and NMES in relation to Dietary Reference Values and Scottish Dietary Targets in children aged 4-16 years, by sex and age group

Mean and 95% CI	Boys				Girls			
	4-6y	7-10y	11-14y	15-16y	4-6y	7-10y	11-14y	15-16y
Energy								
Survey results								
Mean intake (MJ)	7.24	7.45	7.62	7.84	6.95	7.08	6.36	6.48
Lower limit (MJ)	6.96	7.14	7.29	7.31	6.66	6.80	6.10	6.10
Upper limit (MJ)	7.54	7.79	7.98	8.43	7.26	7.38	6.64	6.89
Mean intake (% of EAR)[1]	118	99	79	66	122	101	71	65
Lower limit (% of EAR)	114	95	75	61	117	97	68	61
Upper limit (% of EAR)	123	103	82	70	127	105	74	70
Non-milk extrinsic sugars								
Targets								
Population average (% of food energy)[2]	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)	14.2	15.2	16.2	16.8	14.4	15.9	16.3	16.8
Lower limit (% of food energy)	13.5	14.6	15.5	15.6	13.7	15.2	15.4	15.6
Upper limit (% of food energy)	14.9	15.9	16.9	18.0	15.2	16.7	17.2	18.1
Mean intake (% of population average)	129	138	147	152	131	167	148	153
Lower limit (% of population average)	123	132	141	142	125	138	140	142
Upper limit (% of population average)	136	145	154	164	138	151	164	165
Base (weighted)								
Energy	*178*	*237*	*250*	*136*	*166*	*215*	*242*	*134*
Non-milk extrinsic sugars	*178*	*238*	*250*	*136*	*166*	*215*	*242*	*138*
Base (unweighted)								
Energy	*193*	*260*	*265*	*102*	*172*	*220*	*244*	*112*
Non-milk extrinsic sugars	*193*	*261*	*265*	*102*	*172*	*220*	*244*	*114*

[1]Calculated for each respondent using the EAR appropriate for age and sex, calculated with the median physical activity level value (SACN, 2011)

[2]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.

CI, confidence interval

Table 5.9 Daily intake of energy and NMES in relation to Dietary Reference Values and Scottish Dietary Targets in children aged 4-16 years, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)
Energy					
Mean intake (% of EAR)[1]	83	88	87	93	92
Lower limit (% of EAR)	80	84	82	88	88
Upper limit (% of EAR)	86	91	92	98	95
Non-milk extrinsic sugars					
Mean intake (% of population average)	139	139	137	146	153
Lower limit (% of population average)	134	133	132	140	144
Upper limit (% of population average)	143	144	142	151	162
Base (weighted)					
Energy	*355*	*314*	*268*	*279*	*341*
Non-milk extrinsic sugars	*355*	*314*	*268*	*281*	*344*
Base (unweighted)					
Energy	*393*	*332*	*282*	*268*	*293*
Non-milk extrinsic sugars	*393*	*332*	*282*	*269*	*295*

[1]Calculated for each respondent using the EAR appropriate for age and sex, calculated with the median physical activity level value (SACN, 2011)
CI, confidence interval

Table 5.10 Comparison between 2006 and 2010 in the intake of NMES (% food energy), by sex and age group

Mean and 95% CI	All ages			3-7y			8-11y			12-17y		
	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1	2006	2010	p^1
Both boys & girls												
Mean	17.3	15.7	***<0.001***	15.8	14.7	***0.003***	16.8	15.6	***0.001***	19.0	16.7	***<0.001***
Lower limit	16.9	15.4		15.2	14.2		16.4	15.1		18.2	16.1	
Upper limit	17.7	16.0		16.3	15.1		17.3	16.1		19.9	17.3	
Boys												
Mean	17.3	15.6	***<0.001***	15.9	14.6	***0.010***	16.8	15.5	***0.006***	19.0	16.5	***<0.001***
Lower limit	16.9	15.2		15.2	14.0		16.2	14.8		17.9	15.8	
Upper limit	17.8	16.0		16.7	15.3		17.5	16.2		20.0	17.3	
Girls												
Mean	17.3	15.8	***<0.001***	15.5	14.7	*NS*	16.8	15.7	***0.016***	19.1	16.9	***0.003***
Lower limit	16.7	15.4		14.7	14.1		16.2	15.1		17.9	16.0	
Upper limit	18.0	16.3		16.5	15.3		17.4	16.4		20.3	17.8	
Base (weighted)												
Both boys & girls	*1379*	*1674*		*436*	*558*		*388*	*474*		*554*	*642*	
Boys	*719*	*853*		*234*	*285*		*203*	*242*		*281*	*325*	
Girls	*660*	*821*		*202*	*273*		*185*	*231*		*273*	*317*	
Base (unweighted)												
Both boys & girls	*1391*	*1674*		*437*	*581*		*439*	*505*		*515*	*588*	
Boys	*719*	*871*		*237*	*307*		*230*	*272*		*252*	*292*	
Girls	*672*	*803*		*200*	*274*		*209*	*233*		*263*	*296*	

[1]P-value for difference between 2006 and 2010
CI, confidence interval
NS, non-significant

6. Intake of other nutrients

This chapter describes the intakes of total fat, saturated fatty acids, protein, non-starch polysaccharides, iron and calcium in all children, and variations by age group and sex. Intakes are also compared with the Dietary Reference Values (DRVs)[1] and Scottish Dietary Targets[2], and with the intakes of these nutrients found in the 2006 survey[3].

Summary

Total fat and saturated fatty acids

- The mean intake of total fat in children aged 3-16 years was 32.7% food energy, which is lower than the Dietary Reference Value population average and the Scottish Dietary Target (35% and ≤35% respectively).
- The mean intake of saturated fatty acids was 13.2% food energy, which is higher than the Dietary Reference Value population average and the Scottish Dietary Target (11% and ≤11% respectively).
- Mean intakes of total fat and saturated fatty acids (% food energy) were similar across SIMD quintiles, but absolute intakes (g/day) increased linearly with level of deprivation.
- The food groups contributing the highest proportion to total fat intake were biscuits, cakes and pastries (10%) and processed meat (9%). For saturated fatty acids, the main food sources were milk and cream (12%) and biscuits, cakes and pastries (11%).
- The percentage contributions of total fat and saturated fatty acids to food energy were similar between 2006 (32.9% and 13.8% respectively) and 2010 (32.7% and 13.2%).

Protein

- Protein contributed 13.7% to food energy overall, and mean daily protein intake in children aged 3-16 years was 57.5g.
- Mean daily protein intake was higher than the recommended level (RNI) in all age and sex groups, especially in the younger age groups:

  Boys: 60.5g in 4-6 year olds versus RNI of 19.7g
  60.5g in 7-10 year olds versus RNI of 28.3g
  61.2g in 11-14 year olds versus RNI of 42.1g
  61.9g in 15-16 year olds versus RNI of 55.2g

  Girls: 58.6g in 4-6 year olds versus RNI of 19.7g
  57.0g in 7-10 year olds versus RNI of 28.3g
  49.8g in 11-14 year olds versus RNI of 41.2g
  48.9g in 15-16 year olds versus RNI of 45.0g

- The contribution of protein to food energy intake decreased linearly with level of deprivation, but mean intakes expressed as g/day were similar across SIMD quintiles.
- The percentage contribution of protein to food energy was similar between 2006 (13.1%) and 2010 (13.7%).

Summary continued.

Non-starch polysaccharides, iron and calcium

- The mean intake of non-starch polysaccharides in 3-16 year olds was 11.6 g/day. There are currently no recommendations for children for intake of non-starch polysaccharides.
- Intakes of non-starch polysaccharides (g/day) were significantly higher in boys than in girls, reflecting their higher energy intake, and decreased significantly with age in girls, but not in boys.
- Mean daily iron intake was greater than the RNI in younger children, but below the RNI in older children (11-14 and 15-16 years), especially in older girls whose mean intake was only 52% of the RNI and was below the lower reference nutrient intake (LRNI):

  Boys: 8.9mg in 4-6 year olds versus RNI of 6.1mg
  9.2mg in 7-10 year olds versus RNI of 8.7mg
  9.5mg in 11-14 year olds versus RNI of 11.3mg
  9.2mg in 15-16 year olds versus RNI of 11.3mg

  Girls: 8.5mg in 4-6 year olds versus RNI of 6.1mg
  8.6mg in 7-10 year olds versus RNI of 8.7mg
  7.5mg in 11-14 year olds versus RNI of 14.8mg
  7.4mg in 15-16 year olds versus RNI of 14.8mg
- The mean intake of calcium exceeded the RNI in boys aged 4-6 and 7-10 years and in girls aged 4-6, 7-10 and 11-14 years. The mean calcium intake was only marginally below the RNI in 11-14 and 15-16 year old boys and in 15-16 year old girls.

  Boys: 1053mg in 4-6 year olds versus RNI of 450mg
  1026mg in 7-10 year olds versus RNI of 550mg
  984mg in 11-14 year olds versus RNI of 1000mg
  986mg in 15-16 year olds versus RNI of 1000mg

  Girls: 982mg in 4-6 year olds versus RNI of 450mg
  920mg in 7-10 year olds versus RNI of 550mg
  811mg in 11-14 year olds versus RNI of 800mg
  794mg in 15-16 year olds versus RNI of 800mg
- Mean intakes of non-starch polysaccharides (g/day) and iron (mg/day) were similar across SIMD quintiles, but calcium (mg/day) increased linearly with level of deprivation.
- Mean intakes of non-starch polysaccharides, iron and calcium were very similar between 2006 and 2010 when expressed per 1000kcal.

6.1 Intake of other nutrients

6.1.1 Intake of other nutrients by age and sex

The intakes of total fat, saturated fatty acids and protein, expressed as a percentage of food energy, for all children and by age group and sex are shown in Table 6.1. The intakes of total fat, saturated fatty acids, protein, non-starch polysaccharides, iron and calcium as grams per day (g/day) for all children and by age group and sex are shown in Table 6.2.

The mean intake of total fat as a percentage of food energy was 32.7%. The percentage contribution of total fat to food energy did not differ significantly between boys and girls, or by age overall. However, the percentage contribution increased significantly with age in boys, but not in girls.

Saturated fatty acids contributed 13.2% to food energy overall. This percentage contribution decreased significantly with age in girls, but not in boys. Boys had a significantly higher percentage contribution from saturated fatty acids to food energy than girls; however this significant difference was only evident in the older children: 13.4% in boys compared with 12.7% in girls aged 12-16 years.

Protein contributed 13.7% to food energy overall. This percentage contribution to food energy decreased significantly with age group in both boys and girls. There was no significant difference between boys and girls in protein intake overall or in the 3-7 or 8-11 year age groups. However, boys aged 12-16 years had a significantly higher intake of protein (13.5% of food energy) compared with girls of the same age (13.1% of food energy).

Table 6.1

Intakes of total fat, saturated fatty acids, protein and non-starch polysaccharides, expressed as g/day, were all significantly higher in boys than in girls, reflecting their higher energy intake (see Chapter 5). Total fat and saturated fatty acid intakes increased significantly with age in boys, but decreased significantly with age in girls. Intakes of protein and non-starch polysaccharides decreased significantly with age in girls, but there were no significant differences in intakes of these nutrients with age in boys.

Iron and calcium intakes decreased significantly with age in girls, but not in boys. Boys had significantly higher intakes of iron and calcium compared with girls.

Table 6.2

6.1.2 Intake of other nutrients by SIMD quintile

Table 6.3 shows the intake of other nutrients by quintile of SIMD. There were no significant associations between SIMD quintile and the contribution of total fat or saturated fatty acids to food energy intake. There was a significant linear association between the contribution of protein to food energy intake and SIMD quintile, with lower values in children in the more deprived quintiles. The higher intakes of total fat (g/day), saturated fatty acids (g/day) and calcium (mg/day) in children in the more deprived quintiles were consistent with the higher energy intake in children in the more deprived quintiles (see chapter 5). There was no significant association between protein (g/day), non-starch polysaccharides (g/day) or iron (mg/day) and SIMD quintile.

Table 6.3

6.2 Contribution of food groups to intake of other nutrients

Table 6.4 shows the food groups which contributed 5% or more to the intake of total fat, saturated fatty acids, protein, non-starch polysaccharides, iron and calcium. The food groups contributing the highest proportion of total fat intake were biscuits, cakes and pastries (10%) and processed meat (9%). For saturated fatty acids, the main food sources were milk and cream (12%) and biscuits, cakes and pastries (11%). For protein, the food groups providing the highest proportion were milk and cream (13%) and meats and meat dishes (excluding processed meat) (10%). The main sources of non-starch polysaccharides were fruit (16%), bread (excluding wholemeal) (11%) and vegetables (10%). The major food sources of iron were bread (excluding wholemeal) and unsweetened breakfast cereals (both 11%), followed by biscuits, cakes and pastries (8%). Calcium was mainly obtained from milk and cream (28%), with bread (excluding wholemeal) and yoghurt and fromage frais each contributing 9%. The full list of the food groups and their contribution to total fat and saturated fatty acids is given in Appendix L.

Table 6.4

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

There were significant differences between boys and girls in these values for many food groups but the magnitude of these differences was small (≤4%). There were larger differences between age groups in these values, especially for the contribution of confectionery to saturated fatty acids (4% in 3-7 year olds versus 9% in 12-16 year olds), the contribution of fruit to non-starch polysaccharides (20% in 3-7 year olds versus 13% in 12-16 year olds), and the contribution of yoghurt and fromage frais to calcium (12% in 3-7 year olds versus 6% in 12-16 year olds).

Table 6.4

6.2.2 Contribution of food groups to intake of other nutrients by SIMD quintile

Table 6.5 shows the associations between SIMD quintile and the percentage contribution of food groups to the intakes of total fat, saturated fatty acids, protein, non-starch polysaccharides, iron and calcium. Children in the more deprived areas had significantly higher contributions of processed meat, crisps and savoury snacks, confectionery and bread (excluding wholemeal) to the intakes of other nutrients than children in the less deprived areas. Children in the more deprived areas also had significantly lower contributions of biscuits, cakes and pastries, cheese, meats and meat dishes (excluding processed meat), vegetables and fruit to intakes of other nutrients compared with children in less deprived areas. However, the differences between SIMD quintiles were generally small (≤3%).

Table 6.5

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

Comparison of absolute intakes (g/day or mg/day) with recommended levels should be interpreted with caution. The C2 FFQ was found to produce significantly higher estimates of protein, iron and calcium when compared with either diet diaries or 24h recalls in the 2006 survey. The C3 FFQ was found to produce significantly lower estimates of protein when compared with 24h recalls, and significantly higher estimates of calcium when compared with 24h recalls[3].

Mean intakes of non-starch polysaccharides are not compared with the Dietary Reference Values[1] which are for adults; there are currently no recommendations for children.

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

Table 6.6 shows the mean daily intake of total fat and saturated fatty acids as a percentage of food energy, and the mean daily intake of protein (g/day) compared with the recommended levels in the four age groups used in the DRV report[1]. Table 6.7 shows the mean daily intake of iron and calcium compared with the reference nutrient intake (RNI) in the same four age groups.

The mean intake of total fat as a percentage of food energy was lower than the DRV population average and the Scottish Dietary Target (35% and ≤35% respectively) in all age and sex groups: between 32.5% and 33.3% of food energy. However, the mean intake of saturated fatty acids was higher than the DRV population average and the Scottish Dietary Target (11% and ≤11% respectively) in all age and sex groups: between 12.6% and 13.5% of food energy. The mean protein intake (g/day) was higher than the recommended level (RNI) in all age and sex groups, especially in the younger age groups.

Table 6.6

Mean iron intake was greater than the RNI in younger children, but below the RNI in older children, especially in older girls whose mean intake was only 52% of the RNI. In boys aged 11-14 and 15-16 years, mean iron intake was below the RNI but greater than the EAR (8.7mg/d). However in girls aged 11-14 and 15-16 years, mean iron intake was below the EAR and also below the lower reference nutrient intake (LRNI) of 8.0mg/d.

The mean intake of calcium exceeded the RNI in boys aged 4-6 and 7-10 years and in girls aged 4-6, 7-10 and 11-14 years. The mean calcium intake was only marginally below the RNI in 11-14 and 15-16 year old boys and in 15-16 year old girls.

Table 6.7

6.3.2 Comparison of intake of other nutrients with Dietary Reference Values and Scottish Dietary Targets by SIMD quintile

There was no clear pattern of adequacy of the intake of other nutrients between SIMD quintiles. The mean intakes of total fat and saturated fatty acids expressed as a percentage of the DRV population average varied very little (≤4%) between SIMD quintiles. There was greater variation between SIMD quintiles for the mean intakes of protein, iron, and calcium expressed as a percentage of the RNI: differences of up to 14% between SIMD quintiles.

Table 6.8

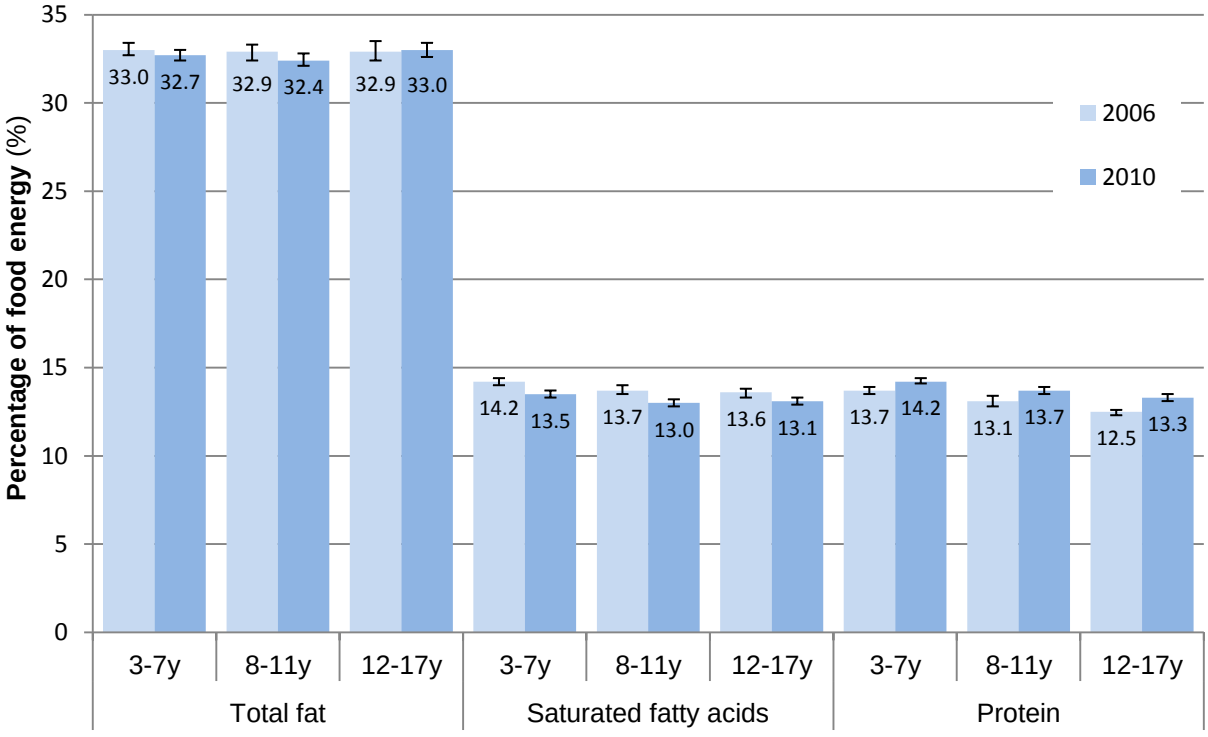
6.4 Comparison with intakes of other nutrients in 2006

6.4.1 Comparison with daily intakes of other nutrients in 2006

The percentage contributions of total fat, saturated fatty acids and protein to food energy were similar between 2006 and 2010: 32.9%, 13.8% and 13.1% respectively in 2006, and 32.7%, 13.2% and 13.7% in 2010. There was very little difference (less than 1% of food energy) between 2006 and 2010 in these percentage contributions by age group or by sex.

Figure 6.1

Figure 6.1 Mean (95% CI) daily intake of total fat, saturated fatty acids and protein in 2006 and 2010, by age group

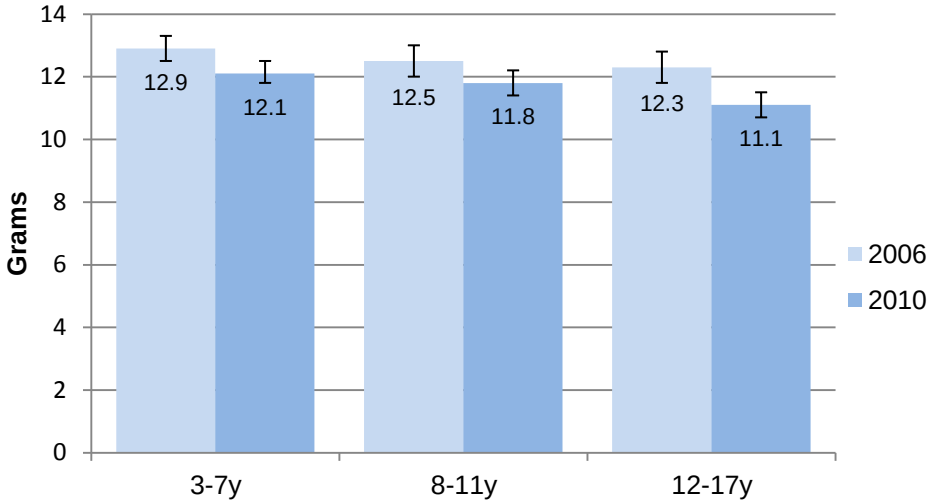


The mean absolute daily intakes of total fat, saturated fatty acids and protein decreased between 2006 and 2010: 67.7g to 62.6g for total fat, 28.6g to 25.4g for saturated fatty acids, and 58.9g to 57.5g for protein. Similarly, the mean intake of non-starch polysaccharides decreased slightly from 12.5g to 11.6g in all children. Mean daily intakes of iron and calcium also decreased between 2006 and 2010 in all children: 9.3mg to 8.6mg for iron, and 994mg to 950mg for calcium. These decreases were evident in all age groups, and in both boys and girls, and may partly reflect the decrease in overall food intake as reflected in the decrease in energy intake between 2006 and 2010. When intakes of non-starch polysaccharides, iron and calcium were expressed per 1000kcal, the mean intakes were very similar between 2006 and 2010, suggesting that differences in energy intake accounted for much of the difference in nutrient intake between 2006 and 2010.

