Body Mass Index of Primary 1 Children in Scotland
School Year 2018/19

10 December 2019
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Introduction

This publication provides annual statistics on the proportion of children in Primary 1 in schools across Scotland who have healthy, high, and low body mass index (BMI). Information is provided for school years 2001/02 to 2018/19.

Information used in this publication

The information presented in this report is derived from height and weight measurements recorded at Primary 1 health reviews. A Primary 1 review is offered to all children in mainstream and special\(^1\) state schools as part of the wider child health programme. Measurements are conducted by health staff in schools at any point during the school year. Children’s height is measured in centimetres to one decimal place and their weight measured in kilograms to two decimal places\(^2\). The results are entered into the Child Health Surveillance Programme - School (CHSP-S) national information system. ISD receives quarterly downloads of data from the CHSP-S system to support the production of national statistics.

An estimated 1-2% of children in Primary 1 in Scotland attend an independent school. Independent schools are responsible for offering the agreed child health programme to their pupils. A small number of independent schools chose to record the results of their P1 height and weight measurements in the CHSP-S system and these are included in the results provided in this report where available (12 schools in 2018/19). See the technical report for more information.

NHS Boards are responsible for working with Local Authorities to ensure that children not attending school, for example due to being home schooled or long term illness, have access to care in line with the agreed child health programme. It is unlikely that P1 height and weight measurements for this small group of children will be included in the CHSP-S system.

The CHSP-S system was introduced in NHS Borders in 1995. Other NHS Boards across Scotland subsequently adopted the system at different times. In some Boards, the system was initially only used in selected areas. The CHSP-S system has been used to record Primary 1 reviews in all parts of Scotland since school year 2011/12. This report provides information from school year 2001/02 onwards. In 2001/02, 3 of the then 15 NHS Boards across Scotland were using the system to record Primary 1 reviews in all areas, and a further Board was using it in one Local Authority area.

The proportion of all children in Primary 1 that had a record of their child health review recorded on the CHSP-S system (review ‘coverage’) is estimated by comparing the number of reviews recorded on the system with the population of 5 year old children living in the area of interest at that time. Estimated coverage has increased from 21% in 2001/02 (when only 4 NHS Boards recorded data on CHSP-S) to 94% in 2011/12 (when all areas used CHSP-S). Estimated review coverage remained over 90% for school years 2012/13 to 2015/16 however it fell to 85% in 2016/17, rose slightly to 88% in 2017/18, but has fallen to 76% in 2018/19. The main reason for the decline in coverage in 2018/19 is the change in the way parental consent was sought for P1 reviews to be carried out.

\(^1\) Children at complex needs schools may not be offered a P1 review due to their severe/complex needs making it more difficult for P1 reviews to be carried out

\(^2\) Royal College of Paediatrics & Child Health, Growth chart guidance

https://www.rcpch.ac.uk/resources/uk-who-growth-charts-guidance-health-professionals
Information Services Division

Estimated coverage varies between different NHS Board and Local Authority areas, and varies for the same areas over time. Once an area has implemented the CHSP-S system, low coverage can reflect difficulties in providing reviews to all eligible children and/or difficulties in recording the results on the CHSP-S system.

The proportion of P1 reviews recorded on the CHSP-S system that include valid measurements of height and weight (and hence can be used to calculate the child’s BMI - see below) is consistently very high. Over 98% of records for school year 2018/19 included valid height and weight information.

**Measuring healthy weight in children**

In this report, children are assigned to healthy and unhealthy weight categories based on their body mass index (BMI). BMI is calculated by dividing an individual’s weight (in kilograms) by their height squared (in metres\(^2\)). BMI gives an indication of whether an individual’s weight is in proportion to their height. It is accepted as a reasonably robust measure of an individual’s level of body fat for children aged 2 years and over as well as adults\(^3\).

In adults aged 18 years or over, standard BMI cut off values can be used to categorise an individual as underweight (BMI < 18.5), healthy weight (BMI 18.5-24.9), overweight (BMI 25-29.9), or obese (BMI ≥ 30). However, these categories cannot be used for children as children’s BMI naturally changes as they get older, and it is different for boys and girls\(^4\).