Figures 6.2, 6.3 and 6.4

Figure 6.2 Mean (95% CI) daily intake of non-starch polysaccharides in 2006 and 2010, by age group

A. Grams of non-starch polysaccharides



B. Grams / 1000kcal of non-starch polysaccharides

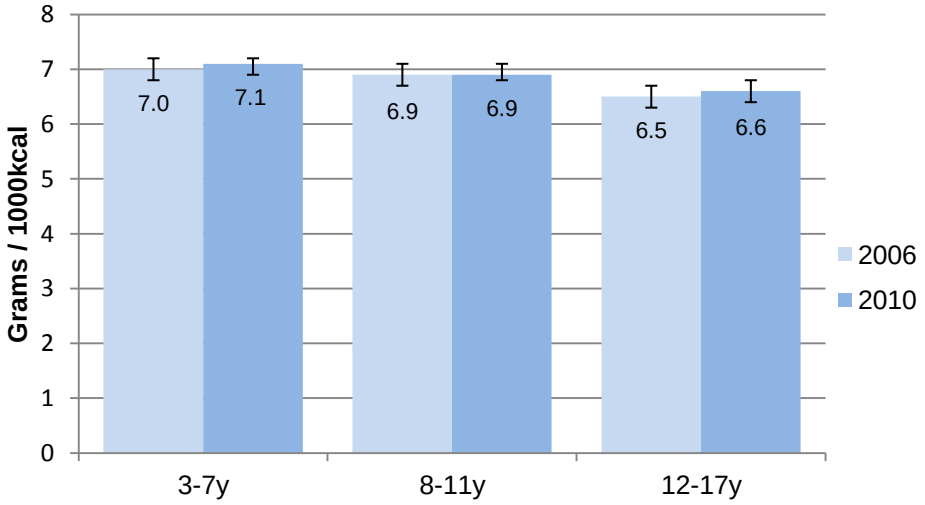
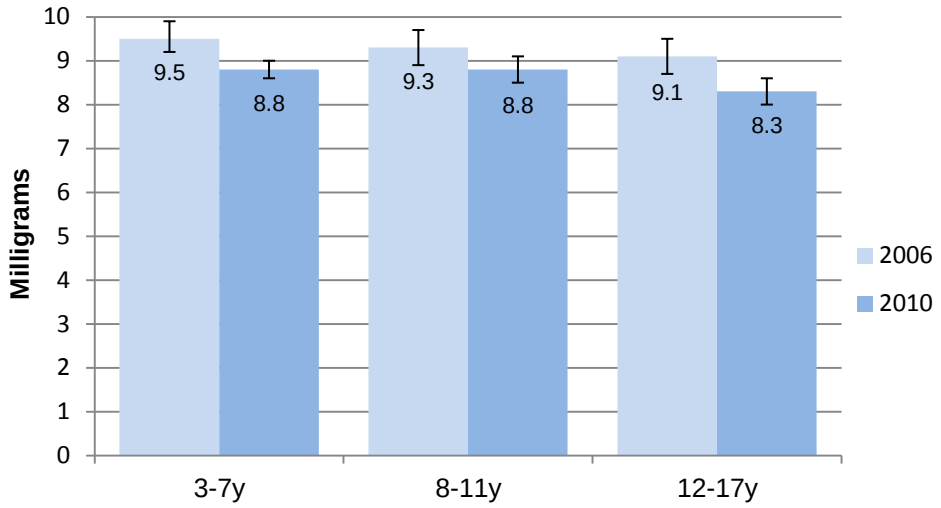


Figure 6.3 Mean (95% CI) daily intake of iron in 2006 and 2010, by age group

A. Milligrams of iron



B. Milligrams / 1000kcal of iron

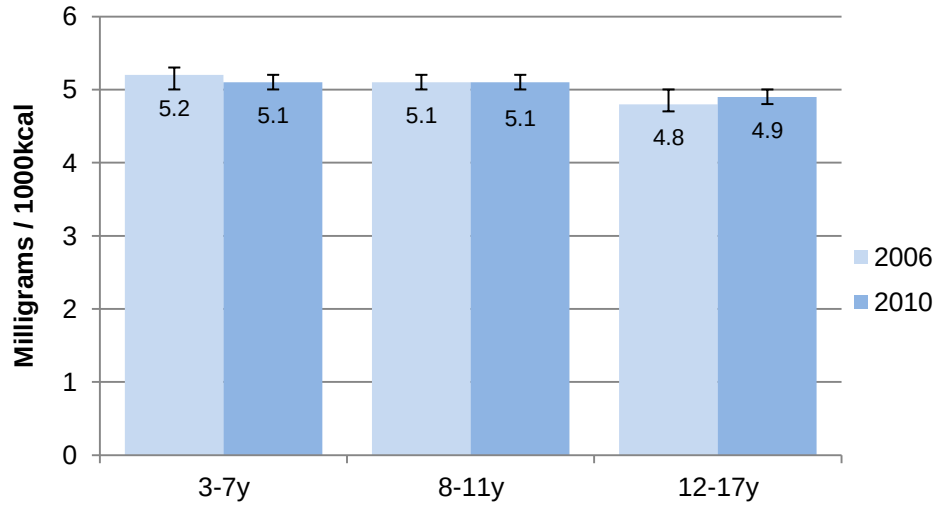
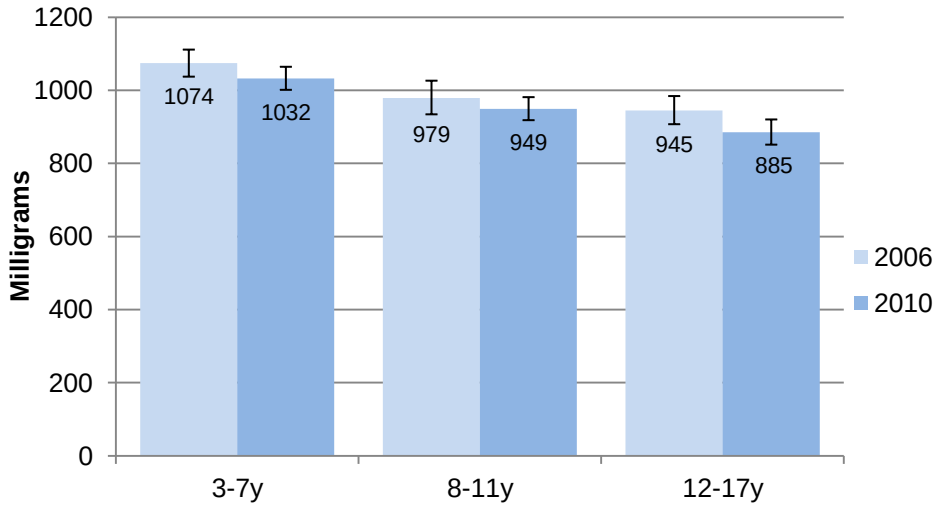
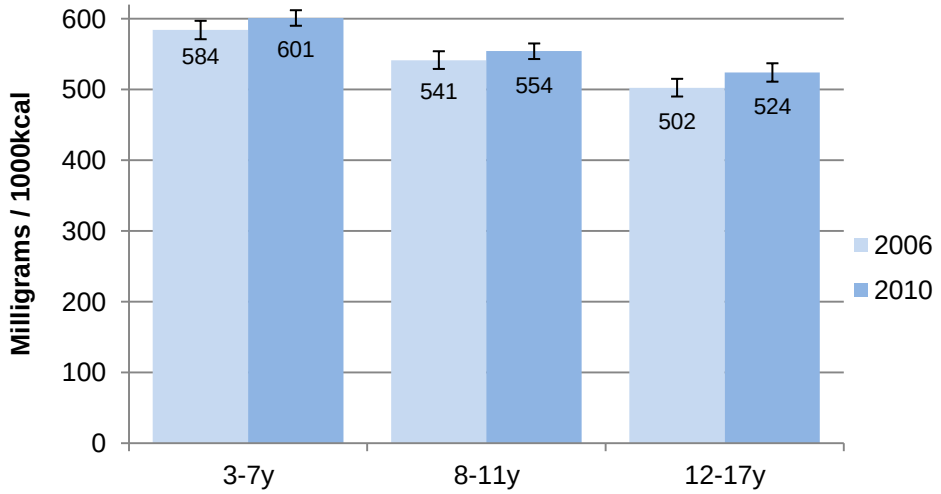


Figure 6.4 Mean (95% CI) daily intake of calcium in 2006 and 2010, by age group

A. Milligrams of calcium



B. Milligrams / 1000kcal of calcium



6.4.2 Comparison with the contribution of food groups to other nutrients in 2006

The largest difference between 2006 and 2010 in the mean percentage contribution of food groups to the intake of other nutrients was for the contribution of unsweetened breakfast cereals to iron intake in 3-7 year old boys (17% in 2006 versus 13% in 2010). The rest of the differences between 2006 and 2010 were not more than 3 percentage points in the various age/sex groups.

In both 2006 and 2010, biscuits, cakes and pastries were the largest contributors to total fat intake (10% in both years), and milk and cream were the largest contributors to saturated fatty acid intake (12% in both years). Milk and cream were the largest contributors to protein intake in both years (14% in 2006 and 13% in 2010). Fruit made the largest contribution to the intake of non-starch polysaccharides (16% in both 2006 and 2010) followed by bread (excluding wholemeal) (13% in 2006 and 11% in 2010). Unsweetened breakfast cereals remained the largest contributors to iron intake (13% in 2006 and 11% in 2010), and milk and cream remained the largest contributors to calcium intake (29% in 2006 and 28% in 2010).

6.5 References

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

2. The Scottish Office Department of Health. (1996) *Eating for Health: a Diet Action Plan for Scotland*. Edinburgh.

3. Sheehy C, McNeill G, Masson L, Craig L, Macdiarmid J, Holmes B & Nelson M. (2008) *Survey of sugar intake among children in Scotland*. Aberdeen, Food Standards Agency Scotland. http://www.food.gov.uk/multimedia/pdfs/sugarintakescot2008rep.pdf

Table 6.1 Daily intake of other nutrients (% of food energy), by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
% of food energy																						
Total fat																						
Mean	32.7	32.7	32.4	33.0	*NS*	*NS*	32.7	32.4	32.5	33.2	***0.044***	***0.014***	32.8	33.0	32.3	32.9	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Lower limit	32.5	32.4	32.1	32.6			32.4	31.9	32.0	32.6			32.5	32.6	31.8	32.3						
Upper limit	33.0	33.0	32.8	33.4			33.1	32.9	33.1	33.7			33.1	33.4	32.8	33.5						
Saturated fatty acids																						
Mean	13.2	13.5	13.0	13.1	***<0.001***	***0.001***	13.3	13.4	13.1	13.4	*NS*	*NS*	13.0	13.6	12.9	12.7	***<0.001***	***<0.001***	***0.020***	*NS*	*NS*	***0.002***
Lower limit	13.1	13.3	12.8	12.9			13.1	13.1	12.8	13.1			12.9	13.3	12.6	12.4						
Upper limit	13.3	13.7	13.2	13.3			13.5	13.7	13.3	13.7			13.2	13.8	13.1	13.0						
Protein																						
Mean	13.7	14.2	13.7	13.3	***<0.001***	***<0.001***	13.8	14.1	13.8	13.5	***0.009***	***0.002***	13.7	14.4	13.5	13.1	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	***0.041***
Lower limit	13.6	14.1	13.5	13.1			13.6	13.9	13.5	13.3			13.5	14.2	13.3	12.8						
Upper limit	13.9	14.4	13.9	13.5			14.0	14.4	14.1	13.8			13.8	14.6	13.8	13.4						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Overall association with age group

[2]Linear association with age group

CI, confidence interval

NS, non-significant

Table 6.2 Daily intake of other nutrients (grams), by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Grams																						
Total fat																						
Mean	62.6	63.2	62.4	62.4	*NS*	*NS*	65.9	63.0	64.7	69.6	***0.009***	***0.003***	59.4	63.4	60.2	55.8	***<0.001***	***<0.001***	***<0.001***	*NS*	***0.034***	***<0.001***
Lower limit	61.5	61.6	60.4	60.3			64.1	60.6	61.6	66.1			57.9	61.0	57.4	53.5						
Upper limit	63.8	64.8	64.4	64.5			67.8	65.5	67.9	73.4			60.9	65.8	62.8	58.1						
Saturated fatty acids																						
Mean	25.4	26.2	25.1	24.8	***0.040***	***0.028***	27.0	26.2	26.2	28.3	***0.037***	***0.026***	23.8	26.1	24.0	21.7	***<0.001***	***<0.001***	***<0.001***	*NS*	***0.016***	***<0.001***
Lower limit	24.8	25.5	24.3	24.0			26.2	25.1	24.9	26.8			23.1	25.0	22.9	20.8						
Upper limit	25.9	26.9	26.0	25.8			27.7	27.3	27.5	29.9			24.4	27.3	25.2	22.7						
Protein																						
Mean	57.5	60.2	57.5	55.1	***<0.001***	***<0.001***	60.9	60.1	60.1	62.3	*NS*	*NS*	54.1	60.3	55.0	48.6	***<0.001***	***<0.001***	***<0.001***	*NS*	***0.004***	***<0.001***
Lower limit	56.5	58.8	55.8	53.4			59.4	57.9	57.6	59.4			52.8	58.0	52.7	46.8						
Upper limit	58.5	61.7	59.3	56.9			62.5	62.4	62.8	65.3			55.4	62.7	57.3	50.6						
Non-starch polysaccharides																						
Mean	11.6	12.1	11.8	11.1	***0.002***	***<0.001***	12.0	12.3	11.9	12.0	*NS*	*NS*	11.2	12.0	11.7	10.3	***<0.001***	***<0.001***	***0.001***	*NS*	*NS*	***<0.001***
Lower limit	11.4	11.8	11.4	10.7			11.7	11.8	11.3	11.4			10.9	11.5	11.2	9.8						
Upper limit	11.9	12.5	12.2	11.5			12.4	12.8	12.5	12.6			11.5	12.5	12.2	10.8						
Milligrams																						
Iron																						
Mean	8.6	8.8	8.8	8.3	***0.028***	***0.012***	9.2	8.9	9.1	9.5	*NS*	*NS*	8.1	8.7	8.5	7.3	***<0.001***	***<0.001***	***<0.001***	*NS*	*NS*	***<0.001***
Lower limit	8.5	8.6	8.5	8.0			8.9	8.6	8.6	9.0			7.9	8.4	8.1	7.0						
Upper limit	8.8	9.0	9.1	8.6			9.4	9.2	9.5	10.0			8.2	9.0	8.9	7.6						
Calcium																						
Mean	950	1032	949	885	***<0.001***	***<0.001***	1015	1048	1004	994	*NS*	*NS*	887	1015	894	786	***<0.001***	***<0.001***	***<0.001***	*NS*	***<0.001***	***<0.001***
Lower limit	930	1001	918	851			989	1003	961	945			861	967	853	746						
Upper limit	970	1064	981	920			1041	1096	1050	1046			915	1066	937	828						
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Overall association with age group; [2]Linear association with age group;
CI, confidence interval; NS, non-significant

Table 6.3 Daily intake of other nutrients, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
% of food energy							
Total fat							
Mean	32.5	32.7	33.0	32.8	32.9	*NS*	*NS*
Lower limit	32.0	32.3	32.5	32.2	32.3		
Upper limit	32.9	33.1	33.4	33.3	33.4		
Saturated fatty acids							
Mean	13.1	13.2	13.4	13.1	13.1	*NS*	*NS*
Lower limit	12.9	13.0	13.1	12.8	12.8		
Upper limit	13.3	13.4	13.7	13.4	13.4		
Protein							
Mean	14.1	13.9	13.8	13.7	13.1	***<0.001***	***<0.001***↓
Lower limit	13.9	13.7	13.5	13.5	12.8		
Upper limit	14.3	14.2	14.1	14.0	13.4		
Grams							
Total fat							
Mean	59.2	62.0	61.0	64.3	66.9	***<0.001***	***<0.001***↑
Lower limit	57.0	60.0	58.6	61.6	64.3		
Upper limit	61.3	64.2	63.5	67.1	69.7		
Saturated fatty acids							
Mean	23.9	25.2	25.0	25.9	26.9	***0.003***	***<0.001***↑
Lower limit	23.0	24.3	23.8	24.6	25.8		
Upper limit	24.9	26.1	26.2	27.2	28.0		
Protein							
Mean	56.3	58.0	55.9	59.1	58.2	*NS*	*NS*
Lower limit	54.3	56.0	53.5	56.9	55.9		
Upper limit	58.3	60.0	58.3	61.3	60.6		
Non-starch polysaccharides							
Mean	11.7	12.0	11.4	11.6	11.4	*NS*	*NS*
Lower limit	11.2	11.6	10.8	11.2	10.9		
Upper limit	12.1	12.5	12.0	12.0	12.1		
Milligrams							
Iron							
Mean	8.4	8.7	8.3	8.8	8.8	*NS*	*NS*
Lower limit	8.1	8.4	8.0	8.5	8.4		
Upper limit	8.7	9.1	8.7	9.1	9.2		
Calcium							
Mean	922	948	931	969	982	*NS*	***0.034***↑
Lower limit	884	909	882	921	937		
Upper limit	961	989	983	1018	1029		
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]Overall association with SIMD quintile

[2]Linear association with SIMD quintile

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

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

CI, confidence interval

NS, non-significant

Table 6.4 Mean percentage contributions of food groups[1] to intake of other nutrients, by sex and age group

	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y
Total fat																						
Biscuits, cakes & pastries	10	10	11	9	***<0.001***	***<0.001***$^{\downarrow}$	10	11	11	9	***0.002***	***0.004***$^{\downarrow}$	10	10	11	9	***<0.001***	***0.002***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Milk & cream	8	10	8	7	***<0.001***	***<0.001***$^{\downarrow}$	9	10	8	8	***<0.001***	***<0.001***$^{\downarrow}$	7	9	7	6	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*NS*	*NS*	***0.001***
Processed meat, including sausages, burgers, coated chicken	9	9	9	8	*NS*	*NS*	9	9	10	9	*NS*	*NS*	8	9	8	8	*NS*	***0.026***$^{\downarrow}$	***<0.001***	*NS*	***0.009***	***<0.001***
Crisps & savoury snacks	7	6	8	7	***<0.001***	***0.049***$^{\uparrow}$	7	6	8	6	***<0.001***	*NS*	7	6	8	7	***0.004***	*NS*	***0.014***	*NS*	*NS*	***0.041***
Saturated fatty acids																						
Biscuits, cakes & pastries	11	11	12	10	***<0.001***	***<0.001***$^{\downarrow}$	11	11	12	10	***0.002***	***0.010***$^{\downarrow}$	11	11	13	10	***<0.001***	***0.025***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Milk & cream	12	15	12	11	***<0.001***	***<0.001***$^{\downarrow}$	13	16	13	12	***<0.001***	***<0.001***$^{\downarrow}$	11	14	11	10	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	***0.046***	***0.045***	***0.004***
Cheese	6	6	5	5	***<0.001***	***0.001***$^{\downarrow}$	5	6	5	5	*NS*	*NS*	6	7	5	5	***<0.001***	***0.001***$^{\downarrow}$	***0.011***	***0.008***	*NS*	*NS*
Processed meat, including sausages, burgers, coated chicken	8	7	8	8	*NS*	*NS*	8	8	8	8	*NS*	*NS*	7	7	7	7	*NS*	*NS*	***<0.001***	*NS*	***0.024***	***0.001***
Confectionery	5	4	5	9	***<0.001***	***<0.001***$^{\uparrow}$	6	4	5	9	***<0.001***	***<0.001***$^{\uparrow}$	5	3	4	9	***<0.001***	***<0.001***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Protein																						
Pasta, rice, pizza & other cereals	5	5	5	6	***0.002***	***0.001***$^{\uparrow}$	5	5	5	6	*NS*	*NS*	6	5	5	6	***0.005***	***0.001***$^{\uparrow}$	***0.049***	*NS*	*NS*	*NS*
Bread, excluding wholemeal	8	7	9	9	***<0.001***	***<0.001***$^{\uparrow}$	8	7	9	9	***<0.001***	***<0.001***$^{\uparrow}$	8	7	8	8	***0.007***	***0.004***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Milk & cream	13	14	13	12	***0.001***	***<0.001***$^{\downarrow}$	14	15	14	13	***0.007***	***0.003***$^{\downarrow}$	12	13	12	12	*NS*	***0.029***$^{\downarrow}$	***0.001***	***0.017***	***0.008***	*NS*
Meats & meat dishes, excluding processed meat	10	9	11	11	***<0.001***	***<0.001***$^{\uparrow}$	10	9	11	11	***<0.001***	***<0.001***$^{\uparrow}$	10	10	11	10	*NS*	NS	*NS*	*NS*	*NS*	***0.007***
Processed meat, including sausages, burgers, coated chicken	8	8	8	8	*NS*	*NS*	8	8	9	8	*NS*	*NS*	7	8	8	7	*NS*	*NS*	***<0.001***	*NS*	***0.008***	***0.005***
Non-starch polysaccharides																						
Pasta, rice, pizza & other cereals	6	5	5	6	***<0.001***	***0.011***$^{\uparrow}$	5	5	5	6	***0.039***	***0.032***$^{\uparrow}$	6	6	5	6	***0.044***	*NS*	*NS*	*NS*	*NS*	*NS*
Bread, excluding wholemeal	11	10	12	12	***<0.001***	***<0.001***$^{\uparrow}$	12	10	12	13	***<0.001***	***<0.001***$^{\uparrow}$	11	10	11	11	*NS*	*NS*	***0.025***	*NS*	*NS*	***0.025***
Biscuits, cakes & pastries	7	7	8	6	***<0.001***	***<0.001***$^{\downarrow}$	7	8	7	6	***0.023***	***0.010***$^{\downarrow}$	7	7	8	6	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Vegetables, excluding potatoes & baked beans	10	11	10	10	*NS*	*NS*	10	10	9	10	*NS*	*NS*	11	11	10	11	*NS*	*NS*	***<0.001***	***0.022***	*NS*	***0.008***
Crisps & savoury snacks	5	5	6	6	***<0.001***	***0.002***$^{\uparrow}$	5	4	6	5	***<0.001***	***0.039***$^{\uparrow}$	6	5	6	6	***0.010***	***0.026***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Fruit, excluding fruit juice	16	20	16	13	***<0.001***	***<0.001***$^{\downarrow}$	15	20	15	12	***<0.001***	***<0.001***$^{\downarrow}$	17	19	18	13	***<0.001***	***<0.001***$^{\downarrow}$	***0.044***	*NS*	***0.016***	*NS*
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

Table 6.4 continued. Mean percentage contributions of food groups[1] to intake of other nutrients, by sex and age group

	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y	p^2	p^3	All	3-7y	8-11y	12-16y
Iron																						
Bread, excluding wholemeal	11	10	12	12	***<0.001***	***<0.001***$^{\uparrow}$	12	10	12	12	***<0.001***	***<0.001***$^{\uparrow}$	11	11	11	12	*NS*	***0.048***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Unsweetened breakfast cereals, including muesli	11	13	10	9	***<0.001***	***<0.001***$^{\downarrow}$	12	13	11	10	***0.003***	***0.001***$^{\downarrow}$	10	12	10	7	***<0.001***	***<0.001***$^{\downarrow}$	***0.001***	*NS*	*NS*	***<0.001***
Biscuits, cakes & pastries	8	9	9	8	***<0.001***	***<0.001***$^{\downarrow}$	8	9	9	8	***0.024***	***0.010***$^{\downarrow}$	9	9	9	8	***0.007***	***0.026***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Calcium																						
Bread, excluding wholemeal	9	8	10	10	***<0.001***	***<0.001***$^{\uparrow}$	9	8	10	11	***<0.001***	***<0.001***$^{\uparrow}$	9	8	10	10	***<0.001***	***<0.001***$^{\uparrow}$	*NS*	*NS*	*NS*	*NS*
Biscuits, cakes & pastries	5	5	6	5	***0.013***	*NS*	5	5	5	5	*NS*	*NS*	5	5	6	5	***0.014***	*NS*	*NS*	*NS*	*NS*	*NS*
Milk & cream	28	29	28	27	*NS*	***0.040***$^{\downarrow}$	30	31	30	29	*NS*	*NS*	27	28	26	26	*NS*	*NS*	***<0.001***	***0.016***	***0.007***	***0.044***
Cheese	5	6	5	5	***0.010***	***0.025***$^{\downarrow}$	5	5	5	5	*NS*	*NS*	6	7	5	5	***0.005***	***0.007***$^{\downarrow}$	***0.006***	***0.003***	*NS*	*NS*
Yoghurt & fromage frais	9	12	9	6	***<0.001***	***<0.001***$^{\downarrow}$	9	12	9	6	***<0.001***	***<0.001***$^{\downarrow}$	9	12	10	6	***<0.001***	***<0.001***$^{\downarrow}$	*NS*	*NS*	*NS*	*NS*
Base (weighted)	*1674*	*558*	*474*	*642*			*853*	*285*	*242*	*325*			*821*	*273*	*231*	*317*						
Base (unweighted)	*1674*	*581*	*505*	*588*			*871*	*307*	*272*	*292*			*803*	*274*	*233*	*296*						

[1]Food groups contributing ≥5% in all participants

[2]Overall association with age group

[3]Linear association with age group

$^{\uparrow}$Percentage increases with age group

$^{\downarrow}$Percentage decreases with age group

NS, non-significant

Table 6.5 Mean percentage contributions of food groups[1] to intake of other nutrients, by SIMD quintile

	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p[2]	p[3]
Total fat							
Biscuits, cakes & pastries	11	10	10	10	9	***0.001***	***<0.001***↓
Milk & cream	8	8	8	8	8	*NS*	*NS*
Processed meat, including sausages, burgers, coated chicken	8	8	8	9	10	***<0.001***	***<0.001***↑
Crisps & savoury snacks	6	6	7	7	8	***<0.001***	***<0.001***↑
Saturated fatty acids							
Biscuits, cakes & pastries	12	11	11	11	10	***0.005***	***<0.001***↓
Milk & cream	12	12	13	12	13	*NS*	*NS*
Cheese	6	6	6	5	5	***0.014***	***0.005***↓
Processed meat, including sausages, burgers, coated chicken	7	7	7	8	9	***<0.001***	***<0.001***↑
Confectionery	5	5	5	6	6	*NS*	***0.009***↑
Protein							
Pasta, rice, pizza & other cereals	6	6	5	5	5	*NS*	*NS*
Bread, excluding wholemeal	8	8	8	8	9	*NS*	***0.020***↑
Milk & cream	13	13	13	13	13	*NS*	*NS*
Meats & meat dishes, excluding processed meat	11	11	10	10	9	***<0.001***	***<0.001***↓
Processed meat, including sausages, burgers, coated chicken	7	7	8	8	9	***<0.001***	***<0.001***↑
Non-starch polysaccharides							
Pasta, rice, pizza & other cereals	6	6	5	6	5	*NS*	*NS*
Bread, excluding wholemeal	11	10	11	12	12	***0.026***	***0.004***↑
Biscuits, cakes & pastries	7	7	7	7	6	***0.027***	***0.002***↓
Vegetables, excluding potatoes & baked beans	12	12	11	9	8	***<0.001***	***<0.001***↓
Crisps & savoury snacks	5	5	5	6	7	***<0.001***	***<0.001***↑
Fruit, excluding fruit juice	17	17	16	15	14	***0.004***	***<0.001***↓
Iron							
Bread, excluding wholemeal	11	10	12	12	12	***0.018***	***0.005***↑
Unsweetened breakfast cereals, including muesli	11	10	11	10	10	*NS*	*NS*
Biscuits, cakes & pastries	9	9	9	8	8	***0.005***	***<0.001***↓
Calcium							
Bread, excluding wholemeal	9	9	9	10	10	*NS*	***0.018***↑
Biscuits, cakes & pastries	6	5	5	5	5	***0.009***	***<0.001***↓
Milk & cream	28	28	28	28	28	*NS*	*NS*
Cheese	6	6	6	5	5	***0.008***	***0.007***↓
Yoghurt & fromage frais	9	9	9	9	9	*NS*	*NS*
Base (weighted)	*370*	*337*	*292*	*307*	*368*		
Base (unweighted)	*409*	*355*	*305*	*291*	*314*		

[1]Food groups contributing ≥5% in all participants

[2]Overall association with SIMD quintile

[3]Linear association with SIMD quintile

↑Percentage increases from 5th (least deprived) to 1st (most deprived) quintile

↓Percentage decreases from 5th (least deprived) to 1st (most deprived) quintile

NS, non-significant

Table 6.6 Daily intake of other macronutrients in relation to Dietary Reference Values and Scottish Dietary Targets in children aged 4-16 years, by sex and age group

Mean and 95% CI	Boys				Girls			
	4-6y	7-10y	11-14y	15-16y	4-6y	7-10y	11-14y	15-16y
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	32.8	33.3	33.2	32.6	32.6	32.9
Lower limit (% of food energy)	32.1	32.0	32.3	32.4	32.6	32.0	32.0	32.0
Upper limit (% of food energy)	33.4	33.1	33.3	34.2	33.8	33.1	33.2	33.8
Mean intake (% of population average)	94	93	93	95	95	93	93	94
Lower limit (% of population average)	92	91	92	93	93	92	91	91
Upper limit (% of population average)	95	95	95	98	96	95	95	96
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)	13.5	13.1	13.2	13.4	13.5	13.1	12.7	12.6
Lower limit (% of food energy)	13.2	12.9	13.0	12.9	13.2	12.7	12.4	12.2
Upper limit (% of food energy)	13.9	13.4	13.5	14.0	13.8	13.4	13.0	13.1
Mean intake (% of population average)	123	119	120	122	123	119	115	115
Lower limit (% of population average)	120	117	118	117	120	116	113	111
Upper limit (% of population average)	126	122	123	127	126	122	118	119
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)	60.5	60.5	61.2	61.9	58.6	57.0	49.8	48.9
Lower limit (g)	58.1	57.9	58.2	57.9	55.9	54.3	47.8	45.7
Upper limit (g)	62.9	63.2	64.4	66.2	61.5	59.7	51.9	52.4
Mean intake (% of RNI)[1]	307	214	146	112	298	202	121	109
Lower limit (% of RNI)	295	205	139	105	284	192	116	102
Upper limit (% of RNI)	320	224	153	120	312	211	126	117
Base (weighted)	*178*	*238*	*250*	*136*	*166*	*215*	*242*	*138*
Base (unweighted)	*193*	*261*	*265*	*102*	*172*	*220*	*244*	*114*

[1]Calculated for each respondent using the RNI appropriate for age group and sex

CI, confidence interval

Table 6.7 Daily intake of iron and calcium in relation to Dietary Reference Values in children aged 4-16 years, by sex and age group

Mean and 95% CI	Boys				Girls			
	4-6y	7-10y	11-14y	15-16y	4-6y	7-10y	11-14y	15-16y
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)	8.9	9.2	9.5	9.2	8.5	8.6	7.5	7.4
Lower limit (mg)	8.5	8.7	9.0	8.5	8.1	8.2	7.1	7.0
Upper limit (mg)	9.3	9.7	10.0	10.0	8.9	9.0	7.9	7.9
Mean intake (% of RNI)[1]	147	107	86	83	141	101	52	52
Lower limit (% of RNI)	141	102	82	77	134	96	49	48
Upper limit (% of RNI)	154	113	90	90	147	106	54	55
Calcium								
Target								
DRV Reference Nutrient Intake (RNI) (mg)	450	550	1000	1000	450	550	800	800
Survey results								
Mean intake (mg)	1053	1026	984	986	982	920	811	794
Lower limit (mg)	1006	982	933	913	929	873	768	723
Upper limit (mg)	1102	1072	1037	1064	1037	971	857	870
Mean intake (% of RNI)[1]	234	187	99	99	219	168	102	100
Lower limit (% of RNI)	224	179	94	92	207	159	97	91
Upper limit (% of RNI)	245	195	104	107	231	177	108	110
Base (weighted)	*178*	*238*	*250*	*136*	*166*	*215*	*242*	*138*
Base (unweighted)	*193*	*261*	*265*	*102*	*172*	*220*	*244*	*114*

[1]Calculated for each respondent using the RNI appropriate for age group and sex

CI, confidence interval

Table 6.8 Daily intake of other nutrients in relation to Dietary Reference Values and Scottish Dietary Targets in children aged 4-16 years, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)
Total fat					
Mean intake (% of population average)	93	93	94	94	94
Lower limit (% of population average)	91	92	93	92	92
Upper limit (% of population average)	94	95	96	96	96
Saturated fatty acids					
Mean intake (% of population average)	118	120	122	119	118
Lower limit (% of population average)	116	117	120	116	116
Upper limit (% of population average)	120	122	125	122	121
Protein					
Mean intake (% of RNI)[1]	171	176	177	185	173
Lower limit (% of RNI)	163	167	164	173	165
Upper limit (% of RNI)	181	186	191	197	182
Iron					
Mean intake (% of RNI)[1]	88	91	89	95	91
Lower limit (% of RNI)	83	86	83	90	86
Upper limit (% of RNI)	93	96	95	100	96
Calcium					
Mean intake (% of RNI)[1]	136	141	143	148	144
Lower limit (% of RNI)	129	133	133	138	137
Upper limit (% of RNI)	144	149	155	159	152
Base (weighted)	*355*	*314*	*268*	*281*	*344*
Base (unweighted)	*393*	*332*	*282*	*269*	*295*

[1]Calculated for each respondent using the RNI appropriate for age group and sex

CI, confidence interval

7. Overweight and obesity

This chapter describes the prevalence of overweight and obesity in all children and in sub-groups of age, sex and deprivation category. The association between overweight and obesity and the intake of (i) selected food groups high in fat or sugars and (ii) the intake of energy, fat and sugars (expressed as a percentage of energy) is also presented. Finally, the prevalence of overweight and obesity is compared with the prevalence found in the 2010 Scottish Health Survey (SHeS)[1] and the 2006 survey[2].

Summary

- 31% of all children were *overweight including obese* (≥85th percentile): 15% were *overweight but not obese* and 17% were *obese* (≥95th percentile). 10% of children were *severely obese* (≥98th percentile).
- Boys were more likely to be *overweight including obese* than girls (34% versus 28%).
- In boys, the prevalence of *overweight including obese* was lower in 3-7 year olds (27%) than in 8-11 year olds (40%) or 12-16 year olds (36%). There was no difference in prevalence between age groups in girls.
- The prevalence of *overweight including obese* increased with deprivation, from 25% in the least deprived quintile to 38% in the most deprived quintile.
- Overall mean BMI z-score was 0.53, indicating that on average the values were 0.53 SD above the mean values in the reference population.
- The prevalence of *underweight* (≤5th percentile) was low (2% in boys and 3% in girls).
- Overall, 48% of all children had a waist circumference ≥85th percentile and 21% had a waist circumference ≥98th percentile. The highest percentage of children with a waist circumference ≥98th percentile was in girls aged 12-16 years (31%).
- Waist circumference z-score increased with age group in both boys and girls. In 12-16 year olds, girls had a greater waist circumference z-score than boys (1.37 versus 0.98).
- Mean intake of non-diet soft drinks increased from 107g/day in *neither overweight nor obese* children to 129g/day in *overweight but not obese* children and 125g/day in *obese* children.
- Mean saturated fatty acid intake (as % food energy) was lower in *obese* children (12.8%) compared with children who were *neither overweight nor obese* or *overweight but not obese* (13.2% in both groups).
- The prevalence of *overweight including obese* increased (but not statistically significantly) in boys from 30% in 2006 to 34% in 2010, but decreased significantly in girls from 33% in 2006 to 28% in 2010.
- The prevalence of *overweight including obese* found in the 2010 SHeS was 30% in 2-15 year olds which is similar to the prevalence of 29% in 3-15 year olds in this survey when calculated using the same methodology as the SHeS, i.e. excluding children with a BMI z-score >3.

7.1 Height and weight measurements

7.1.1 Height and weight measurements by age and sex

Table 7.1 shows the mean height and weight of children with reliable measurements. Height and weight increased linearly with age group in both boys and girls, as expected. There was no significant difference between boys and girls in either height or weight in the two younger age groups (3-7 and 8-11 years). However, in children aged 12-16 years, boys were significantly taller than girls by 5.8cm on average (166.2cm versus 160.4cm), and significantly heavier than girls by 2.3kg on average (57.1kg versus 54.8kg).

Table 7.1

7.1.2 Height and weight measurements by SIMD quintile

There was a significant overall association between mean height and SIMD quintile, such that mean values were highest in children in the least deprived (5^{th}) quintile (141.6cm), and lowest in children in the 3^{rd} quintile (136.1cm). The same pattern was seen for weight, with the highest mean weight in the least deprived quintile (35.6kg) and the lowest mean weight in the 3^{rd} quintile (32.3kg), however the association between weight and SIMD quintile was not statistically significant.

Table 7.2

7.2 Body mass index and the prevalence of overweight and obesity

Body mass index (BMI) was calculated for the 1816 participants who had reliable measurements of both height and weight. BMI was calculated by dividing weight in kilograms by height in metres squared. The majority (94%) of the sample were aged <16 years (6% were aged 16 years), therefore the UK 1990 centile charts[3-4] were used to classify children as shown in Table 2.5 and summarized below.

Underweight: BMI $\leq 5^{th}$ percentile
Healthy weight: BMI $>5^{th}$ and $<85^{th}$ percentile
Overweight but not obese: BMI $\geq 85^{th}$ and $<95^{th}$ percentile
Obese but not severely obese: BMI $\geq 95^{th}$ and $<98^{th}$ percentile
Severely obese: BMI $\geq 98^{th}$ percentile

In this chapter, *underweight* and *healthy weight* categories have been combined in some tables, and are described as *neither overweight nor obese*.

Anthropometric data are also described using z-scores: the number of standard deviations (SD) above or below the mean population value. A z-score of zero for a child indicates that the child has the same measurement as the mean value for the population. A positive z-score indicates that the child has a measurement above the mean for the population, and a negative z-score indicates that the child has a measurement below the population mean.

7.2.1 BMI and BMI z-score

7.2.1.1 BMI and BMI z-score by age and sex

There was a positive association between mean BMI and age group in both boys and girls. In boys, mean BMI increased from 16.3 kg/m^2 in 3-7 year olds to 20.5 kg/m^2 in 12-16 year olds. In girls, the corresponding increase was from 16.2 kg/m^2 to 21.1 kg/m^2. There was no significant difference between boys and girls in mean BMI in the two youngest age groups (3-7 and 8-11 years), however girls aged 12-16 years had a significantly higher mean BMI than boys of the same age.

The overall mean BMI z-score was 0.53, indicating that on average the values were 0.53 SD above the mean values in the reference population. In boys, mean BMI z-score was significantly different between age groups such that 8-11 years olds had a higher mean z-score than boys aged 3-7 or 12-16 years. There was no significant difference between age groups in mean BMI z-score in girls. Mean BMI z-score was higher in boys than in girls in all age groups, but the difference was only significant for the 8-11 year old age group (0.75 in boys versus 0.45 in girls).

Table 7.1

7.2.1.2 BMI and BMI z-score by SIMD quintile

There was a significant overall association between BMI and SIMD quintile, but no evidence of a linear association: children in the 3rd quintile had the lowest mean BMI (17.8 kg/m^2) and children in the most deprived (1st) quintile had the highest mean BMI (18.6 kg/m^2). Mean BMI z-score was significantly positively associated with SIMD quintile, such that children in the least deprived quintile had the lowest z-score for BMI (0.40) and children in the most deprived quintile had the highest z-score for BMI (0.68).

Table 7.2

7.2.2 Prevalence of underweight, overweight and obesity

7.2.2.1 Prevalence of underweight, overweight and obesity by age and sex

Table 7.3 shows the prevalence of underweight, overweight and obesity in children with reliable height and weight measurements. The 95% confidence intervals indicate the reliability of the estimates, and reflect the relatively small sample size in some groups.

The prevalence of *underweight* amongst children was low at 2% (2% in boys and 3% in girls) compared to an expected value of 5% for the 5th percentile. Two thirds (66%) of children had a BMI within the *healthy weight* range (i.e. >5th percentile and <85th percentile), and this proportion decreased with age, from 71% in the youngest age group (3-7 years) to 64% in the oldest age group (12-16 years). More girls than boys had a *healthy weight* (69% in girls versus 64% in boys).

Overall, nearly one third (31%) of children were *overweight including obese*: 15% were *overweight but not obese*, 17% were *obese*, and 10% were *severely obese*. Boys were significantly more likely to be *overweight including obese* than girls (34% versus 28%), and this difference between sexes was largest in 8-11 year olds (40% in boys and 30% in girls). The prevalence of *overweight including obese* was significantly lower in younger boys aged 3-7 years (27%) compared with boys aged 8-11 years (40%) or 12-16 years (36%), but there was no significant difference between the age groups in girls.

Table 7.3

7.2.2.2 Prevalence of underweight, overweight and obesity by SIMD quintile

BMI classification was significantly associated with level of deprivation (Table 7.4). The prevalence of *overweight including obese* increased with deprivation, from 25% in the least deprived (5th) quintile to 38% in the most deprived (1st) quintile. The prevalence of obesity (including severe obesity) was nearly twice as high in the most deprived quintile (23%) compared with the least deprived quintile (12%).

Table 7.4

7.3 Waist circumference

Mean waist circumference was calculated for the 1810 participants who had two successful waist circumference measurements that were within 2cm of each other. The UK waist circumference charts[5] were then used to classify children using the same percentiles as for the BMI classification: <85th percentile, ≥85th and <95th percentile, ≥95th and <98th percentile, and ≥98th percentile. Waist circumference is also described using z-scores (see description in section 7.2). Waist circumference has been recommended for diagnosis of metabolic syndrome in children[6] and it has been suggested that both BMI and waist circumference may be useful in identifying children with increased health risks[7] (see Section 2.3).

7.3.1 Waist circumference and waist circumference z-score

7.3.1.1 Waist circumference by age and sex

Table 7.5 shows that waist circumference and waist circumference z-score increased linearly with age group in both boys and girls. In the two youngest age groups (3-7 and 8-11 years), there was no significant difference between boys and girls in mean waist circumference or mean waist circumference z-score. However, in 12-16 year olds, boys had a significantly greater waist circumference than girls (73.9cm versus 71.6cm), but girls had a significantly greater waist circumference z-score than boys (1.37 versus 0.98).

Table 7.5

7.3.1.2 Waist circumference by SIMD quintile

Table 7.6 shows that waist circumference and waist circumference z-score were significantly associated with deprivation such that the greatest values were found in children in the most deprived (1st) quintile (63.9cm and 1.19 SD), and the smallest values were found in children in the 3rd quintile (60.8cm and 0.86 SD).

Table 7.6

7.3.2 Categories of waist circumference

7.3.2.1 Categories of waist circumference by age and sex

Table 7.7 shows the proportion of children in each category of waist circumference, with 95% confidence intervals to indicate the reliability of the prevalence estimates. Around half (48%) of all children had a waist circumference ≥85th percentile, and this proportion increased significantly with age, from 38% in children aged 3-7 years to 52% in children aged 12-16 years. One fifth of all children (21%) had a waist circumference ≥98th percentile, and this proportion increased from 14% in 3-7 year olds to 26% in 12-16 year olds.

Girls were significantly more likely than boys to have a waist circumference ≥85th percentile (51% versus 44%), and a waist circumference ≥98th percentile (24% versus 19%). The difference between the sexes was most pronounced in the oldest children (12-16 years), with 31% of girls having a waist circumference ≥98th percentile compared with 20% of boys.

Table 7.7

7.3.2.2 Categories of waist circumference by SIMD quintile

There was no significant association between the 2 group classification of waist circumference and level of deprivation (Table 7.8). However, the 4 group classification was significantly associated with deprivation such that the proportion of children with a waist circumference ≥98th percentile was highest in children from the most deprived areas (28%) and lowest in children from the 3rd quintile (17%) and least deprived areas (18%).

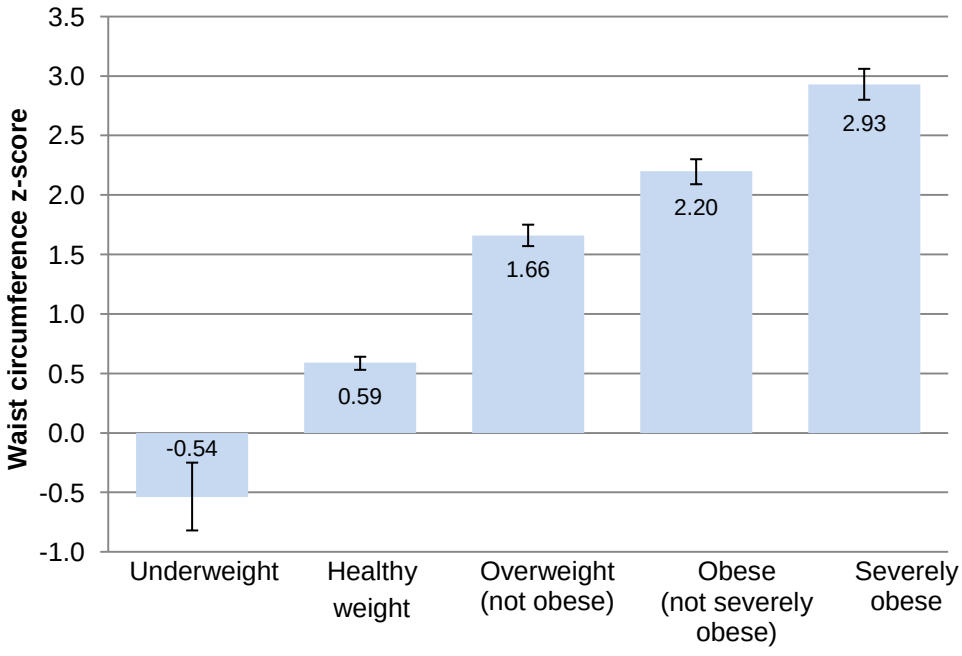
Table 7.8

7.3.3 Association between waist circumference and BMI classification

As expected, mean waist circumference z-score increased linearly with BMI classification (Figure 7.1). In *underweight* children, mean waist circumference z-score was negative (-0.54), indicating that on average the values were 0.54 SD below the mean values in the reference population. The mean waist circumference z-scores were positive in *healthy weight*, *overweight but not obese*, *obese but not severely obese*, and *severely obese* children.