To assign an individual child to an (un)healthy weight category, their BMI is therefore first compared to a set of growth reference data. The reference data show the expected distribution of BMI values for children of their age and sex. Comparing the child’s BMI with the reference data provides the child’s BMI centile value. The centile value equates to the percentage of all children of that age and sex within the growth reference dataset that had a BMI lower than the child of interest. So, for example, if a child was found to have a BMI on the 97th centile, that means that 97 out of every 100 children of their age and sex in the growth reference dataset had a BMI lower than them, and only 3 out of 100 children had a BMI that was the same or higher. Further information on the reference data and calculation of centiles can be found in the [technical report](https://www.sign.ac.uk/assets/sign115.pdf).

Once a child’s BMI centile is known, centile cut off/threshold values are used to assign the child to the appropriate (un)healthy weight category. In this report we have used two sets of cut off values, again as recommended\(^5\)\(^6\). Epidemiological thresholds are used to define children at risk of under- or overweight and are used primarily to monitor the health of the

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4 A simple guide to classifying body mass index in children, National Obesity Observatory, NHS England

5 SACN Statement defining child underweight, overweight and obesity, Public Health England, 2012

6 115 Management of Obesity, Scottish Intercollegiate Guidelines Network, 2010
[https://www.sign.ac.uk/assets/sign115.pdf](https://www.sign.ac.uk/assets/sign115.pdf)
whole child population. Clinical thresholds are used to define children with a level of under- or overweight that may warrant clinical intervention, such as further assessment, support, or treatment. The epidemiological and clinical thresholds used to define the various categories of child (un)healthy weight are provided in the technical report.

As an example, the proportion of children in P1 at risk of overweight or obesity (epidemiological threshold) is defined as those with a BMI centile equal to or greater than the 85th centile. Given that the UK90 reference data were used to derive the BMI centiles, this means that, if children in Primary 1 now had the same BMI distribution as children living in the UK in the years leading up to 1990, we would expect 15% of children to fall into this category. In practice, children nowadays have higher levels of body fat now than children did in previous decades, hence the proportion of children in Primary 1 in 2018/19 that fell into this category was higher at 22.4%.

**The benefits of maintaining a healthy weight**

Maintaining a healthy weight throughout childhood is associated with many health benefits. Overweight and obesity in childhood is associated with a wide range of health problems such as risk factors for heart disease, type 2 diabetes, asthma, emotional distress and mental health difficulties. In addition, overweight and obese children are at risk of remaining overweight or obese as adults. The higher a child’s BMI, the stronger the risk their BMI will remain high as the child grows up. Overweight and obesity in adulthood is strongly associated with health problems such as type II diabetes, heart disease, various cancers, and mental health difficulties. Being underweight in childhood can also be a cause for concern, indicating poor nutritional intake and/or underlying medical problems.

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7 Han JC et al, Childhood Obesity, Lancet 2010;375, 1737-1748
https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(10)60171-7/fulltext

8 Singh AS et al, Tracking of childhood overweight into adulthood: a systematic review of the literature, International Association for the study of obesity, 2008; volume 9, issue 5, 474-488

9 Childhood Obesity, Obesity Action Scotland, Glasgow, 2017
http://www.obesityactionscotland.org/media/1020/childhoodobesityweb.pdf
Main Points

• In school year 2018/19, around three out of four Primary 1 children (76.6%) had a healthy weight, 22.4% were at risk of overweight or obesity and 1.0% were at risk of underweight.

• Since 2001/02, the overall proportion of Primary 1 children who are at risk of overweight or obesity has remained fairly constant.

• There are now substantial inequalities in child unhealthy weight across Scotland. Since 2001/02, the proportion of Primary 1 children at risk of overweight or obesity has increased in the most deprived areas but decreased in the least deprived areas.

• Boys in Primary 1 are slightly less likely than girls to have a healthy weight.
Results and Commentary

In school year 2018/19, a total of 44,782 children had a Primary 1 review including valid height and weight information recorded on the CHSP-S system. This equates to 76.3% of the estimated population of 5 year olds living in Scotland in mid 2018.

Body mass index distribution of children in Primary 1 (epidemiological categories)

Based on the epidemiological thresholds used for population health monitoring purposes, 76.6% of Primary 1 children in 2018/19 had a BMI in the healthy weight range. 12.2% of children were at risk of overweight and 10.2% were at risk of obesity (22.4% at risk of overweight or obesity combined). 1.0% of children were at risk of underweight.