Figure 7.1

Figure 7.1 Mean (95% CI) waist circumference z-score, by BMI classification*

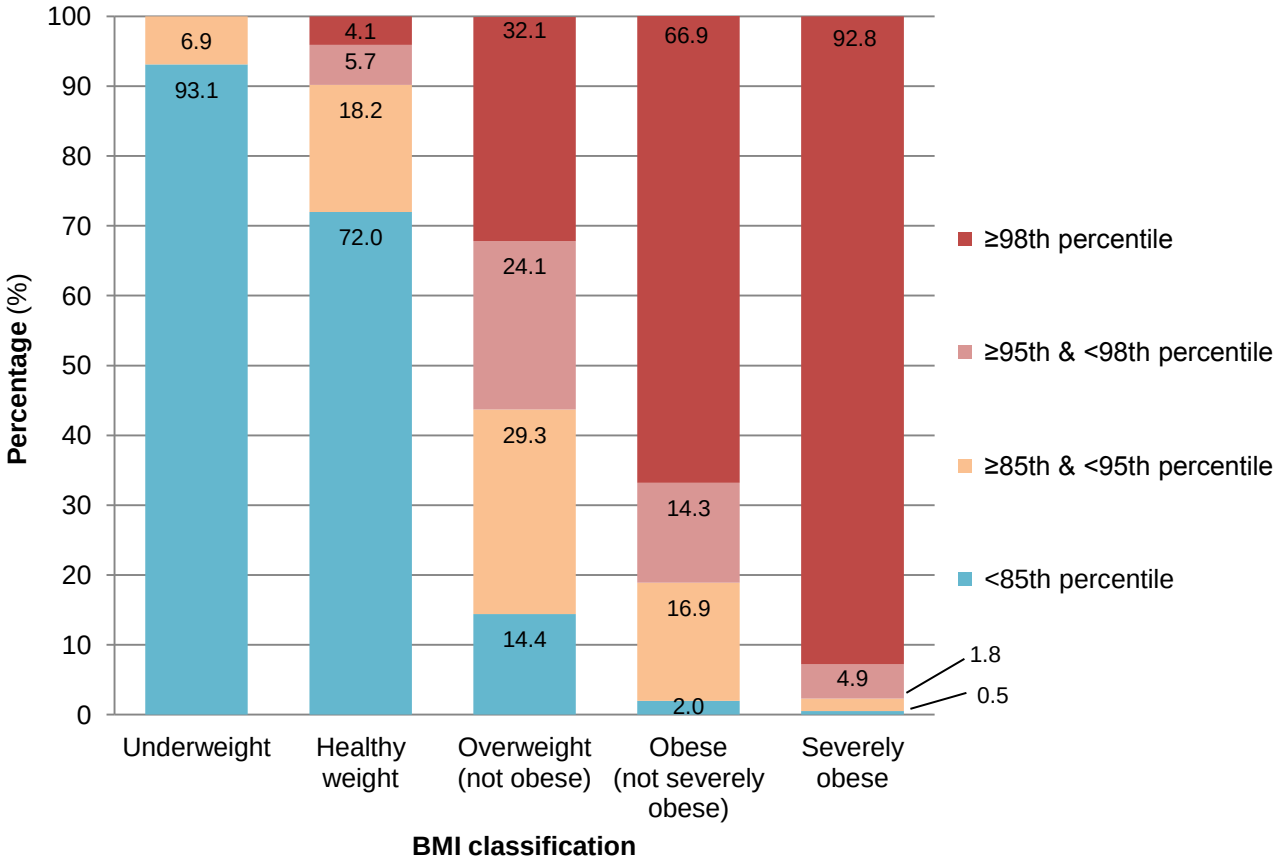


*Weighted (unweighted) base: underweight, 43 (42); healthy weight, 1187 (1203); overweight (not obese), 261 (264); obese (not severely obese), 127 (122); severely obese, 168 (161).

The classification of children based on the 85th, 95th and 98th percentiles using BMI did not always match the classification using waist circumference (Figure 7.2). For example, of the children classified as having a *healthy weight* by the BMI classification, 28% had a waist circumference ≥85th percentile, including 4% with a waist circumference ≥98th percentile. Furthermore, of the children classified as *overweight but not obese* by the BMI classification, 14% had a waist circumference <85th percentile and 32% had a waist circumference ≥98th percentile.

Figure 7.2

Figure 7.2 Percentage of children in each waist circumference category, by BMI classification*



*Weighted (unweighted) base: underweight, 43 (42); healthy weight, 1187 (1203); overweight (not obese), 261 (264); obese (not severely obese), 127 (122); severely obese, 168 (161).

7.4 Association between intake of selected food groups and overweight and obesity

Of the 1816 children who had reliable height and weight measurements, 1584 children had an FFQ available for analysis. Table 7.9 presents the mean intakes of selected food groups (those contributing at least 10% to intake of saturated fatty acids or NMES) in relation to overweight and obesity in these 1584 children.

The mean intake of non-diet soft drinks increased significantly from 107g/day in *neither overweight nor obese* children to 129g/day in *overweight but not obese* children and 125g/day in *obese* children. No significant association between BMI classification and non-diet soft drinks was found in the 2006 survey[2]. There was no evidence for any association between BMI classification and the intakes of (i) biscuits, cakes and pastries, (ii) milk and cream, or (iii) confectionery. These results should be interpreted with caution however, as they could be influenced by dieting and/or under-reporting in the overweight and obese children.

Table 7.9

7.5 Association between intake of macronutrients and overweight and obesity

Table 7.10 shows the mean intakes of energy and percentage energy as fat, saturated fatty acids, total sugars and NMES by BMI classification in 1584 children who had reliable height and weight measurements and an FFQ available for analysis. There was no evidence for an association between overweight and obesity and intake of energy or percentage energy from total fat, total sugars or NMES.

Mean saturated fatty acid intake was significantly lower in *obese* children (12.8% food energy) compared with children who were *neither overweight nor obese* or *overweight but not obese* (13.2% food energy in both groups). This finding of a lower percentage energy from saturated fatty acids in obese children compared with other children is consistent with that found in 2006[2].

Table 7.10

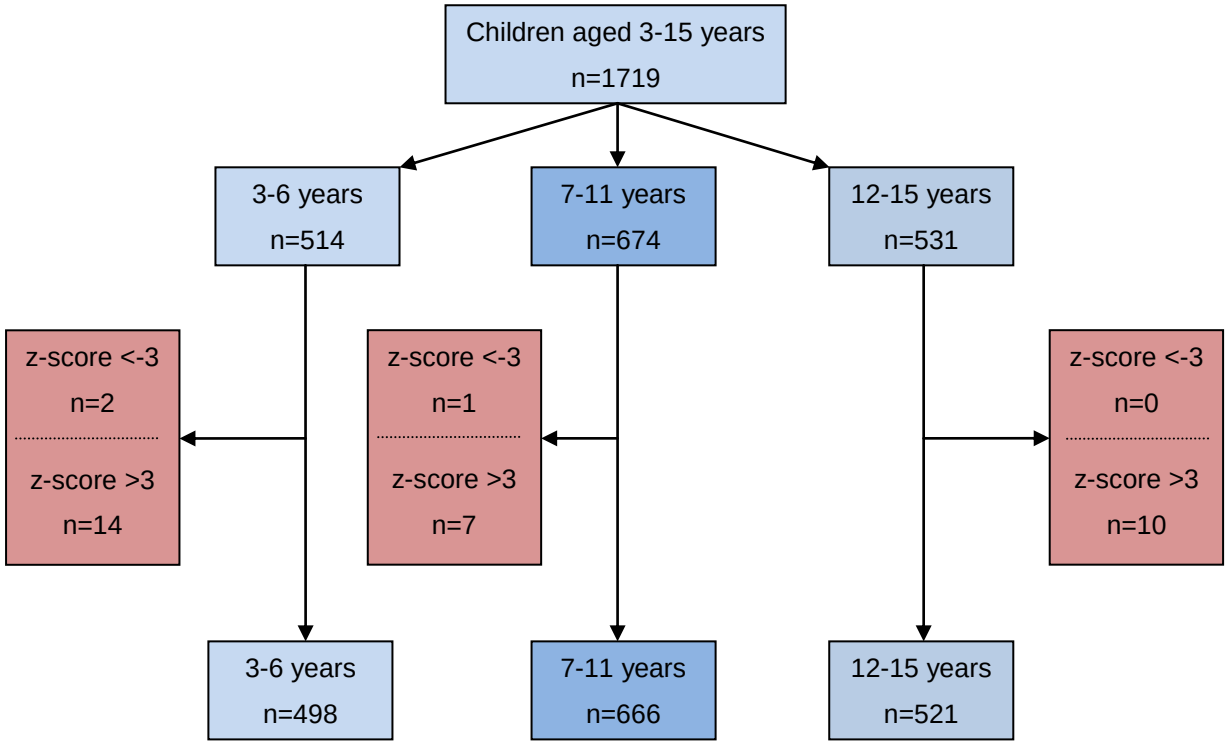
7.6 Comparison with the 2010 Scottish Health Survey

The 2010 Scottish Health Survey (SHeS) report includes data on the prevalence of overweight and obesity for 1199 children within 3 age groups (2-6 years, 7-11 years and 12-15 years), and excludes children whose BMI was more than 3 standard deviations (SD) above or below the norm for their age[1]. This section compares the prevalence of overweight and obesity found in the 2010 SHeS with the prevalence found in this survey, using similar age groups and exclusion criteria as in the SHeS.

Of 1719 children aged 3-15 years who had reliable height and weight measurements for the calculation of BMI, only 3 children (<1%) with a BMI z-score <-3 were excluded, and 31 severely obese children (2%) with a BMI z-score >3 were excluded.

Figure 7.3

Figure 7.3 Exclusion of children with BMI z-score <-3 or z-score >3



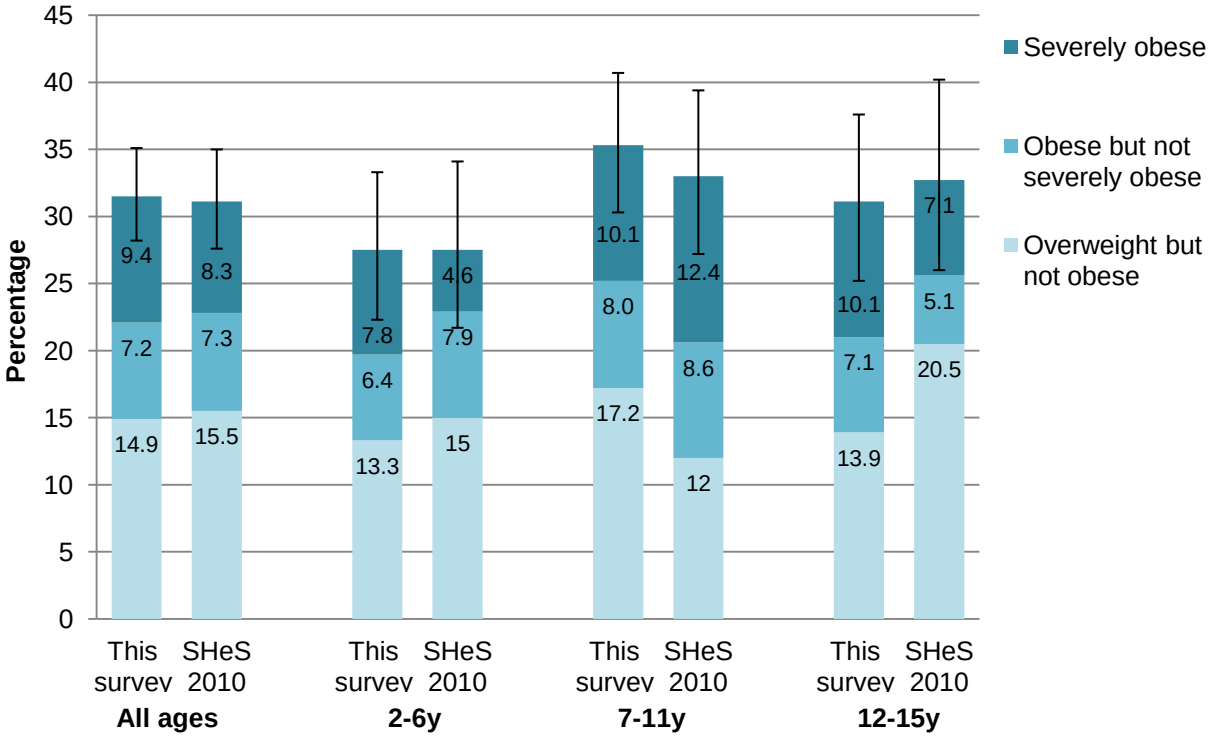
The overall prevalence of *overweight including obese* found in the 2010 SHeS was 30% in 2-15 year olds which is similar to the prevalence of 29% in 3-15 year olds found in the current survey. The prevalence of *obese but not severely obese* was similar between the surveys (7% in both surveys), as was the prevalence of *severely obese* (7% in the 2010 SHeS and 8% in this survey).

Amongst boys, the prevalence of *overweight including obese* in this survey was similar to that found in the 2010 SHeS, in all children (32% versus 31% respectively) and in all age groups (Figure 7.4). In girls, the prevalence of *overweight including obese* in this survey was slightly lower than in the 2010 SHeS in all children (27% versus 29% respectively) and in the 12-15 year olds (29% versus 34% respectively).

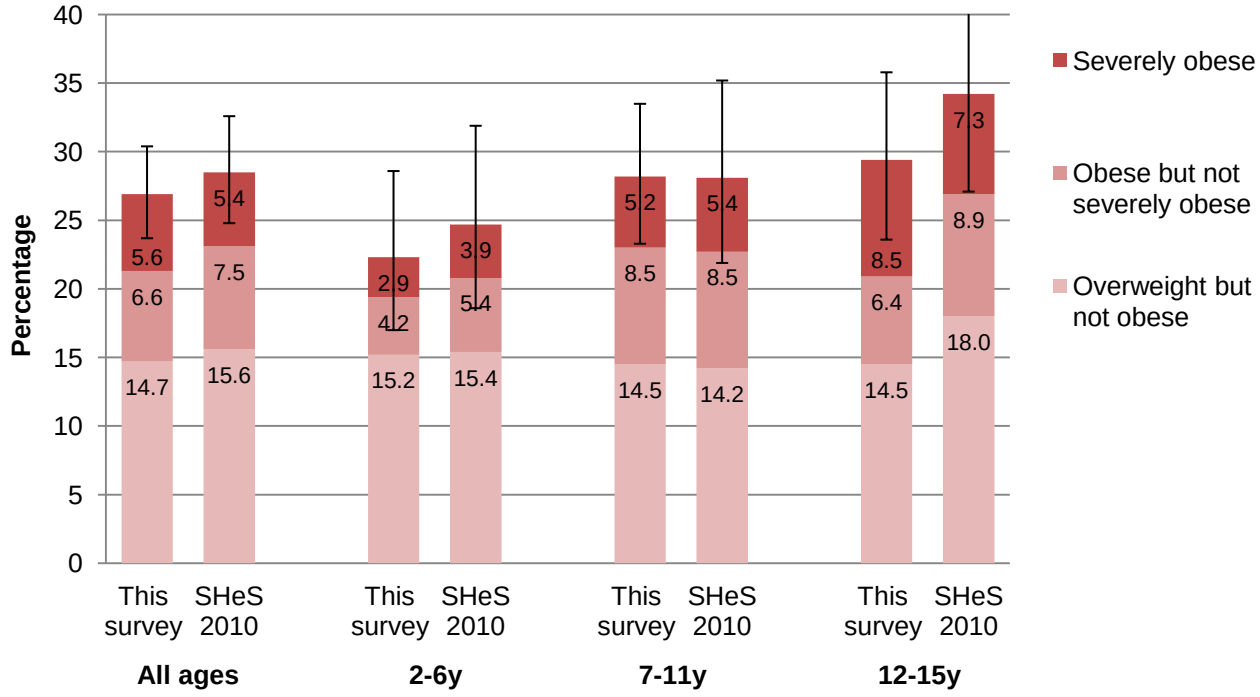
Figure 7.4

Figure 7.4 Prevalence (95% CI) of overweight and obesity in this survey and in the 2010 Scottish Health Survey (SHeS), by age group[1]

A. Boys



B. Girls



[1]Excludes children with BMI >3 SD above or below the norm for their age, to be consistent with SHeS methodology

7.7 Comparison with prevalence of overweight and obesity in 2006

Figure 7.5 compares the prevalence of overweight and obesity between 2006 (in 1615 children aged 3-17 years) and 2010 (in 1816 children aged 3-16 years). The prevalence of overweight and obesity in 2006 presented in this report may differ by up to 1% from that presented in the original report[2] because the original BMI classifications were based on BMI z-scores calculated to 2 decimal places, whereas BMI z-scores were calculated to 6 decimal places for the current report. Five children (0.3%) who were classified as *obese* in 2006 are classified as *overweight but not obese* with this method. These 5 children included 2 boys aged 8-11 years, 2 boys aged 12-17 years, and 1 girl aged 12 years.

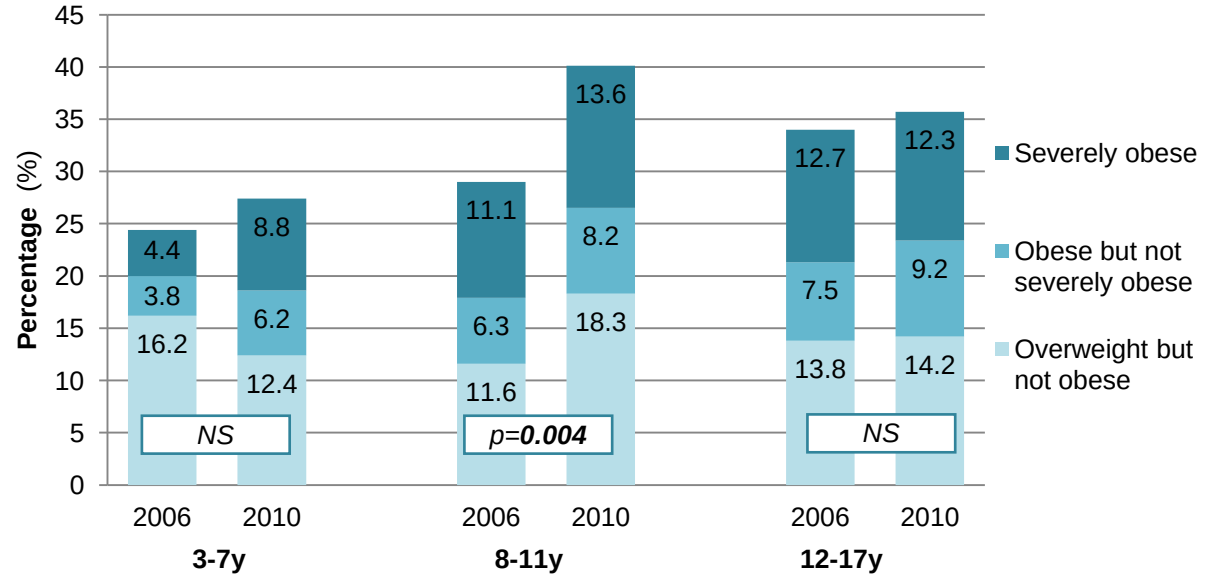
In boys, the prevalence of *overweight including obese* increased from 30% in 2006 to 34% in 2010, although this increase did not reach statistical significance. The largest increase occurred in the 8-11 year age group (29% to 40%, *p=0.004*). There was no significant change in the percentage who were *overweight including obese* in 3-7 or 12-17 year old boys. In 3-7 year old boys, however, the prevalence of *overweight but not obese* decreased by 4 percentage points whilst the prevalence of *obesity* increased by 7 percentage points, which included a doubling in the prevalence of severe obesity. In 8-11 year old boys, the proportion of children who were *overweight but not obese* and *obese* rose by 7 and 4 percentage points respectively. In 12-17 year old boys, there was little change in the prevalence of *overweight but not obese* and *obesity*.

In girls, the prevalence of *overweight including obese* decreased significantly from 33% in 2006 to 28% in 2010 (*p=0.046*). This decrease occurred in all age groups, although none of these decreases reached statistical significance. The largest decreases occurred in the 3-7 year age group (5 percentage point decrease) and the 12-17 year age group (6 percentage point decrease). Whilst the proportion of 3-7 year old girls who were *overweight but not obese* increased by 2 percentage points between 2006 and 2010, the prevalence of *obesity* in this group decreased from 18% to 11%. In 8-11 year old girls, the proportion of girls who were *severely obese* reduced from 9% to 5%. In 12-17 year old girls, the prevalence of both *overweight but not obese* and *obesity* decreased.

Figure 7.5

Figure 7.5 Prevalence of overweight and obesity in 2006 and 2010, by age group

A. Boys



A. Girls

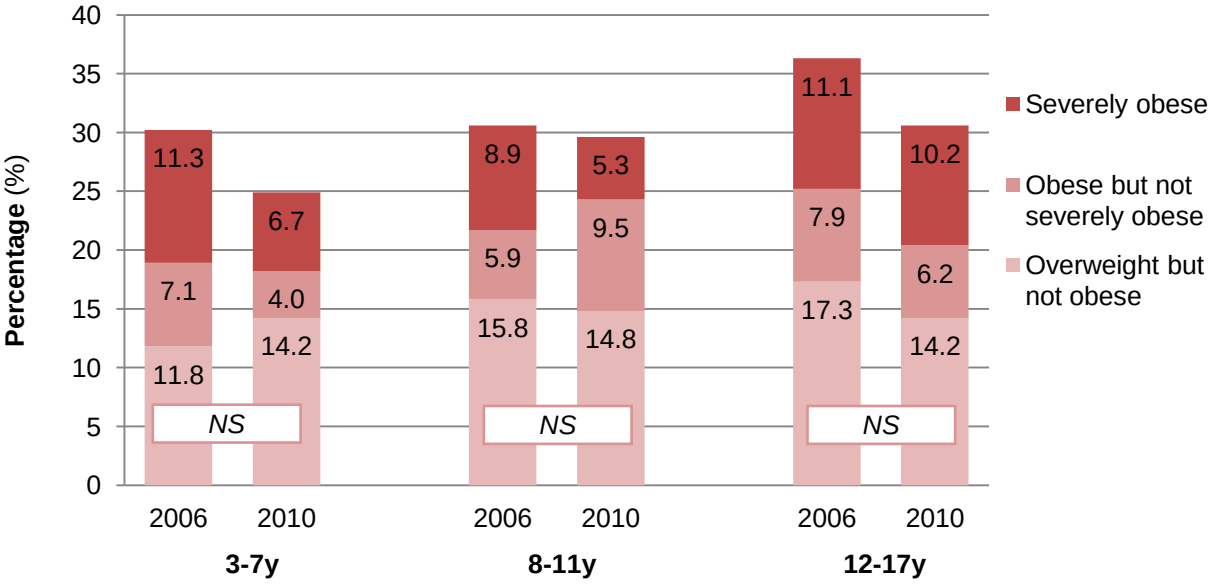


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Table 7.1 Mean height, weight, BMI and BMI z-score, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Height (cm)																						
Mean	139.5	112.6	139.4	163.4	***<0.001***	***<0.001***	140.8	113.4	139.7	166.2	***<0.001***	***<0.001***	138.0	111.8	139.0	160.4	***<0.001***	***<0.001***	***0.014***	*NS*	*NS*	***<0.001***
Lower limit	138.2	111.8	138.5	162.6			139.1	112.3	138.6	164.9			136.4	110.5	137.8	159.6						
Upper limit	140.7	113.4	140.2	164.2			142.6	114.4	140.7	167.6			139.7	113.1	140.3	161.1						
Weight (kg)																						
Mean	34.7	20.6	35.2	56.0	***<0.001***	***<0.001***	35.3	20.9	35.6	57.1	***<0.001***	***<0.001***	34.2	20.3	34.9	54.8	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	***0.031***
Lower limit	33.9	20.3	34.5	55.0			34.1	20.5	34.5	55.4			33.0	19.7	33.9	53.6						
Upper limit	35.6	20.9	36.0	57.0			36.4	21.3	36.8	58.9			35.4	20.8	35.8	56.0						
BMI (kg/m^2)																						
Mean	18.2	16.2	18.0	20.8	***<0.001***	***<0.001***	18.2	16.3	18.1	20.5	***<0.001***	***<0.001***	18.2	16.2	17.9	21.1	***<0.001***	***<0.001***	*NS*	*NS*	*NS*	***0.031***
Lower limit	18.0	16.1	17.8	20.5			18.0	16.1	17.7	20.1			18.0	15.9	17.6	20.7						
Upper limit	18.4	16.4	18.2	21.1			18.4	16.4	18.5	20.9			18.5	16.4	18.2	21.5						
BMI z-score																						
Mean	0.53	0.44	0.60	0.55	***0.007***	*NS*	0.59	0.48	0.75	0.58	***0.006***	*NS*	0.46	0.40	0.45	0.52	*NS*	*NS*	***0.024***	*NS*	***0.002***	*NS*
Lower limit	0.47	0.35	0.52	0.45			0.51	0.36	0.61	0.44			0.37	0.26	0.33	0.39						
Upper limit	0.58	0.53	0.68	0.65			0.67	0.60	0.89	0.72			0.54	0.53	0.56	0.65						
Base (weighted)																						
Height	*1820*	*616*	*512*	*693*			*933*	*320*	*255*	*358*			*888*	*296*	*257*	*335*						
Weight	*1821*	*625*	*511*	*686*			*937*	*325*	*255*	*357*			*884*	*299*	*256*	*329*						
BMI & BMI z-score	*1810*	*616*	*511*	*684*			*932*	*320*	*255*	*357*			*879*	*296*	*256*	*327*						
Base (unweighted)																						
Height	*1825*	*645*	*544*	*636*			*953*	*345*	*284*	*324*			*872*	*300*	*260*	*312*						
Weight	*1827*	*654*	*543*	*630*			*958*	*351*	*284*	*323*			*869*	*303*	*259*	*307*						
BMI & BMI z-score	*1816*	*645*	*543*	*628*			*952*	*345*	*284*	*323*			*864*	*300*	*259*	*305*						

[1]Overall association with age group

[2]Linear association with age group

CI, confidence interval

NS, non-significant

Table 7.2 Mean height, weight, BMI and BMI z-score, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Height (cm)							
Mean	141.6	140.8	136.1	138.9	139.3	***0.029***	*NS*
Lower limit	139.3	138.3	133.3	136.3	137.2		
Upper limit	143.9	143.2	138.9	141.5	141.5		
Weight (kg)							
Mean	35.6	35.5	32.3	34.6	35.3	*NS*	*NS*
Lower limit	34.0	33.8	30.5	32.7	33.9		
Upper limit	37.2	37.4	34.2	36.6	36.8		
BMI (kg/m^2)							
Mean	18.1	18.3	17.8	18.2	18.6	***0.032***	*NS*
Lower limit	17.8	17.9	17.5	17.8	18.3		
Upper limit	18.4	18.7	18.2	18.7	18.9		
BMI z-score							
Mean	0.40	0.55	0.43	0.57	0.68	***0.030***	***0.007***$^{\uparrow}$
Lower limit	0.29	0.42	0.32	0.42	0.55		
Upper limit	0.52	0.68	0.55	0.72	0.80		
Base (weighted)							
Height	*405*	*366*	*329*	*329*	*391*		
Weight	*403*	*368*	*330*	*332*	*388*		
BMI & BMI z-score	*403*	*365*	*329*	*328*	*385*		
Base (unweighted)							
Height	*430*	*386*	*343*	*316*	*350*		
Weight	*428*	*389*	*344*	*319*	*347*		
BMI & BMI z-score	*428*	*385*	*343*	*315*	*345*		

[1]Overall association with SIMD quintile

[2]Linear association with SIMD quintile

[↑]Increases from 5th (least deprived) to 1st (most deprived) quintile

CI, confidence interval

NS, non-significant

Table 7.3 Prevalence of underweight, overweight and obesity in 2010, by sex and age group

BMI classification	Both boys & girls					Boys					Girls					*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y
	%	%	%	%		%	%	%	%		%	%	%	%					
5 group classification					***0.012***					***0.031***					***NS***	***0.018***	*NS*	***0.004***	*NS*
Underweight	2.4	3.2	0.9	2.8		1.7	2.7	0	2.1		3.1	3.7	1.8	3.5					
Lower limit[2]	1.7	2.1	0.3	1.8		1.1	1.4	-	1.1		2.1	2.1	0.7	1.9					
Upper limit[2]	3.3	4.7	2.4	4.4		2.8	5.0	-	4.2		4.6	6.5	4.7	6.4					
Healthy weight	66.3	70.7	64.2	64.0		64.2	70.0	59.8	62.2		68.6	71.4	68.6	65.9					
Lower limit[2]	63.8	66.8	60.3	59.9		60.4	64.8	54.0	55.9		65.2	65.8	62.7	60.6					
Upper limit[2]	68.7	74.3	68.0	67.9		67.9	74.6	65.4	68.1		71.8	76.4	74.0	70.9					
Overweight but not obese	14.5	13.3	16.6	14.2		14.7	12.4	18.3	14.2		14.4	14.2	14.8	14.2					
Lower limit[2]	13.0	10.7	13.8	11.5		12.4	9.3	14.5	10.1		12.3	10.4	11.2	10.8					
Upper limit[2]	16.2	16.4	19.7	17.3		17.3	16.3	22.9	19.6		16.7	19.0	19.4	18.3					
Obese but not severely obese	7.2	5.1	8.9	7.8		7.9	6.2	8.2	9.2		6.4	4.0	9.5	6.2					
Lower limit[2]	6.1	3.6	6.7	6.0		6.3	4.0	5.7	6.6		5.0	2.2	6.3	4.1					
Upper limit[2]	8.4	7.3	11.6	10.0		9.9	9.5	11.9	12.7		8.1	7.1	14.0	9.4					
Severely obese	9.6	7.8	9.5	11.3		11.5	8.8	13.6	12.3		7.6	6.7	5.3	10.2					
Lower limit[2]	8.2	6.0	7.3	8.5		9.5	6.3	10.0	8.6		5.9	4.4	3.0	7.1					
Upper limit[2]	11.2	10.1	12.3	14.8		13.8	12.2	18.4	17.4		9.7	10.2	9.3	14.5					
2 group classification					***0.002***					***0.004***					*NS*	***0.027***	*NS*	***0.013***	*NS*
Neither overweight nor obese[3]	68.7	73.8	65.1	66.8		65.9	72.6	59.8	64.3		71.6	75.1	70.4	69.5					
Lower limit[2]	66.4	70.0	61.3	63.0		62.3	67.6	54.0	58.1		68.3	69.5	64.7	64.4					
Upper limit[2]	71.0	77.3	68.7	70.4		69.4	77.1	65.4	70.1		74.7	80.4	75.5	74.0					
Overweight including obese	31.3	26.2	34.9	33.2		34.1	27.4	40.2	35.7		28.4	24.9	29.6	30.6					
Lower limit[2]	29.1	22.7	31.3	29.6		30.6	22.9	34.6	29.9		25.3	20.0	24.5	26.0					
Upper limit[2]	33.6	30.0	38.7	37.0		37.7	32.4	46.0	41.9		31.7	30.5	35.3	35.6					
Base (weighted)	*1810*	*616*	*511*	*684*		*932*	*320*	*255*	*357*		*879*	*296*	*256*	*327*					
Base (unweighted)	*1816*	*645*	*543*	*628*		*952*	*345*	*284*	*323*		*864*	*300*	*259*	*305*					

[1]Association between age group and BMI classification; [2]95% confidence interval for prevalence; [3]Includes underweight and healthy weight

NS, non-significant

Table 7.4 Prevalence of underweight, overweight and obesity in 2010, by SIMD quintile

BMI classification	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p[1]
	%	%	%	%	%	
5 group classification						***0.049***
Underweight	1.5	2.0	2.4	3.5	2.6	
Lower limit[2]	0.7	0.9	1.2	2.1	1.4	
Upper limit[2]	3.5	4.5	4.9	6.0	5.0	
Healthy weight	73.2	66.2	68.3	63.6	59.9	
Lower limit[2]	68.9	60.8	63.0	57.5	54.7	
Upper limit[2]	77.2	71.2	73.2	69.2	64.8	
Overweight but not obese	13.5	15.5	14.5	15.2	14.2	
Lower limit[2]	10.3	12.0	11.7	11.5	11.0	
Upper limit[2]	17.5	19.8	17.8	19.8	18.1	
Obese but not severely obese	4.8	6.1	8.1	7.3	9.8	
Lower limit[2]	3.2	3.8	5.3	5.0	7.2	
Upper limit[2]	7.2	9.6	12.2	10.5	13.1	
Severely obese	7.0	10.2	6.7	10.4	13.6	
Lower limit[2]	4.7	7.0	4.6	7.0	10.7	
Upper limit[2]	10.2	14.6	9.9	15.2	17.0	
2 group classification						***0.009***
Neither overweight nor obese[3]	74.8	68.2	70.7	67.1	62.5	
Lower limit[2]	70.2	63.0	65.7	61.0	57.6	
Upper limit[2]	78.9	73.0	75.2	72.7	67.2	
Overweight including obese	25.2	31.8	29.3	32.9	37.5	
Lower limit[2]	21.1	27.0	24.8	27.3	32.9	
Upper limit[2]	29.8	37.0	34.3	39.0	42.4	
Base (weighted)	*403*	*365*	*329*	*328*	*385*	
Base (unweighted)	*428*	*385*	*343*	*315*	*345*	

[1]Association between SIMD quintile and BMI classification

[2]95% confidence interval for prevalence

[3]Includes underweight and healthy weight

Table 7.5 Mean waist circumference and waist circumference z-score, by sex and age group

Mean and 95% CI	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
Waist circumference (cm)																						
Mean	62.7	54.2	63.6	72.8	***<0.001***	***<0.001***↑	63.3	54.4	64.1	73.9	***<0.001***	***<0.001***↑	62.2	53.9	63.1	71.6	***<0.001***	***<0.001***↑	***0.019***	*NS*	*NS*	***0.004***
Lower limit	62.2	53.8	62.9	72.0			62.6	53.9	63.0	72.8			61.5	53.3	62.3	70.7						
Upper limit	63.3	54.6	64.3	73.6			64.0	54.9	65.2	75.1			62.9	54.5	63.9	72.6						
Waist circumference z-score																						
Mean	1.04	0.77	1.21	1.17	***<0.001***	***<0.001***↑	0.96	0.75	1.18	0.98	***<0.001***	***0.015***↑	1.14	0.80	1.23	1.37	***<0.001***	***<0.001***↑	***0.001***	*NS*	*NS*	***<0.001***
Lower limit	0.99	0.68	1.11	1.08			0.88	0.62	1.04	0.86			1.06	0.68	1.11	1.24						
Upper limit	1.10	0.86	1.30	1.26			1.03	0.88	1.33	1.10			1.22	0.93	1.35	1.50						
Base (weighted)	*1805*	*612*	*509*	*684*			*927*	*319*	*254*	*354*			*878*	*293*	*255*	*330*						
Base (unweighted)	*1810*	*643*	*540*	*627*			*948*	*345*	*283*	*320*			*862*	*298*	*257*	*307*						

[1]Overall association with age group

[2]Linear association with age group

↑Increases with age group

CI, confidence interval

NS, non-significant

Table 7.6 Mean waist circumference and waist circumference z-score, by SIMD quintile

Mean and 95% CI	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
Waist circumference (cm)							
Mean	63.0	62.8	60.8	63.0	63.9	***0.007***	*NS*
Lower limit	61.9	61.8	59.6	61.7	62.8		
Upper limit	64.2	63.9	61.9	64.3	65.1		
Waist circumference z-score							
Mean	1.02	1.05	0.86	1.09	1.19	***0.016***	*NS*
Lower limit	0.90	0.94	0.74	0.93	1.05		
Upper limit	1.14	1.16	0.98	1.24	1.34		
Base (weighted)	*398*	*365*	*327*	*331*	*384*		
Base (unweighted)	*422*	*386*	*341*	*317*	*344*		

[1]Overall association with SIMD quintile
[2]Linear association with SIMD quintile
CI, confidence interval
NS, non-significant

Table 7.7 Percentage of children in each waist circumference category, by sex and age group

Waist circumference classification	Both boys & girls					Boys					Girls					*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y	p^1	All	3-7y	8-11y	12-16y
	%	%	%	%		%	%	%	%		%	%	%	%					
4 group classification				***<0.001***						***0.003***					***<0.001***	***0.010***	*NS*	*NS*	***0.008***
<85th percentile	52.2	62.3	46.0	47.8		55.6	64.1	48.4	52.9		48.7	60.3	43.6	42.2					
Lower limit[2]	49.5	58.4	41.7	43.6		52.1	58.2	42.4	47.1		45.3	55.2	38.1	36.8					
Upper limit[2]	54.9	66.1	50.3	52.0		58.9	69.7	54.5	58.7		52.1	65.3	49.2	47.8					
≥85th and <95th percentile	17.8	16.8	18.5	18.3		17.2	16.6	16.3	18.3		18.5	16.9	20.6	18.4					
Lower limit[2]	16.1	14.1	15.5	15.2		14.9	12.8	12.6	14.5		16.1	13.4	16.3	14.3					
Upper limit[2]	19.7	19.8	21.9	21.9		19.8	21.4	20.9	22.8		21.2	21.1	25.7	23.3					
≥95th and <98th percentile	8.7	6.9	11.3	8.5		8.6	6.7	11.0	8.6		8.9	7.1	11.6	8.4					
Lower limit[2]	7.5	5.3	9.0	6.4		6.9	4.5	7.9	5.7		7.2	5.0	8.0	5.8					
Upper limit[2]	10.1	8.9	14.2	11.2		10.7	9.7	15.3	12.6		10.9	10.0	16.6	11.9					
≥98th percentile	21.2	14.1	24.2	25.5		18.7	12.6	24.2	20.2		23.9	15.7	24.2	31.1					
Lower limit[2]	19.4	11.6	20.9	21.8		16.5	9.5	19.5	15.8		21.3	12.0	20.1	26.2					
Upper limit[2]	23.2	16.9	27.9	29.5		21.1	16.4	29.6	25.6		26.7	20.3	28.8	36.4					
2 group classification				***<0.001***						***0.001***					***<0.001***	***0.002***	*NS*	*NS*	***0.008***
<85th percentile	52.2	62.3	46.0	47.8		55.6	64.1	48.4	52.9		48.7	60.3	43.6	42.2					
Lower limit[2]	49.5	58.4	41.7	43.6		52.1	58.2	42.4	47.1		45.3	55.2	38.1	36.8					
Upper limit[2]	54.9	66.1	50.3	52.0		58.9	69.7	54.5	58.7		52.1	65.3	49.2	47.8					
≥85th percentile	47.8	37.7	54.0	52.2		44.4	35.9	51.6	47.1		51.4	39.7	56.4	57.8					
Lower limit[2]	45.2	33.9	49.7	48.0		41.1	30.4	45.5	41.3		48.0	34.7	50.8	52.2					
Upper limit[2]	50.5	41.6	58.3	56.4		47.9	41.8	57.6	52.9		54.7	44.9	61.9	63.2					
Base (weighted)	*1805*	*612*	*509*	*684*		*927*	*319*	*254*	*354*		*878*	*293*	*255*	*330*					
Base (unweighted)	*1810*	*643*	*540*	*627*		*948*	*345*	*283*	*320*		*862*	*298*	*257*	*307*					

[1]Association between age group and waist circumference classification

[2]95% confidence interval for prevalence

NS, non-significant

Table 7.8 Percentage of children in each waist circumference category, by SIMD quintile

Waist circumference classification	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p[1]
	%	%	%	%	%	
4 group classification						***0.014***
<85th percentile	54.0	48.9	58.9	52.3	47.6	
Lower limit[2]	48.7	43.6	53.3	45.7	41.7	
Upper limit[2]	59.3	54.3	64.2	58.8	53.6	
≥85th and <95th percentile	18.9	22.8	16.7	15.9	14.7	
Lower limit[2]	15.3	18.8	12.8	12.4	10.5	
Upper limit[2]	23.0	27.5	21.4	20.2	20.1	
≥95th and <98th percentile	9.0	8.4	7.3	9.3	9.6	
Lower limit[2]	6.7	5.7	5.1	6.7	6.9	
Upper limit[2]	12.0	12.3	10.2	12.6	13.2	
≥98th percentile	18.1	19.8	17.2	22.5	28.2	
Lower limit[2]	14.2	16.3	13.4	18.1	24.2	
Upper limit[2]	22.8	24.0	21.7	27.6	32.6	
2 group classification						*NS*
<85th percentile	54.0	48.9	58.9	52.3	47.6	
Lower limit[2]	48.7	43.6	53.3	45.7	41.7	
Upper limit[2]	59.3	54.3	64.2	58.8	53.6	
≥85th percentile	46.0	51.1	41.1	47.7	52.4	
Lower limit[2]	40.7	45.7	35.8	41.2	46.4	
Upper limit[2]	51.3	56.4	46.7	54.3	58.3	
Base (weighted)	*398*	*365*	*327*	*331*	*384*	
Base (unweighted)	*422*	*386*	*341*	*317*	*344*	

[1]Association between SIMD quintile and waist circumference classification

[2]95% confidence interval for prevalence

NS, non-significant

Table 7.9 Intake of selected food groups (g/day)[1], by BMI classification

Mean and 95% CI	Neither overweight nor obese[2]	Overweight but not obese	Obese	*p*[3]	*p*[4]
Biscuits, cakes & pastries					
Mean	35	32	32	*NS*	*NS*
Lower limit	33	29	28		
Upper limit	37	36	35		
Milk & cream					
Mean	219	235	207	*NS*	*NS*
Lower limit	209	210	188		
Upper limit	230	262	227		
Confectionery					
Mean	18	18	19	*NS*	*NS*
Lower limit	17	16	17		
Upper limit	20	21	22		
Non-diet soft drinks					
Mean	107	129	125	*NS*	***0.048***[↑]
Lower limit	97	105	104		
Upper limit	119	158	149		
Base (weighted)	*1089*	*226*	*255*		
Base (unweighted)	*1111*	*228*	*245*		

[1]Food groups that contribute ≥10% to SFA or NMES intake

[2]Includes underweight and healthy weight

[3]Overall association with BMI classification

[4]Linear association with BMI classification

[↑]Intake increases from *neither overweight nor obese* category to *obese* category

CI, confidence interval

NS, non-significant

Table 7.10 Intake of energy and percentage energy as fat, saturated fatty acids, total sugars and non-milk extrinsic sugars, by BMI classification

Mean and 95% CI	Neither overweight nor obese[1]	Overweight but not obese	Obese	*p*[2]	*p*[3]
Energy (MJ/day)					
Mean	7.14	7.19	7.00	*NS*	*NS*
Lower limit	7.00	6.81	6.71		
Upper limit	7.29	7.58	7.31		
Total fat (% of food energy)					
Mean	32.8	32.6	32.5	*NS*	*NS*
Lower limit	32.5	32.0	31.9		
Upper limit	33.1	33.1	33.1		
Saturated fatty acids (% of food energy)					
Mean	13.2	13.2	12.8	*NS*	***0.043***$^{\downarrow}$
Lower limit	13.1	12.9	12.5		
Upper limit	13.4	13.5	13.2		
Total sugars (% of food energy)					
Mean	27.3	27.5	27.4	*NS*	*NS*
Lower limit	27.0	26.7	26.6		
Upper limit	27.7	28.4	28.3		
Non-milk extrinsic sugars (% of food energy)					
Mean	15.6	16.0	15.7	*NS*	*NS*
Lower limit	15.2	15.2	15.0		
Upper limit	15.9	16.8	16.5		
Base (weighted)	*1089*	*226*	*255*		
Base (unweighted)	*1111*	*228*	*245*		

[1]Includes underweight and healthy weight
[2]Overall association with BMI classification
[3]Linear association with BMI classification
$^{\downarrow}$Intake decreases from *neither overweight nor obese* category to *obese* category
CI, confidence interval
NS, non-significant

8. Physical activity

This chapter presents data on participation in physical activities, overall physical activity levels and a measure of physical inactivity or sedentary behaviour (time spent sitting in front of a screen) in all children and in sub-groups of age, sex and deprivation category. The association between physical activity and obesity is examined, and the proportion of children meeting the physical activity recommendations is compared with the same proportion found in the 2010 Scottish Health Survey (SHeS)[1] and the 2006 survey[2]. Unless stated otherwise, measures of physical activity include activities at school.

Summary

- The mean number of hours spent participating in physical activity in the past week decreased with age (21 hours in 3-7 year olds and 17 hours in 12-16 year olds), and this decrease with age was more pronounced in girls than in boys.
- Children from the more affluent areas spent less time participating in physical activity in the past week than children from the most deprived areas (18 versus 20 hours).
- Overall 86% of children reported reaching the recommended physical activity level of 60 minutes or more on all seven days in the past week.
- More boys than girls met this recommended physical activity level (89% versus 83%), and this difference was greatest in 12-16 year olds (84% in boys and 67% in girls).
- The proportion of children meeting the recommended physical activity level decreased with age: 93%, 92% and 76% in children aged 3-7, 8-11 and 12-16 years respectively.
- The proportion of children meeting physical activity recommendations was similar across different areas of deprivation.
- The mean time spent in front of a screen increased with age (1.4 hours/day in 3-7 year olds and 2.4 hours/day in 12-16 year olds), and was higher in boys than girls (2.0 versus 1.8 hours/day).
- The mean time spent in front of a screen also increased with level of deprivation: 1.7 hours/day in children from the least deprived areas to 2.2 hours/day in children from the most deprived areas.
- A higher proportion of boys who were *neither overweight nor obese* (91%) reached the recommended level of physical activity compared with boys who were *overweight including obese* (86%). There was no difference between BMI groups in girls.
- Mean time spent sitting at a screen on an average day was higher in *overweight including obese* children (2.1 hours) than in *neither overweight nor obese* children (1.8 hours).
- A significantly lower percentage of children met the recommended physical activity level in 2010 (80%) compared with 2006 (86%) (excluding school-based activity).
- There was little difference between 2006 and 2010 in the mean number of hours spent sitting at a screen (1.8 hours in 2006 and 1.9 hours in 2010).

8.1 Introduction

8.1.1 Physical activity and sedentary behaviour

Physical activity is a broad term to describe movement of the body that results in expenditure of energy (calories). For children and young people, these activities can include play, games, sports, walking, cycling, chores, recreation, physical education or planned exercise. Appropriate levels of physical activity can provide benefits from an early age, including the development of healthy musculoskeletal tissues and a healthy cardiovascular system, neuromuscular awareness, the maintenance of a healthy body weight, and psychological benefits such as improved control over symptoms of anxiety and depression and helping in social development[3].

Sedentary behaviour is not merely a lack of physical activity, but refers to a cluster of behaviours characterised by sitting or lying and where energy expenditure is very low. This can include behaviours at work or school as well as at home, in transit and in leisure time, for example watching TV, using a computer, travelling by car, bus or train, and sitting to read, talk, do homework or listen to music[4]. A recent review by the Sedentary Behaviour and Obesity Expert Working Group[5] found that in young people, high amounts of sedentary behaviour is associated with a greater risk of obesity, and that sedentary time is positively associated with markers of metabolic risk. In adults, sedentary behaviour is associated with all-cause and cardiovascular mortality, diabetes, some cancers and metabolic dysfunction[5].