The proportion of children in the different BMI categories has shown little change since school year 2001/02 (when 3 NHS Boards and a further Board in one Local Authority area were recording Primary 1 reviews on the CHSP-S system) or since 2011/12 (when information became available for all areas of Scotland) (Figure 1).
The Scottish Health Survey found that 73% of children aged 2 to 6 years in 2018 had a healthy weight, with 26% at risk of overweight or obesity combined. The NCMP found that 76.5% of children in Reception class in England in school year 2018/19 had healthy weight, with 22.6% at risk of overweight or obesity combined. These findings are very similar to the results for Primary 1 children in Scotland reported above.

In line with the findings for Primary 1 children, the Scottish Health Survey has not found any overall trend in the proportion of children aged 2-15 years with a healthy weight since 1998 (when children were first included in the survey). Similarly, the proportion of children in Reception in England at risk of overweight or obesity has shown little change from 2006/07 when reliable data became available\(^\text{10}\).

BMI distribution by gender (epidemiological categories)

In 2018/19, boys in Primary 1 were slightly less likely than girls to have a healthy weight (75.5% boys; 77.7% girls). Boys were slightly more likely than girls to be at risk of overweight or obesity (23.3% boys; 21.6% girls) and at risk of underweight (1.3% boys; 0.7% girls). The differences between boys and girls are small, but have been seen consistently since 2001/02 (Figure 2).

Figure 2: Percentage of Primary 1 children at risk of overweight and obesity, and underweight (epidemiological categories), by gender, school years 2001/02 to 2018/19, all participating NHS Boards/Scotland

![Graph showing BMI distribution by gender and deprivation over years]

Note: Individual NHS Boards implemented data collection at different times, with all areas providing data from 2011/12 onwards.

The NCMP has also consistently found that boys in Reception class in England are slightly more likely than girls to be at risk of underweight, overweight, and obesity.

BMI distribution by deprivation (epidemiological categories)

In 2018/19, children living in more deprived areas were less likely to have a healthy weight (72.6% of children living in the most deprived areas, 81.4% least deprived). Children living in more deprived areas were somewhat more likely to be at risk of overweight and more than twice as likely to be at risk of obesity than children living in the least deprived areas. The proportion of children at risk of underweight is similar for children in all deprivation categories (Figure 3).
In 2001/02 and 2002/03, the proportion of children at risk of overweight and obesity was similar for all deprivation categories. Since then, the proportion of children at risk of overweight or obesity has increased in the most deprived areas but decreased in the least deprived areas, resulting in the current high levels of inequality (Figure 4).
Figure 4: Percentage of Primary 1 children at risk of overweight and obesity (epidemiological categories), by deprivation, school years 2001/02 to 2018/19, all participating NHS Boards/Scotland

Note: Individual NHS Boards implemented data collection at different times, with all areas providing data from 2011/12 onwards.

Findings from the English NCMP programme also show a strong, and increasing, association between deprivation and risk of overweight and obesity in childhood.
BMI distribution by NHS Board area (epidemiological categories)
There are small differences in the proportion of children in healthy and unhealthy weight categories between NHS Board and Local Authority areas. In 2018/19 the proportion of children living in mainland NHS Board areas classified as healthy weight ranged from 72.4% in NHS Highland to 78.2% in NHS Grampian (Figure 5). Differences between areas reflect a complex range of factors such as data quality, the proportion of children living in deprived or urban areas, the proportion from ethnic minority groups, and the extent to which local environments and services promote healthy weight. In general, children of Black ethnicity are more likely than White children to have high BMI, and children of Asian ethnicity are more likely to have low BMI. In addition, children living in urban areas are at higher risk of unhealthy weight than those living in rural areas11.

Figure 5: Percentage of Primary 1 children with healthy weight (epidemiological categories), by deprivation, school years 2001/02 to 2018/19, all participating NHS Boards/Scotland
BMI distribution of children in Primary 1 (clinical categories)

Based on the clinical thresholds used to guide the care of individual children, 84.1% of Primary 1 children in 2018/19 had a BMI in the healthy weight range. 9.0% of children were overweight, 3.7% were obese, and 2.8% were severely obese. 0.3% of children were clinically underweight (Figure 6).

Figure 6: BMI distribution (clinical categories) of Primary 1 Children, school years 2001/02 to 2018/19, all participating NHS Boards/Scotland

Note: Individual NHS Boards implemented data collection at different times, with all areas providing data from 2011/12 onwards.