8.1.2 Recommendations and targets

The National Physical Activity Task Force was set up by Scottish ministers in 2001, and Scotland's first physical activity strategy '*Let's Make Scotland More Active*' was published in 2003[6]. This strategy made the following recommendation and target for children:

Recommendation for children

- Children should accumulate (build up) at least 1 hour of moderate activity on most days of the week

Target for children

- 80% of all children aged 16 and under meeting the minimum recommended levels of physical activity by 2022

(Physical Activity Task Force, 2003)

The Chief Medical Officers of England, Scotland, Wales and Northern Ireland issued updated guidelines on physical activity in 2011[4] as shown in the box below. These guidelines are consistent with WHO's global recommendations on physical activity for health in 5-17 year olds[3].

Early years (under 5 years)

1. Physical activity should be encouraged from birth, particularly through floor-based play and water-based activities in safe environments.
2. Children of pre-school age who are capable of walking unaided should be physically active daily for at least 180 minutes (3 hours), spread throughout the day.
3. All children under 5 years should minimise the amount of time spent being sedentary (being restrained or sitting) for extended periods (except time spent sleeping).

Children and young people (5-18 years)

1. All children and young people should engage in moderate to vigorous intensity physical activity for at least 60 minutes and up to several hours every day.
2. Vigorous intensity activities, including those that strengthen muscle and bone, should be incorporated at least 3 days a week.
3. All children and young people should minimise the amount of time spent being sedentary (sitting) for extended periods.

(Department of Health, 2011)

8.2 Physical activity questions

The questions used in this element of the survey were the same as those used for the 2008-2011 SHeS[1] and contained the same questions as in the 2006 survey[2]. The questions asked about activities that were thought to account for the largest part of children's total activity:

- sport and exercise
- active play
- walking
- housework and 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 SHeS which did not ask children aged under 8 years about their participation in housework/gardening. Information about sport/exercise and active play was collected separately for weekend and weekdays, but questions on walking and housework/gardening did not distinguish between activities carried out on a weekday and at weekends.

There was no lower 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. This is all consistent with the questions used for the 2008-2011 SHeS.

No information was collected on the intensity of housework, sport/exercise or active play. For the purpose of this report it was assumed that all these activities were at least of moderate intensity.

The physical activity module split activities by inside/outside school lessons. The school activity question was added at the end and all the other items were asked in the same way as in the 2006 survey and the 2003 SHeS. Therefore, this survey produced two measures of physical activity: one that includes activity at school (Sections 8.3, 8.4 and 8.6), and summary levels of activity outside school for comparison with the 2006 survey (Section 8.8).

Questions were also asked about the time spent in front of a screen as a measure of inactivity. Children were asked about the number of hours spent sitting in front of a screen (including television, computer, console or video game) on an average weekday and on an average weekend day. This did not include time spent in front of a screen at nursery or school.

8.3 Participation in physical activity in the past week

This section presents reported number of hours spent participating in physical activity in the previous week. It should be noted that calculations of the mean number of hours are based on all children, including those that reported that they did not participate in any activity.

The number of hours spent participating in physical activity in the past week was significantly associated with age group (Table 8.1). In both boys and girls, there was little difference between the two youngest age groups in the number of hours spent participating in physical activities, but there was a decrease in the mean number of hours spent participating in these activities in children aged 12-16 years. This decrease was more pronounced in girls than in boys: 21, 20 and 14 hours in girls aged 3-7, 8-11 and 12-16 years respectively compared with 21, 23 and 20 hours in boys aged 3-7, 8-11 and 12-16 years respectively.

Table 8.1

There was a significant linear association between the mean number of hours spent participating in physical activity in the past week and SIMD quintile (Table 8.2), such that the mean number of hours increased from 18 hours in children from the least deprived areas to 20 hours in children from the most deprived areas.

Table 8.2

8.4 Summary physical activity levels

Data on the different activities described above were summarised into an overall physical activity level, taking into consideration the average time spent participating in physical activities and the number of active days in the past week. It was assumed that all reported activities were at least of moderate intensity. The summary physical activity levels are as follows:

High: Active for ≥60 minutes on 7 days in the past week (meets recommended level).
Medium: Active for 30-59 minutes on 7 days in the last week.
Low: Active on <7 days in the past week or for <30 minutes a day.

8.4.1 Summary physical activity levels by age and sex

Overall, 86% of children reached the higher recommended physical activity level of 60 minutes or more on all seven days (Table 8.3). A higher proportion of boys reached this level compared with girls (89% versus 83%). The difference between the sexes was significant in 12-16 year olds (84% of boys and 67% of girls reaching the high level), but not in 3-7 or 8-11 year olds. A further 5% of boys and 9% of girls reached the medium level of activity.

There was a significant association between age group and summary activity level in both boys and girls. In both sexes, the proportion of children reaching the high level of activity was similar in the two youngest age groups and the proportion decreased in the oldest age group, although this decrease was more pronounced amongst girls than boys (84% in boys and 67% in girls aged 12-16 years). This trend of a sharper decline in activity with age in girls than in boys is consistent with that found in the 2010 SHeS[1].

Table 8.3

8.4.2 Summary physical activity levels by SIMD quintile

There was no significant association between summary physical activity level and level of deprivation (Table 8.4). The proportion of children reaching the highest level of physical activity ranged from 85% to 88% in the five quintiles, and the proportion reaching the medium level of physical activity ranged from 6% to 8%.

Table 8.4

8.5 Time spent sitting at a screen

8.5.1 Time spent sitting at a screen by age and sex

Table 8.5 shows that boys spent significantly more time sitting in front of a screen than girls (2.0 versus 1.8 hours/day). This difference between boys and girls was significant in children aged 3-7 and 12-16 years, but not in children aged 8-11 years.

There was a positive linear association between age group and time spent in front of a screen, with 19% of children aged 12-16 years spending on average at least 4 hours/day in front of a screen compared with 4% of children aged 3-7 years and 6% of children aged 8-11 years. This association with age group was significant in both boys and girls.

Table 8.5

8.5.2 Time spent sitting at a screen by SIMD quintile

The average time spent sitting in front of a screen increased significantly with level of deprivation (Table 8.6). The mean number of hours spent sitting in front of a screen on an average day increased from 1.7 hours/day for children in the least deprived areas to 2.2 hours/day for children in the most deprived areas. The percentage of children spending at least 4 hours/day on average in front of a screen increased from 6% in the least deprived areas to 16% in the most deprived areas.

Table 8.6

8.6 Physical activity and body mass index

This section examines whether the proportion of children meeting the recommended physical activity level (at least 60 minutes on all seven days) differs by BMI classification. Children were classified into one of two BMI groups for this analysis: *neither overweight nor obese* and *overweight including obese*.

8.6.1 Proportion of children meeting physical activity recommendations by age, sex and BMI classification

Table 8.7 shows that the Government target of 80% of children reaching the higher physical activity recommendation (at least 60 minutes on all 7 days) was achieved by boys in both BMI categories and in all age groups. This target was met by girls aged 3-7 and 8-11 years in both BMI categories, however girls aged 12-16 years failed to meet the target: the proportion meeting the recommendation was 66% in the *neither overweight nor obese* category and 72% in the *overweight including obese* category.

There was a significant difference in the proportion of boys reaching the physical activity recommendations by BMI classification. A higher proportion of boys who were *neither overweight nor obese* (91%) reached the recommended level compared with boys who were *overweight including obese* (86%). This difference did not reach statistical significance in any of the three age groups in boys. There was no significant difference between girls who were *neither overweight nor obese* and girls who were *overweight including obese* in the proportion reaching the physical activity recommendations.

Table 8.7

8.6.2 Proportion of children meeting physical activity recommendations by SIMD quintile and BMI classification

The Government target of 80% of children reaching the higher physical activity recommendation was achieved by children in both BMI categories in all SIMD quintiles (Table 8.8). There was no significant difference between BMI categories in the proportion meeting the physical activity recommendation in any of the SIMD quintiles.

Table 8.8

8.6.3 Time spent sitting at a screen by BMI classification

Table 8.9 shows that the mean time spent sitting in front of a screen on an average day was significantly higher in *overweight including obese* children (2.1 hours) than in *neither overweight nor obese* children (1.8 hours). This difference between BMI groups was statistically significant in boys (2.2 versus 1.9 hours), but not in girls.

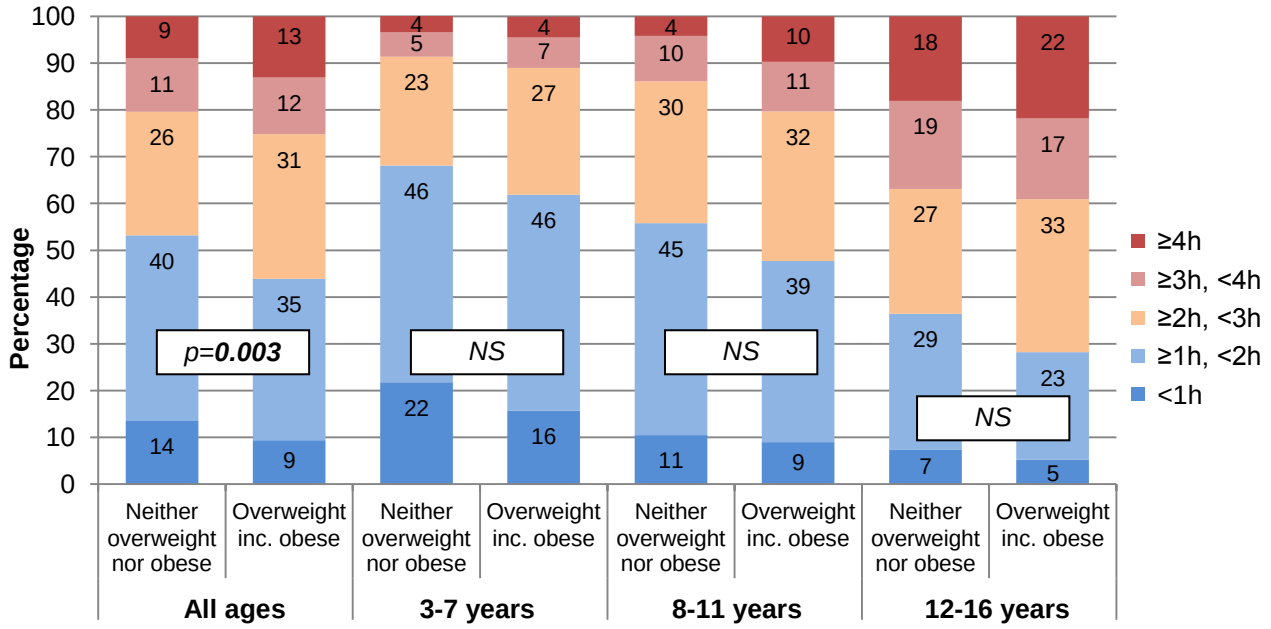
Table 8.9

In boys, there was a significant association between BMI category and categories of time spent sitting at a screen (Figure 8.1B). A higher proportion of boys who were *overweight including obese* spent more than 3 hours in front of a screen on an average day (28%) compared with boys who were *neither overweight nor obese* (22%). There was no significant association in girls overall between BMI category and time spent sitting at a screen, however the proportion of girls aged 8-11 years who spent at least 3 hours in front of a screen on an average day was higher in *overweight including obese* girls (17%) compared with *neither overweight nor obese* girls (11%).

Figure 8.1

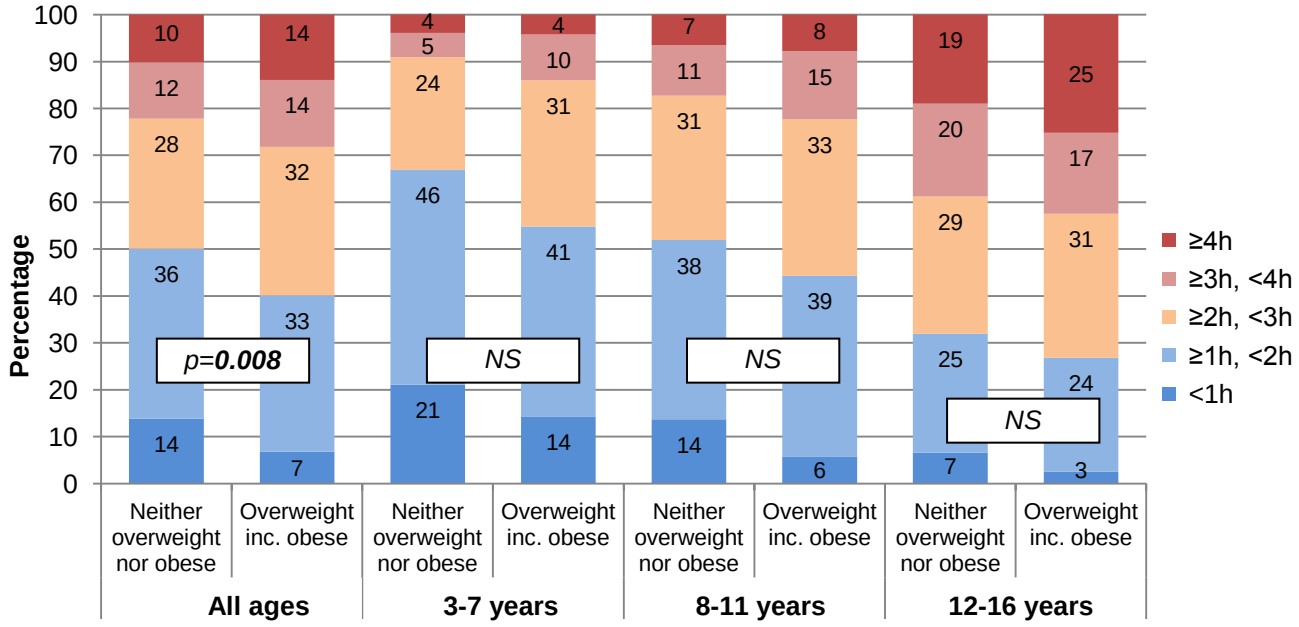
Figure 8.1 Time spent sitting at a screen on an average day, by BMI classification

A. Both boys & girls



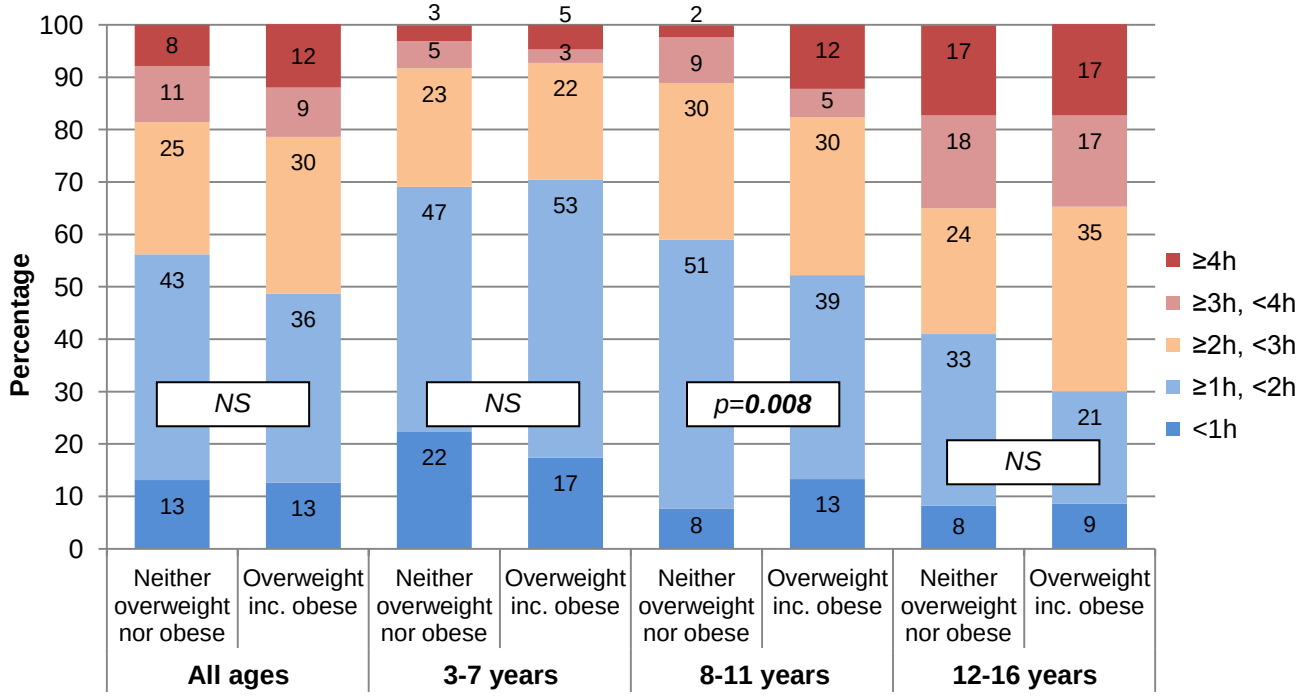
Weighted (unweighted) base: All: neither overweight nor obese, 1243 (1258); overweight inc. obese, 566 (556). 3-7y: neither overweight nor obese, 454 (479); overweight inc. obese, 160 (165). 8-11y: neither overweight nor obese, 333 (353); overweight inc. obese, 178 (190). 12-16y: neither overweight nor obese, 456 (426); overweight inc. obese, 227 (201).

B. Boys



Weighted (unweighted) base: All: neither overweight nor obese, 614 (638); overweight inc. obese, 316 (313). 3-7y: neither overweight nor obese, 232 (252); overweight inc. obese, 87 (92). 8-11y: neither overweight nor obese, 152 (171); overweight inc. obese, 102 (113). 12-16y: neither overweight nor obese, 230 (215); overweight inc. obese, 127 (108).

C. Girls



Weighted (unweighted) base: All: neither overweight nor obese, 628 (620); overweight inc. obese, 249 (243). 3-7y: neither overweight nor obese, 222 (227); overweight inc. obese, 74 (73). 8-11y: neither overweight nor obese, 180 (182); overweight inc. obese, 76 (77). 12-16y: neither overweight nor obese, 226 (211); overweight inc. obese, 100 (93).

8.7 Comparison with the Scottish Health Survey

The calculation used to estimate the time spent in physical activities differed between this survey and the Scottish Health Survey (SHeS)[1]. The SHeS calculation for time spent in physical activities was amended for the current survey so that (i) the time spent in activities was multiplied by 2 if they answered both Saturday and Sunday before giving the time spent on the relevant weekend activity on each of these days, and (ii) the actual time spent walking and doing housework was used instead of the default time of 15 minutes which is used in the SHeS to be able to compare later years with SHeS 2003 results.

In order to enable comparison between this survey and the 2010 SHeS, the proportion of children reaching the physical activity recommendations (including activity at school) presented in this section was determined using the same calculation as for the SHeS, and will therefore differ from the proportions presented in sections 8.4 and 8.6.

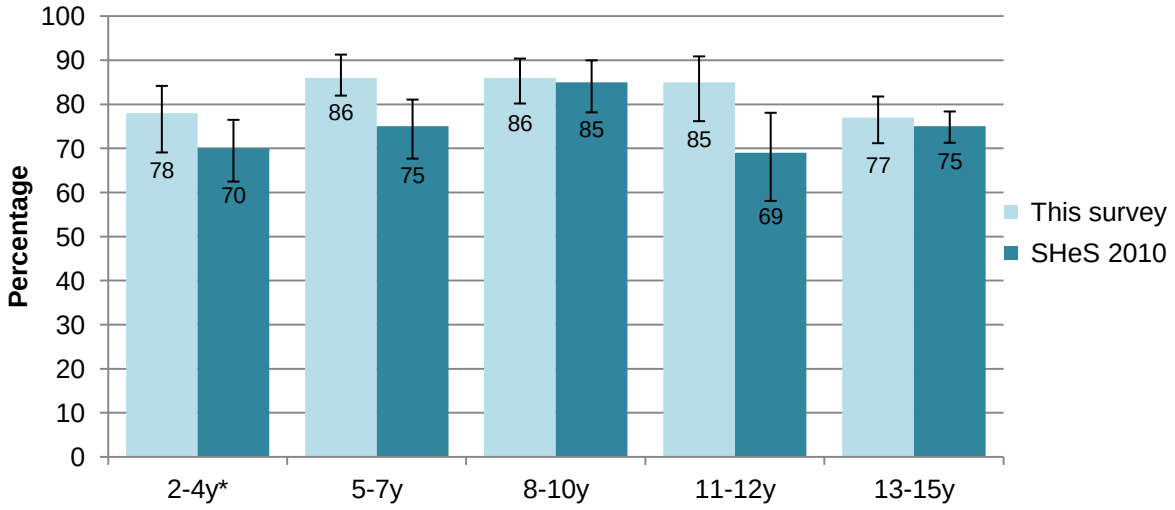
The proportion of 3-15 year olds reaching the higher recommended physical activity level in this survey (79%) was greater than the proportion of 2-15 year olds reaching this level in the 2010 SHeS (72%)[1]. The proportion of children reaching the recommendations was higher in this survey compared with the SHeS in 2-4 and 5-7 year olds, but was similar in 8-10 and 13-15 year olds (Figure 8.2). The proportion of 11-12 year olds reaching the recommendations was higher in boys, but lower in girls, compared with the 2010 SHeS.

Figure 8.2

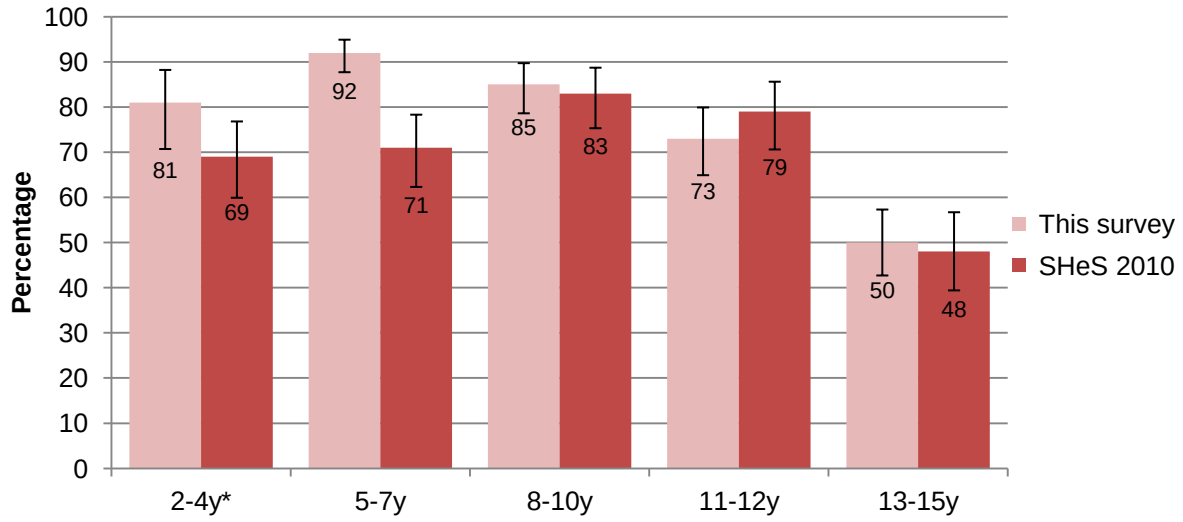
Although this survey used the same questions as those used in the SHeS, there were differences in other areas of the methodology used such as sampling and age range (2-15 years for SHeS). In addition, the fieldwork for this survey was undertaken between June and November whereas the SHeS is a continuous survey with fieldwork being conducted throughout the year. It is not clear what effect the differences in methodology will have on physical activity levels. For example, it is possible that seasonal effects may have contributed to the higher percentage of children reaching recommendations in this survey which included the summer holidays, in comparison with the continuous SHeS.

Figure 8.2 Proportion (95% CI) of children meeting physical activity recommendations (including activity at school) in this survey and in the 2010 Scottish Health Survey, by age group

A. Boys



B. Girls



*2-4 years for SHeS and 3-4 years for this survey.

8.8 Comparison with physical activity in 2006

8.8.1 Comparison with physical activity in 2006

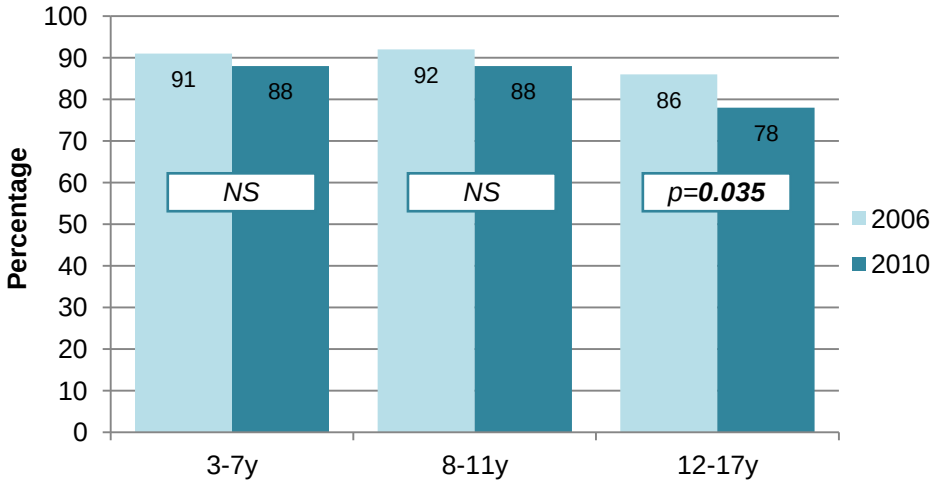
The 2006 survey did not include questions about participation in physical activity at school. Therefore, the proportion of children meeting physical activity recommendations in 2010 presented in this section excludes activity at school. As expected, a lower proportion of children met the physical activity recommendations in 2010 when activity at school was excluded (80% versus 86%).

The proportion of children meeting the higher physical activity recommendation of at least 60 minutes on all 7 days (excluding school-based activity) decreased significantly from 86% in 2006 to 80% in 2010 ($p<0.001$). The largest decrease in this proportion between 2006 and 2010 occurred in 12-17 year olds: 86 to 78% in boys, and 69% to 59% in girls (Figure 8.3).

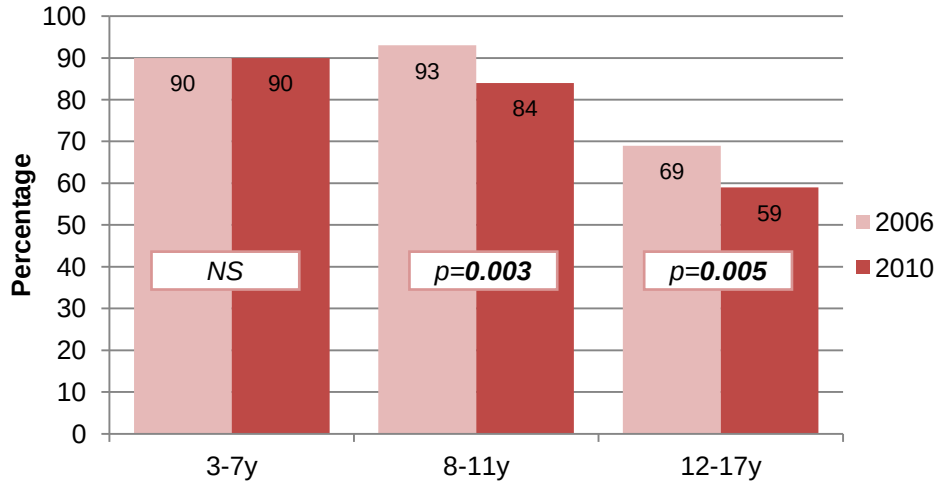
Figure 8.3

Figure 8.3 Proportion of children meeting physical activity recommendations (excluding activity at school) in 2006 and in 2010, by age group

A. Boys



B. Girls

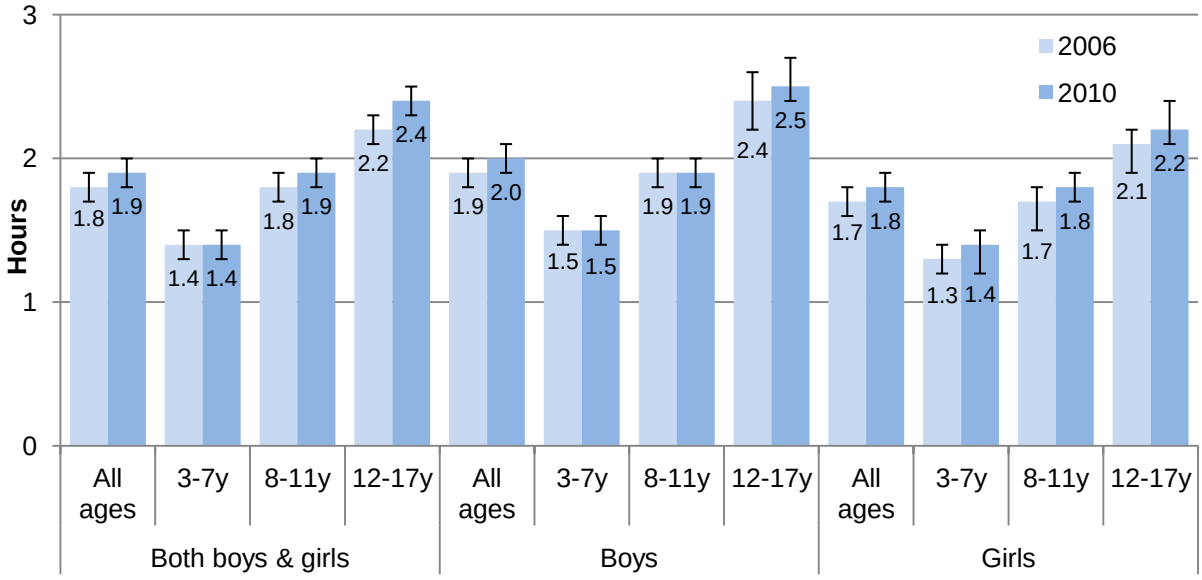


8.8.2 Comparison with time spent sitting at a screen in 2006

In order to compare the time spent sitting at a screen between 2006 and 2010, the raw data for 2006 was transformed into a normal distribution as described in Section 2.7.5 and the revised means are presented in Figure 8.4. The mean number of hours spent sitting at a screen in 2010 was similar to that in 2006.

Figure 8.4

Figure 8.4 Mean (95% CI) hours spent sitting at a screen on an average day in 2006 and 2010, by sex and age group

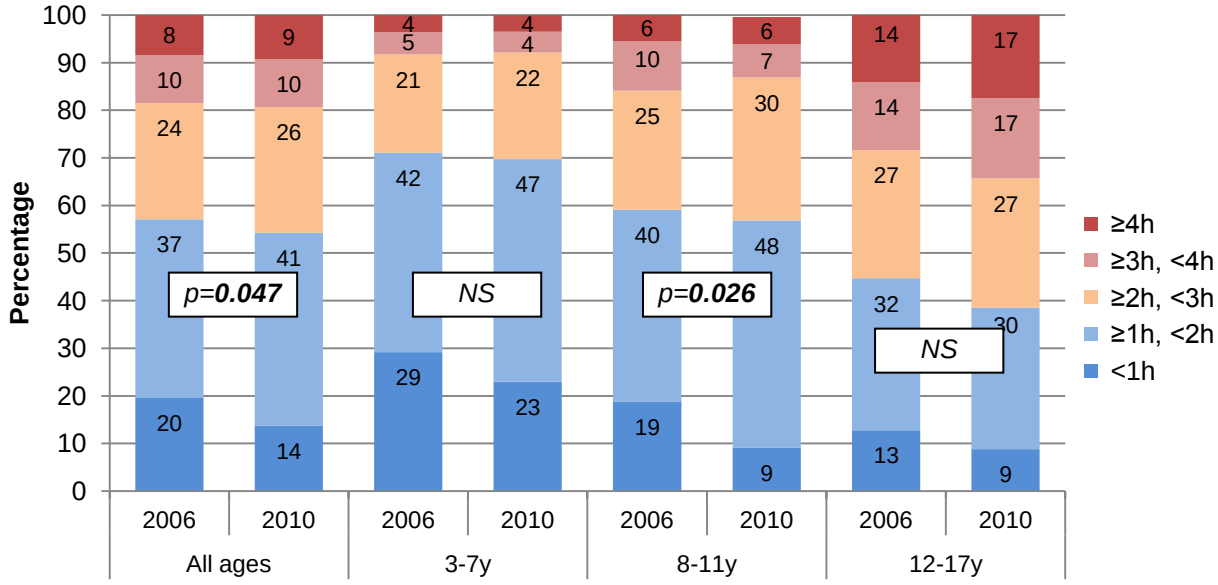


When the number of hours spent sitting in front of a screen was grouped (<1h; ≥1h to <2h; ≥2h to <3h; ≥3h to <4h; ≥4h), there was a significant difference between 2006 and 2010 in time spent sitting at a screen (p=0.017). Although the proportion of children spending ≥3 hours in front of a screen was similar in 2006 (21%) and 2010 (22%), the proportion of children spending <1 hour in front of a screen decreased from 17% in 2006 to 13% in 2010 (data not shown).

The difference between 2006 and 2010 was not statistically significant in any of the age groups in boys (data not shown). However, the proportion of girls aged 8-11 years spending less than 1 hour in front of a screen on an average day decreased from 19% in 2006 to 9% in 2010 (Figure 8.5).

Figure 8.5

Figure 8.5 Time spent sitting at a screen on an average day in 2006 and 2010 in girls, by age group



8.9 References

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Table 8.1 Number of hours participating in physical activity in the past week, by sex and age group

No. of hours of physical activity	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y	p^1	p^2	All	3-7y	8-11y	12-16y
	%	%	%	%			%	%	%	%			%	%	%	%						
Categories					***<0.001***						***<0.001***						***<0.001***		***<0.001***	*NS*	*NS*	***<0.001***
None or <1h	1	1	1	1			1	1	1	1			1	<1	<1	1						
At least 1, < 7h	12	6	7	22			9	6	6	13			16	5	8	31						
At least 7, < 14h	25	23	21	29			23	22	17	29			26	23	25	30						
At least 14, < 21h	23	25	25	20			22	26	24	18			23	24	25	21						
At least 21, < 28h	17	22	19	11			18	22	19	15			16	23	20	6						
At least 28h	22	23	27	18			26	23	32	24			18	23	22	10						
Mean and 95% CI																						
Mean	19.6	21.0	21.9	16.6	***<0.001***	***<0.001***$^{\downarrow}$	21.1	20.9	23.4	19.6	***<0.001***	*NS*	18.0	21.2	20.4	13.5	***<0.001***	***<0.001***$^{\downarrow}$	***<0.001***	*NS*	***0.008***	***<0.001***
Lower limit	18.8	19.9	20.7	15.5			20.0	19.5	21.7	18.0			17.1	19.7	18.9	12.2						
Upper limit	20.4	22.2	23.1	17.8			22.1	22.4	25.1	21.2			19.0	22.6	21.9	14.8						
Base (weighted)	*1902*	*645*	*532*	*725*			*975*	*335*	*267*	*374*			*927*	*311*	*265*	*351*						
Base (unweighted)	*1902*	*675*	*565*	*662*			*994*	*361*	*298*	*335*			*908*	*314*	*267*	*327*						

[1]Overall association between age group and number of hours participating in physical activity in the past week

[2]Linear association between age group and number of hours participating in physical activity in the past week

$^{\downarrow}$Number of hours decreases with age group

CI, confidence interval

NS, non-significant

Table 8.2 Number of hours participating in physical activity in the past week, by SIMD quintile

No. of hours of physical activity	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^1	p^2
	%	%	%	%	%		
Categories						*NS*	
None or <1h	1	1	1	1	1		
At least 1, < 7h	13	11	12	12	13		
At least 7, < 14h	28	26	26	22	22		
At least 14, < 21h	26	24	24	20	19		
At least 21, < 28h	17	14	14	19	20		
At least 28h	15	24	22	26	24		
Mean and 95% CI							
Mean	18.0	20.0	19.1	20.8	20.2	***0.050***	***0.011***↑
Lower limit	16.7	18.6	17.2	19.2	18.8		
Upper limit	19.4	21.4	20.9	22.4	21.7		
Base (weighted)	*418*	*382*	*339*	*345*	*417*		
Base (unweighted)	*444*	*404*	*353*	*331*	*370*		

[1]Overall association between SIMD quintile and number of hours participating in physical activity in the past week
[2]Linear association between SIMD quintile and number of hours participating in physical activity in the past week
↑Number of hours increases with SIMD quintile
CI, confidence interval
NS, non-significant

Table 8.3 Summary physical activity levels, by sex and age group

Summary physical activity levels[1]	Both boys & girls					Boys					Girls					*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	p^2	All	3-7y	8-11y	12-16y	p^2	All	3-7y	8-11y	12-16y	p^2	All	3-7y	8-11y	12-16y
	%	%	%	%		%	%	%	%		%	%	%	%					
Level					***<0.001***					***0.004***					***<0.001***	***0.003***	*NS*	*NS*	***<0.001***
High	86	93	92	76		89	92	93	84		83	94	91	67					
Medium	7	4	4	12		5	4	4	8		9	4	5	17					
Low	7	3	4	12		6	4	4	9		8	2	4	16					
Base (weighted)	*1902*	*645*	*532*	*725*		*975*	*335*	*267*	*374*		*927*	*311*	*265*	*351*					
Base (unweighted)	*1902*	*675*	*565*	*662*		*994*	*361*	*298*	*335*		*908*	*314*	*267*	*327*					

[1]High, 60 minutes or more on all 7 days; medium, 30-59 minutes on all 7 days; low, lower level of activity

[2]Association between age group and summary physical activity levels

NS, non-significant

Table 8.4 Summary physical activity levels, by SIMD quintile

Summary physical activity levels[1]	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	p^2
	%	%	%	%	%	
Level						*NS*
High	85	87	86	88	86	
Medium	8	6	7	7	7	
Low	7	7	6	5	7	
Base (weighted)	*418*	*382*	*339*	*345*	*417*	
Base (unweighted)	*444*	*404*	*353*	*331*	*370*	

[1]High, 60 minutes or more on all 7 days; medium, 30-59 minutes on all 7 days; low, lower level of activity

[2]Association between SIMD quintile and summary physical activity levels

NS, non-significant

Table 8.5 Time spent sitting at a screen (hours)[1] on an average day, by sex and age group

Average time[2] (hours)	Both boys & girls						Boys						Girls						*p*-value for sex difference			
	All	3-7y	8-11y	12-16y	*p*[3]	*p*[4]	All	3-7y	8-11y	12-16y	*p*[3]	*p*[4]	All	3-7y	8-11y	12-16y	*p*[3]	*p*[4]	All	3-7y	8-11y	12-16y
	%	%	%	%			%	%	%	%			%	%	%	%						
Categories					***<0.001***						***<0.001***						***<0.001***		***0.022***	*NS*	*NS*	*NS*
Less than 1h	13	21	10	7			12	19	11	6			14	23	9	9						
At least 1, < 2h	37	45	43	27			35	44	38	24			41	47	48	30						
At least 2, < 3h	28	24	31	29			29	26	32	30			26	22	30	27						
At least 3, < 4h	12	6	10	18			13	7	12	19			10	4	7	17						
At least 4h	10	4	6	19			11	4	7	20			9	4	6	17						
Mean and 95% CI																						
Mean	1.9	1.4	1.9	2.4	***<0.001***	***<0.001***	2.0	1.5	1.9	2.5	***<0.001***	***<0.001***	1.8	1.4	1.8	2.2	***<0.001***	***<0.001***	***0.001***	***0.032***	*NS*	***0.015***
Lower limit	1.8	1.4	1.8	2.3			1.9	1.4	1.8	2.4			1.7	1.2	1.7	2.1						
Upper limit	2.0	1.5	2.0	2.5			2.1	1.6	2.0	2.7			1.9	1.5	1.9	2.4						
Base (weighted)	*1904*	*647*	*532*	*726*			*975*	*335*	*267*	*374*			*929*	*312*	*265*	*352*						
Base (unweighted)	*1904*	*676*	*565*	*663*			*994*	*361*	*298*	*335*			*910*	*315*	*267*	*328*						

[1]Time spent in front of a screen includes television viewing or using a computer or games console, other than at school

[2]Average time includes hours spent on week days and weekend days

[3]Overall association between age group and time spent sitting at a screen

[4]Linear association between age group and time spent sitting at a screen

CI, confidence interval

NS, non-significant

Table 8.6 Time spent sitting at a screen[1] on an average day, by SIMD quintile

Average time[2] (hours)	5th (least deprived)	4th	3rd	2nd	1st (most deprived)	*p*[3]	*p*[4]
	%	%	%	%	%		
Categories						***<0.001***	
Less than 1h	15	15	14	15	6		
At least 1, less than 2h	42	39	39	36	32		
At least 2, less than 3h	27	27	27	27	31		
At least 3, less than 4h	10	11	10	12	15		
At least 4h	6	8	11	11	16		
Mean and 95% CI							
Mean	1.7	1.8	1.8	2.0	2.2	***<0.001***	***<0.001***
Lower limit	1.6	1.6	1.7	1.8	2.1		
Upper limit	1.8	1.9	1.9	2.1	2.3		
Base (weighted)	*418*	*382*	*339*	*347*	*417*		
Base (unweighted)	*444*	*404*	*353*	*333*	*370*		

[1]Time spent in front of a screen includes television viewing or using a computer or games console, other than at school
[2]Average time includes hours spent on week days and weekend days
[3]Overall association between SIMD quintile and time spent sitting at a screen
[4]Linear association between SIMD quintile and time spent sitting at a screen
CI, confidence interval

Table 8.7 Proportion of children meeting physical activity recommendations[1], by sex, age group and BMI classification

BMI classification	Both boys & girls				Boys				Girls			
	All	3-7y	8-11y	12-16y	All	3-7y	8-11y	12-16y	All	3-7y	8-11y	12-16y
	%	%	%	%	%	%	%	%	%	%	%	%
Neither overweight nor obese	87	94	94	76	91	94	94	86	84	93	93	66
Overweight including obese	85	92	90	77	86	89	90	81	84	95	90	72
P-value[2]	*NS*	*NS*	*NS*	*NS*	***0.035***	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Base (weighted)												
Neither overweight nor obese	*1242*	*454*	*333*	*454*	*614*	*232*	*152*	*230*	*627*	*222*	*180*	*225*
Overweight including obese	*566*	*160*	*178*	*227*	*316*	*87*	*102*	*127*	*249*	*74*	*76*	*100*
Base (unweighted)												
Neither overweight nor obese	*1257*	*479*	*353*	*425*	*638*	*252*	*171*	*215*	*619*	*227*	*182*	*210*
Overweight including obese	*556*	*165*	*190*	*201*	*313*	*92*	*113*	*108*	*243*	*73*	*77*	*93*

[1]At least 60 minutes or more on all 7 days

[2]Association between the proportion meeting physical activity recommendations and whether overweight including obese

NS, non-significant

Table 8.8 Proportion of children meeting physical activity recommendations[1], by SIMD quintile and BMI classification

BMI classification	5th (least deprived)	4th	3rd	2nd	1st (most deprived)
	%	%	%	%	%
Neither overweight nor obese	86	88	87	88	88
Overweight including obese	86	83	88	87	85
P-value[2]	*NS*	*NS*	*NS*	*NS*	*NS*
Base (weighted)					
Neither overweight nor obese	*301*	*249*	*233*	*219*	*241*
Overweight including obese	*102*	*115*	*96*	*108*	*144*
Base (unweighted)					
Neither overweight nor obese	*319*	*266*	*245*	*210*	*217*
Overweight including obese	*108*	*118*	*98*	*104*	*128*

[1]At least 60 minutes or more on all 7 days

[2]Association between the proportion meeting physical activity recommendations and whether overweight including obese

NS, non-significant

Table 8.9 Time spent sitting at a screen[1] on an average day, by sex, age group and BMI classification

Average time[2] (hours)	Both boys & girls				Boys				Girls			
	All	3-7y	8-11y	12-16y	All	3-7y	8-11y	12-16y	All	3-7y	8-11y	12-16y
	%	%	%	%	%	%	%	%	%	%	%	%
Mean and 95% CI												
Neither overweight nor obese												
Mean	1.8	1.4	1.8	2.4	1.9	1.5	1.8	2.5	1.8	1.4	1.8	2.2
Lower limit	1.7	1.3	1.7	2.2	1.8	1.4	1.7	2.3	1.7	1.2	1.7	2.0
Upper limit	1.9	1.5	1.9	2.5	2.0	1.6	2.0	2.7	1.9	1.5	1.9	2.5
Overweight including obese												
Mean	2.1	1.6	2.0	2.5	2.2	1.7	2.1	2.7	1.9	1.4	1.9	2.3
Lower limit	2.0	1.4	1.8	2.3	2.1	1.5	1.9	2.4	1.7	1.2	1.6	2.1
Upper limit	2.2	1.7	2.2	2.7	2.3	1.9	2.3	3.0	2.1	1.6	2.2	2.7
P-value[3]	***<0.001***	*NS*	***0.038***	*NS*	***<0.001***	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Base (weighted)												
Neither overweight nor obese	*1243*	*454*	*333*	*456*	*614*	*232*	*152*	*230*	*628*	*222*	*180*	*226*
Overweight including obese	*566*	*160*	*178*	*227*	*316*	*87*	*102*	*127*	*249*	*74*	*76*	*100*
Base (unweighted)												
Neither overweight nor obese	*1258*	*479*	*353*	*426*	*638*	*252*	*171*	*215*	*620*	*227*	*182*	*211*
Overweight including obese	*556*	*165*	*190*	*201*	*313*	*92*	*113*	*108*	*243*	*73*	*77*	*93*

[1]Time spent in front of a screen includes television viewing or using a computer or games console, other than at school

[2]Average time includes hours spent on week days and weekend days

[3]Association between time spent sitting at a screen and whether overweight including obese

CI, confidence interval

NS, non-significant

9. Discussion and recommendations

This final chapter reviews the design and results of the survey and their implications for future research and health improvement for children living in Scotland.

9.1 Survey methodology

9.1.1 Survey population

The Child Benefit records held by HMRC were used as the sampling frame for this survey, and enabled the recruitment of a nationally representative sample of children in Scotland. However, future changes in the eligibility criteria for this benefit may make it less suitable as a sampling frame for future surveys.

The final sample size exceeded the target of 1500 children which was chosen to allow robust estimates of variables for sub-groups defined by age, sex and socio-economic deprivation, as defined by quintile of Scottish Index of Multiple Deprivation (SIMD). However, the ability of the survey to detect differences between urban/rural areas was limited due to the small proportion of the population in remote small towns.