Trends in (un)healthy weight among Primary 1 children, and associations with gender and deprivation, are similar when looking at clinical categories as when looking at epidemiological categories. In general, the association with deprivation is strongest for the highest BMI categories. In other words children from deprived areas are somewhat more likely than children from less deprived areas to be overweight, but much more likely to be obese and in particular severely obese.

The NCMP found that 2.4% of children in Reception in England in school year 2018/19 were clinically severely obese, similar to the figure for Primary 1 children in Scotland reported above. The NCMP does not report on the proportion of children in other clinical categories.
Promoting and supporting child healthy weight in Scotland

This report shows that the overall proportion of Primary 1 children in Scotland with healthy weight has remained fairly constant since 2001/02. The proportion of children at risk of, or with, overweight or obesity, has remained high. Over the same period, inequalities in child overweight and obesity have widened substantially. The proportion of Primary 1 children at risk of overweight or obesity continues to increase in the most deprived areas but it is falling in the least deprived areas.

Effective interventions to promote child healthy weight are available\textsuperscript{12,13} Comprehensive and sustained action will be required to reduce the overall proportion of children in Scotland with unhealthy weight, and to reduce inequalities in unhealthy weight\textsuperscript{14,15}, including action to

\begin{itemize}
  \item Reduce maternal overweight and obesity
  \item Promote breastfeeding
  \item Support children’s access to appropriate quantities of nutritious food in the home, early learning and childcare, and school settings
  \item Promote opportunities for physical activity and reduce sedentary time
  \item Promote adequate sleep
\end{itemize}

Within each of these broad areas, ‘upstream’ interventions (for example those designed to influence the wider food environment, such as food advertising, labelling and price) are likely to be at least as important as more ‘downstream’ interventions (for example those designed to support individual children and families). In addition to the preventive actions outlined above, it will also be important to ensure children who have unhealthy weight have access to a comprehensive range of treatment services such as intensive child healthy weight programmes to improve their health in childhood and reduce their risk of becoming obese adults\textsuperscript{16}.

\textsuperscript{12} Bleich SN et al. Interventions to prevent global childhood overweight and obesity: a systematic review; Lancet, vol 6, issue 4, 332-346, 2018
\textsuperscript{13} Waters E et al. Interventions for preventing obesity in children, Cochrane Library, 2011
\textsuperscript{15} Report of the Commission on Ending Childhood Obesity, World Health Organization, 2016
Global trends in child healthy weight

The proportion of children with overweight and obesity has increased markedly since at least the 1970s in both high and low income countries across the world. The increase has slowed down or stopped in many high income countries since around 2000, however many high income countries continue to see widening socioeconomic inequalities in child overweight and obesity. These trends reflect marked changes in the environments in which children live: increased availability of high calorie but nutritionally poor food, reduced opportunities for physical activity, increased sedentary time, and reduced sleep duration are all important. High levels of maternal obesity and relatively low levels of breastfeeding also contribute to child unhealthy weight.

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Scottish policy on child healthy weight

Preventing Overweight and Obesity in Scotland: a route map towards healthy weight was published in 2010. An Obesity Indicator Framework was developed to monitor progress in implementing the route map’s objectives and tackling obesity, with data published annually between 2012 and 2018.

In July 2018, the obesity route map was superseded by A Healthier Future: Scotland’s Diet and Healthy Weight Delivery Plan. The delivery plan sets out a vision for Scotland ‘where everyone eats well and has a healthy weight’. The plan includes stated ambitions to ‘halve child obesity in Scotland by 2030’ and to ‘significantly reduce health inequalities’. The delivery plan contains a range of commitments aiming to make ‘food environments’ more conducive to healthy eating and also to ensure that people (including children) already suffering from unhealthy weight have access to effective weight management services. A diet and healthy weight monitoring report was published in October 2019.

Existing policy on maternal and infant nutrition and policy and regulations on food provided in schools also aim to promote child healthy weight. The Scottish Government published A More Active Scotland: Scotland’s Physical Activity Delivery Plan in July 2018. This complements the diet and healthy weight plan, recognising the importance of both diet and activity in promoting and maintaining healthy weight. A revised National Performance Framework was issued in 2018. This includes a national indicator on healthy weight based on the proportion of children aged 2-15 years (and, separately, adults aged 16 years or over) with healthy weight as reported by the Scottish Health Survey.