Interviews were carried out with 1906 children (63% of those initially selected for the study), and this response rate suggests that the method used to contact the children and their parents/guardians was acceptable to the majority of those approached. This response rate is comparable with that in the 2010 Scottish Health Survey (SHeS) in which 63% and 66% of eligible households in sample A and in sample B (the child boost sample) respectively co-operated with the survey[1]. There was no evidence of response bias for the interview by sex or SIMD quintile; however the response was lower for children aged 12-16 years and for children living in large urban areas or remote small towns. 1674 FFQs were available for dietary analysis (response of 55%), and response for the FFQ was lower for children aged 12-16 years, children from the most deprived quintile, and children from large urban areas and remote areas. Nevertheless, FFQs were available for analysis for 588 children aged 12-16 years, 314 children from the most deprived SIMD quintile, 638 children from large urban areas and 103 children from remote rural areas, allowing confidence in the weighted estimates of food and nutrient intakes in these groups.

9.1.2 Food frequency questionnaire

The Scottish Collaborative Group FFQ was used successfully to assess dietary intake and to compare intakes directly with those found in 2006[2]. The FFQ was chosen for use in these surveys because it has a lower respondent burden compared with diet diaries, and requires less staff time (<15 minutes per FFQ) for assigning codes and weights to the foods and drinks than diet diaries or 24-hour recalls. In addition, the FFQ may give a better estimate of habitual diet than a 4- or 7-day diet diary or single or multiple 24-hour recall which may not represent usual individual intake[3]. Therefore, estimates of intake in sub-groups may be more robust than if they had been based on records of only one or two days per child.

The completed FFQs were checked by interviewers for missing or ambiguous data, which helped to ensure the high quality of the FFQ data; only a small proportion of FFQs (3%) contained more than 10 blank lines and were therefore excluded. In addition, the quality of data entry of the FFQs was very high, with an error rate of 0.15% (see Section 2.4.1) which compares favourably with an error rate of 0.45% found for the 2006 survey[2].

The relative validity of the FFQ was assessed in the 2006 survey by comparing results from the FFQ with results from (i) 4-day diet diaries in 153 children and (ii) a single 24-hour recall in 350 children[2, 4]. Whilst estimates of energy and the absolute intake of other nutrients tended to be higher by the FFQ than either the diet diary or 24-hour recall, estimates of NMES (as a percentage of energy) were not significantly different between the FFQ and diet diary in all children, or between the FFQ and 24-hour recall in 3-11 year olds. Therefore, the mean intakes of foods and nutrients presented in this report should be viewed as estimates, and differences between groups defined by age, sex, deprivation and urban/rural area should be interpreted as indications of patterns rather than precise estimates of differences.

9.1.3 Anthropometric measurements

The measurement of height, weight and waist circumference in the home by trained field workers was acceptable to most children, with only 2% refusing the measurements. The BMI calculated from height and weight measurements was compared with UK 1990 reference data[5-6] rather than international reference data[7] which uses cut-offs closer to the UK 89th and 99th centiles for overweight and obesity respectively and therefore provides lower estimates of prevalence, especially for obesity, than those based on UK data.

Waist circumference measurement was used as an indicator of abdominal obesity, and the UK waist circumference charts[8] were used to classify children using the same percentile cut-offs as the BMI classification. The use of waist circumference identified higher levels of overweight and obesity in the study population than BMI, however it is not clear what percentiles should be used to define overweight and obesity, and the limitations of the reference data for waist circumference are recognised[8].

It is not currently recommended to use waist circumference to diagnose overweight and obesity in children[9] and therefore the results should be interpreted with caution. Nevertheless, waist circumference is recommended for diagnosis of metabolic syndrome in children[10] and Craig *et al*.[11] found that 11-17 year olds with high waist circumference and high BMI had higher systolic and diastolic blood pressure, higher plasma LDL-cholesterol and triglycerides and lower plasma HDL cholesterol than those with high BMI but normal waist circumference or high waist circumference and normal BMI. Waist circumference has also been shown to track into adulthood, and the tracking coefficient of waist may be stronger than that of BMI[12].

9.1.4 Physical activity

The questions used to assess physical activity were the same as those used for the 2008-2011 SHeS[13], and split activities by inside/outside school lessons. In contrast, the 2006 survey did not include questions about participation in physical activity at school. The school activity question was added at the end and all the other items were asked in the same way as in the 2006 survey, thus enabling the production of two measures of physical activity: one that included activity at school (for comparison with the SHeS), and one that excluded activity at school (for comparison with the 2006 survey). Results from this survey (conducted between June and November) are not directly comparable with those from the 2006 survey (conducted between May and September) or the SHeS which conducts fieldwork throughout the year, as physical activity may vary between winter and summer months, and between school term-time and school holidays.

Key points

- The Child Benefit records provided an effective sampling frame for this survey.
- The target sample size of 1500 children was exceeded: 1906 respondents (response rate of 63%) completed the interview and 1674 respondents (response rate of 55%) had an FFQ available for dietary analysis.
- There was a lower response to the FFQ for children aged 12-16 years, children from the most deprived quintile, and children from large urban areas and remote areas.
- Comparisons between urban/rural areas were limited due to the small proportion of the population in remote small towns.
- The quality of data collected in the FFQs was high (only 3% contained >10 blank lines) and the quality of FFQ data entry was very high (error rate of 0.15%).
- Measurement of height, weight and waist circumference in the home by trained field workers was acceptable to most children (only 2% refused the measurements).
- Estimates of physical activity levels may have been influenced by the period of data collection which included summer months and summer holidays.

Recommendations

- This survey should be repeated around 2014 and compared with the results of the 2006 and 2010 surveys to assess changes in diet and the prevalence of overweight and obesity in children in Scotland.
- Future surveys wishing to stratify results by urban/rural classification will need to ensure adequate numbers in the urban/rural groups of interest.

9.2 Survey results

9.2.1 Foods, supplements and nutrients

Most children consumed a wide range of foods. All 32 food groups were consumed at least once a month by at least two thirds of all children, with the exception of wholemeal bread, oily fish, nuts and seeds, and powdered beverages (drinking chocolate).

Eleven percent of boys and 17% of girls aged 12-16 years reported consuming alcoholic drinks at least once a month. These proportions are similar to those found in the 2006 survey (12% in boys and 20% in girls)[2], but lower than the estimated proportion of children consuming alcohol about once a month or more in years 1 and 2 (combined) of the National Diet and Nutrition Survey (NDNS) rolling programme (2008/2009 – 2009/10) in 13-15 year olds (29% in boys and 22% in girls)[14]. The 2010 Health Behaviour in School-aged Children (HBSC) survey[15] in Scotland found that 10% of 13 year olds and 27% of 15 year olds are weekly drinkers, which is consistent with results from the 2008 Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS)[16] which found that 11% of 13 year olds and 31% of 15 year olds had had an alcoholic drink in the past week. In contrast to this survey, the HBSC survey found no gender difference in weekly drinking in 13 and 15 year olds[15].

The proportion of younger children using any dietary supplement was similar between this survey (18% in 3-7 year olds and 19% in 8-11 year olds) and years 1 and 2 (combined) of the NDNS rolling programme (2008/2009 – 2009/10) (17% in 4-10 year olds in the 4-day diary period), however 14% of 12-16 year olds in this survey used any supplement compared with 9% of 11-18 year olds in the 4-day diary period of the NDNS[14]. The decrease between 2006 and 2010 in the proportion of boys (but not girls) taking supplements could be due to the widespread coverage in the media around the time of the 2006 survey of the purported benefits of supplement use, especially fish oil based supplements, on behaviour and cognition in children. This may have been seen as particularly beneficial for boys rather than girls, and may not be as widely promoted now.

Energy intake was significantly higher in boys than in girls, and increased significantly with age in boys, and decreased significantly with age in girls. Mean energy intakes were slightly lower in 2010 than in 2006 in all age groups and in both boys and girls.

The mean intake of NMES as a percentage of food energy was 15.6% which is lower than the mean intake of 17.4% in 2006, but still considerably higher than the Scottish Dietary Target of <10% total energy. The difference in mean intakes between 2006 and 2010 was statistically significant. Despite differences in methodology, the mean intake of 15.6% food energy is very similar to results from the NDNS in children aged 4-18 years for years 1 and 2 (combined) of the rolling programme (2008/2009 – 2009/10): 15.3% of food energy in boys and 14.9% of food energy in girls[14]. The mean intake of 15.6% food energy is also similar to the mean intake of 15.0% food energy found in the 2009 Expenditure and Food Survey data in Scotland[17], which was similar to the intake found in the 2006 Expenditure and Food Survey (15.2% food energy).

Although updates to the FFQ nutrient database and in-house calculation programme (to reflect changes in the NDNS databank) resulted in a small reduction in the estimates of energy and NMES as a percentage of food energy (see Appendix G), this is unlikely to explain the decrease in NMES of nearly 2% food energy between 2006 and 2010. This decrease in NMES intake could be partly due to the significant decreases in intakes of biscuits, cakes and pastries in 12-17 year olds, and confectionery in girls of all ages. This is in line with findings from the 2010 HBSC survey in Scotland which reported a significant decrease in the daily consumption of sweets between 2002 and 2010[15].

Although the 2010 HBSC survey in Scotland[15] found a decrease in the proportion of children drinking sugary drinks since 2006, this survey found no significant difference between 2006 and 2010 in the mean intake of non-diet soft drinks. Non-diet soft drinks were the largest contributor to NMES in both 2006 and 2010, and as such need to be targeted in healthy eating messages to reduce NMES intake in children. For example, one of the 'Simple Swaps' suggestions in the Take Life On website includes the advice that 'water/unsweetened fruit juice/squash/milk is much better than sugary and fizzy drinks' (http://www.takelifeon.co.uk/).

Whilst foods highlighted by the Obesity Route Map Action Plan[18] were major contributors to NMES, yoghurt and fromage frais also contributed significantly (7%) to NMES intake, as was found in the 2006 survey. 93% of all children and 98% of children aged 3-7 years reported consuming yoghurt or fromage frais at least once a month. Therefore, this food group deserves more attention when discussing reformulation of products with the food industry to reduce the amount of added sugar.

The mean intake of total fat as a percentage of food energy was 32.7%, which is below the DRV population average of 35% and met the Scottish Dietary Target of ≤35%. This result is similar to the mean intake found in 2006 (32.9% food energy), but a little lower than the mean values found in the NDNS of 33.9% in boys and 34.5% in girls[14]. Biscuits, cakes and pastries remain the largest contributor to total fat intake (10% in both 2006 and 2010), but there has been a significant reduction in the intake of biscuits, cakes and pastries between 2006 and 2010 in both boys and girls aged 12-17 years.

The mean intake of saturated fatty acids was 13.2% of food energy, which is higher than the DRV population average of 11% of food energy and the Scottish Dietary Target of ≤11%. There has been a slight decrease in the mean intake since 2006 (13.8% food energy), and our results are comparable with the NDNS results of 13.0% of food energy in boys and 12.9% of food energy in girls[14]. Intakes of milk and cream, which are the main source of saturated fatty acids, have decreased significantly between 2006 and 2010 in 3-7 and 12-17 year old boys, but not in girls.

The objective of the Food Standards Agency to work with Health Departments/Directorates and other stakeholders to reduce the average intake of saturated fatty acids to below 11% of food energy by 2010 (http://food.gov.uk/multimedia/pdfs/satfatprog.pdf) has not been met in children aged 3-16 years. Nevertheless, the slight decrease in saturated fatty acids between 2006 and 2010 is encouraging.

9.2.2 Overweight and obesity

The prevalence of *overweight* (but not obese) and *obesity* in this survey was 15% and 17% respectively. 10% of children were severely obese. These figures are higher than the expected distribution based on the centile cut-offs used (10% lying between the ≥85th and <95th centile, 5% ≥95th centile, and 2% ≥98th centile).

In girls, the prevalence of *overweight including obese* decreased significantly from 33% in 2006 to 28% in 2010. Whilst the prevalence of *overweight including obese* in girls in this survey is similar to that found in the 2010 SHeS, a decrease in prevalence was not seen in the SHeS: 29% in 2003, 27% in 2008, 28% in 2009, and 29% in 2010[19]. There was no significant change in the prevalence of *overweight including obese* between 2006 and 2010 in any of the age groups (3-7, 8-11 or 12-17 years) in girls.

In boys, the prevalence of *overweight including obese* increased from 30% in 2006 to 34% in 2010, although this increase did not reach statistical significance. This increase is difficult to compare with the SHeS data since the prevalence of *overweight including obese* has fluctuated in boys from 32% in 2003, to 36% in 2008, to 30% in 2009 and 31% in 2010. It has been suggested that the differences found in the SHeS between 2008 and 2009 may reflect sample fluctuation rather than a true population difference[19]. Whilst the prevalence of *overweight including obese* increased significantly in 8-11 year old boys from 29% in 2006 to 40% in 2010, no increase was found in 7-11 year old boys in the 2003 to 2010 SHeS.

This survey compares favourably with the 2010 SHeS in terms of (i) sample size (1816 versus 1199 children), (ii) accuracy of estimates (SHeS may underestimate the prevalence of overweight/obesity by excluding those with BMI >3 SD above the norm for their age), and (iii) methodology (SHeS does not measure waist circumference in children). When children with a BMI >3 SD above the norm for their age were excluded (2%), the prevalence of *overweight including obese* of 29% in 3-15 year olds was similar to that of 30% in 2-15 year olds in the 2010 SHeS.

Nearly half (48%) of all children had a waist circumference ≥85th percentile, and one fifth (21%) of all children had a waist circumference ≥98th percentile. The highest percentage of children with a waist circumference ≥98th percentile was in girls aged 12-16 years (31%). Of the children who had a *healthy weight* based on the BMI classification, 28% had a waist circumference ≥85th percentile. Whilst the use of waist circumference to diagnose overweight and obesity in children is not currently recommended[9], it has been shown that the combined use of BMI and waist circumference may be useful in identifying children with increased health risks[11].

There was little evidence for differences between children who were *neither overweight nor obese*, *overweight but not obese*, or *obese* in the intake of energy, biscuits, cakes and pastries; milk and cream; or confectionery. However, this cross-sectional analysis may have been affected by under-reporting in overweight or obese children, or by avoidance of these foods in overweight or obese children who are attempting to lose weight. Children who were overweight or obese had higher intakes of non-diet soft drinks than children who were *neither overweight nor obese*. Therefore this may be a key food group to target in healthy eating messages for reducing NMES intake and preventing weight gain in children.

9.2.3 Physical activity

The Curriculum for Excellence[20], published in 2004 and implemented in 2011, encourages at least two hours of physical education for every child each week in addition to physical activity and sport which is supported by Active Schools. Overall, 89% of boys and 83% of girls reached the recommended activity level of 60 minutes or more on all 7 days, thereby meeting the target of '80% of all children aged 16 and under meeting the minimum recommended levels of physical activity by 2022'[21]. This target was not met by girls aged 12-16 years, of whom only 67% did 60 minutes or more on all 7 days.

Boys who were *overweight including obese* were significantly less likely to meet the recommended level of physical activity, and spent significantly more time in front of a screen than boys who were *neither overweight nor obese*. There was no difference between these BMI groups in girls with regard to reported physical activity or sedentary behaviour.

9.2.4 Inequalities

Differences between SIMD quintiles in the amount of foods or drinks consumed per day (by those who consumed the foods) were generally small. Children in more deprived areas had lower intakes of meats and meat dishes; vegetables; fruits; fruit juice; and tea, coffee and water, and higher intakes of eggs and egg dishes; processed meats; chips, fried and roast potatoes and potato products; crisps and savoury snacks; confectionery and diet and non-diet soft drinks than children in less deprived areas. The percentage of children taking any type of dietary supplement was significantly higher in the least deprived areas (22%) than in the most deprived areas (11%). This trend was also seen in 2006: 27% in the least deprived areas versus 18% in the most deprived areas[2].

NMES intakes increased significantly from 15.2% food energy in the least deprived SIMD quintile to 16.7% in the most deprived SIMD quintile. This significant association was also found in the 2006 survey[2]. Intakes of non-diet soft drinks, which are the largest contributor to NMES intake, were higher in children from more deprived areas than children who were from less deprived areas. Total fat and SFA intakes as a percentage of food energy did not differ by SIMD quintile, consistent with results found in the 2006 survey.

The prevalence of *overweight including obese* increased significantly from 25% in the least deprived quintile to 38% in the most deprived quintile. In 2006, the corresponding values were 25% and 32% respectively. In 2010, the proportions of children who were *obese but not severely obese* and *severely obese* were twice as high in children from the most deprived quintile compared with the least deprived quintile. The percentage of children with a waist circumference ≥98th percentile increased from 18% in the least deprived quintile to 28% in the most deprived quintile.

In both 2006 and 2010, the proportion of children meeting the physical activity recommendations was similar between SIMD quintiles. Average time spent in front of a screen increased significantly from 1.7 hours/day for children in the least deprived areas to 2.2 hours/day for children in the most deprived areas.

Key points

- NMES intake was 15.6% food energy which is considerably higher than the Scottish Dietary Target of <10% total energy, but lower than the mean intake of 17.4% food energy in 2006. The difference in mean NMES intake between 2006 and 2010 was statistically significant.
- Total fat intake as a percentage of food energy was 32.7%, which is below the DRV recommended population average of 35% and the Scottish Dietary Target of ≤35%, and is similar to the intake in 2006.
- Saturated fatty acid intake was 13.2% food energy, which is higher than the DRV recommended population average of 11% and the Scottish Dietary Target of ≤11%.
- Non-diet soft drinks remain the largest contributor to NMES intake (contributing 16%), and there has been no change in their consumption between 2006 and 2010.
- Between 2006 and 2010 there have been decreases in intakes of biscuits, cakes and pastries in both boys and girls aged 12-17 years, confectionery in all age groups in girls, and milk and cream in 3-7 and 12-17 year old boys.
- The prevalence of overweight (but not obese) and obesity was 15% and 17% respectively, with 10% of children being severely obese.
- Between 2006 and 2010, the prevalence of *overweight including obese* decreased significantly in girls from 33% to 28%. In boys, there was an increase from 30% to 34% but this increase was not statistically significant.
- Overall, 48% of all children had a waist circumference ≥85th percentile and 21% had a waist circumference ≥98th percentile. The highest percentage of children with a waist circumference ≥98th percentile was in girls aged 12-16 years (31%).
- 89% of boys and 83% of girls reported meeting the recommended level of physical activity of 60 minutes or more on all seven days.
- Children from more deprived areas were significantly more likely to have a lower intake of fruit and vegetables and a higher intake of confectionery, non-diet soft drinks and NMES (% food energy); to be *overweight including obese*; have a waist circumference ≥98th percentile; and spend more time in front of a screen than children in less deprived areas.

Recommendations

- Work on foods highlighted in the Obesity Route Map Action Plan should continue in order to reduce the intake of the main sources of NMES and saturated fatty acids. Yoghurt and fromage frais should be considered a target for reformulation to reduce NMES intake.
- The observed increase in the prevalence of *overweight including obesity* in 8-11 year old boys needs to be monitored in future surveys. The implications of the high percentage of children with a high waist circumference, especially girls aged 12-16 years, needs further investigation. Measurements of waist circumference should be included in future surveys.
- In order for the target of 80% of all children meeting physical activity recommendations to be met, physical activity needs to be promoted particularly in girls aged 12-16 years.
- Inequalities between children in less versus more deprived areas need to be addressed.

9.3 Implications

9.3.1 Implications for further research

This survey continued the work of the 2006 Survey of Sugar Intake Among Children in Scotland[2] to assess the dietary intake of NMES, total fat and saturated fatty acids in relation to the Scottish Dietary Targets[22] and Dietary Reference Values[23-24], and to monitor the impact of policy initiatives and relevant campaigns aimed at improving children's diet. Ideally, this survey should be repeated around 2014 and compared with the results of the 2006 and 2010 surveys to assess changes in diet and the prevalence of overweight and obesity in children in Scotland.

A repeat of this survey would be particularly important to monitor the impact of relevant initiatives to improve health in children in Scotland such as the Obesity Route Map Action Plan[18], school-based initiatives, and public awareness campaigns (e.g. Take Life On). In particular, a survey the size of the current survey is required to assess the impact of these recommendations in sub-groups of children in Scotland, i.e. by sex, age group, level of deprivation etc. It is recognised, however, that differences between surveys may also reflect random variation between different sample populations as well as true changes over time.

The survey could also provide baseline results for longitudinal studies of diet and health in the participants of the current survey. Prospective studies would provide stronger evidence than the cross-sectional analyses presented in this report of an association between diet or physical activity (or inactivity) and the development of overweight and obesity, or weight loss in children who are currently overweight or obese.

There is scope for secondary analyses that could be carried out with the data from the current survey. These include:

- A statistical comparison of intakes of nutrients and food groups between 2006 and 2010 to assess whether diet has changed in children overall and in various sub-groups, defined for example by age, sex, level of deprivation and BMI classification.
- Investigation of the association between waist circumference and the intake of NMES, total fat and saturated fatty acids and physical activity and inactivity.
- Investigation of the association between measures of physical activity and inactivity and diet.

9.3.2 Implications for health improvement

The main finding of the survey was that NMES and saturated fatty acid intake as a percentage of food energy remain much higher than recommended levels in children aged 3-16 years and in all age and sex sub-groups. Whilst it is encouraging that mean NMES intake has decreased by 1.8% food energy since 2006, the mean intake of saturated fatty acids has decreased only slightly, by 0.6% food energy, despite the various initiatives and campaigns launched since 2006 (see Section 1.1.3).

Major changes to the current diet of children are required before the targets for NMES and saturated fatty acids are met, especially for NMES intake in older children aged 12-16 years. Healthy eating messages need to focus on replacing the intake of the main food sources of these nutrients with lower sugar and saturated fatty acid alternatives. Non-diet soft drinks should, ideally, be replaced by no added sugar drinks such as water, milk (ideally semi-skimmed), low sugar juices or sugar-free soft drinks. Biscuits, cakes, pastries and confectionery should be replaced by other energy-providing foods, preferably foods high in complex carbohydrate.

Research is required to understand the most effective way to enable such behaviour changes in children. While improving knowledge, attitudes and behaviour of children and their families is necessary, it is unlikely to be sufficient to achieve the substantial changes needed to meet dietary recommendations. Changes to the wider obesogenic environment, such as changes in retailing practices and reformulation of food and drink, particularly those aimed at children, will be necessary, as will research to identify how these initiatives can be designed and implemented to ensure that they improve the health of all children in Scotland.

Key points

- Longitudinal studies of the participants of the current survey could be used to investigate how changes in diet or physical activity and inactivity contribute to the development of overweight and obesity, or weight loss in children who are currently overweight or obese.
- Major changes to the current diet of children are required before the targets for NMES and saturated fatty acids can be met. Non-diet soft drinks should be replaced by no added sugar drinks such as water, milk (ideally semi-skimmed) or lower sugar juices. Biscuits, cakes, pastries and confectionery should be replaced by other energy-providing foods, preferably high in complex carbohydrate such as bread, pasta, rice, potatoes and fruit and vegetables.
- Research is required to understand the most effective way to enable the dietary changes in children that are required for the Scottish Dietary Targets to be met. This research needs to take into account the persistent socio-economic differences in diet and overweight and obesity in children in Scotland.

Recommendations

- This survey should be repeated in children in Scotland around 2014 and compared with the results of the 2006 and 2010 surveys to assess changes in diet, the prevalence of overweight and obesity, the magnitude of inequalities in diet, and to monitor the impact of policy initiatives and relevant campaigns aimed at improving children's diet.
- Behaviour change needs to be better understood, and research is required to understand the most effective way to enable the major dietary changes required for children to achieve the Scottish Dietary Targets for NMES and saturated fatty acids.

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