The UK Government published Childhood Obesity: a Plan for Action in 2016, with an update released in 2018. Many of the actions set out in the UK plan apply to England only but some, notably the Soft Drinks Industry Levy which encourages a reduction in the amount of sugar added to soft drinks, apply across the UK.
Other sources of information on child healthy weight in Scotland and the rest of the UK

Each of the UK nations collects data on children’s BMI both through health checks or measurement programmes carried out in schools and through large scale national surveys.

Data from measurement of children in schools in the rest of the UK

The National Child Measurement Programme (NCMP) has overseen the measurement of the height and weight of children in Reception (age 4 to 5 years) and Year 6 (age 10 to 11 years) in all mainstream state maintained primary schools in England since school year 2005/06. The NCMP uses the UK90 reference data when calculating children’s BMI centiles. The programme uses a combination of epidemiological and clinical thresholds when reporting results: the percentage of children at risk of underweight (BMI ≤ 2nd centile), at risk of overweight (≥ 85th centile), at risk of obesity (≥ 95th centile), and clinically severely obese (≥ 99.6th centile) are all reported. Coverage of the NCMP (the percentage of eligible children that had BMI recorded) has increased over time, from 83% for children in Reception in 2006/07 to 95% in 2018/19. In 2018/19 a total of 597,812 Reception children had a valid BMI recorded.

The Child Measurement Programme for Wales has overseen the measurement of all children in Reception (age 4 to 5 years) in Wales since school year 2011/12. Children in Northern Ireland are measured in Primary 1 (age 4½ to 5½ years) and Year 8 (age 11½ to 12½ years) and results are reported on an ad hoc basis by the Public Health Agency of Northern Ireland21.

Survey data in Scotland

The Scottish Health Survey provides detailed information on the health of the general Scottish population living in private households. The survey was first carried out in 1995 (adults aged 16-64 years only), and it has been repeated in 1998 (children and adults aged 2-74 years only), 2003, and annually since 2008 (children and adults of all ages from 2003 onwards). The most recent report is for 201822.

Since 1998, children aged 2 to 15 years inclusive have been invited to have their height and weight measured as part of the survey and the percentage of children in different BMI categories has been reported. The Scottish Health Survey uses the UK90 reference data when calculating children’s BMI centiles, and uses the same cut off values to assign children to the epidemiological categories of (un)healthy weight as ISD.

In 2018, around 60% of children eligible to take part in the Scottish Health Survey participated in the interview, and around 65% of the children aged 2-15 years who were interviewed had their height and weight measured, resulting in BMI information on a total of 1,292 children. Children that do not participate in the survey, or do not have their height and weight measured, are likely to be different to children that do, for example they may be more likely to be in an unhealthy weight category. Statistical techniques (survey weights) are used to compensate for this as far as possible when reporting the survey’s results.

21 Children’s Health in Northern Ireland, Public Health Agency, 2018

22 Scottish Health Survey 2018: Volume One - Main Report, Scottish Government, 2019
The Growing Up in Scotland study provides repeated measures of the height and weight of children in the study as they grow up. Detailed reports on childhood obesity were published in 2012\(^{23}\) and 2018\(^{24}\).

**Survey data in the rest of the UK**

The Health Survey for England provides similar information on child healthy weight as the Scottish Health Survey. The National Survey for Wales does not include direct measurement of children’s height and weight. The Health Survey Northern Ireland does include direct measurement of children however, as is the case with the NI school measurement data, different reference data and cut off values are used to assign children to BMI categories making results difficult to compare with those from the rest of the UK.

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\(^{23}\) Growing Up in Scotland: overweight obesity and activity, Scottish Government

\(^{24}\) Growing Up in Scotland: overweight and obesity at age 10, Scottish Government
https://www.gov.scot/publications/growing-up-scotland-overweight-obesity-age-10/
Supporting information accompanying this report

This publication is accompanied by

- An interactive Primary 1 BMI Dashboard
- Summary data tables in Excel
- Machine readable detailed open data tables available through the NHS Scotland open data platform
- A technical report giving background information on data quality and methods
## List of Tables

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Further Information

Further Information can be found on the ISD website. ISD Scotland publishes a wide range of information on Child Health including infant feeding, immunisations, and the 27-30 month review. Further information can be found in the Child Health section on the ISD website. The next release of this publication will be in December 2020.

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