

Historical Childhood Body Mass Index (BMI) Statistics

A revised [child health programme](#) was implemented across Scotland following the recommendations published in the 2005 report [Health for all children 4: guidance on implementation in Scotland](#) (Hall 4). Prior to the implementation of Hall 4, the core child health programme included reviews at 39-42 months, Primary 7 and Secondary 3. Historical Body Mass Index (BMI) statistics derived from height and weight measurements collected at these reviews are available for a limited number of NHS Boards who recorded these data on the Child Health Systems Programme (CHSP) [Pre-School](#) and [School](#) systems. As these reviews no longer routinely take place under the core child health programme, the latest available BMI data from the 39-42 month review are for children born in 2001 and relate to children approximately 3.5 years of age. The latest available BMI data for children in Primary 7 and Secondary 3 are for school year 2004/05. The last update of BMI statistics for children in these age ranges was in December 2006.

Tables and charts

Tables and charts are available via the links below. Data are presented by NHS Board, Scottish Index of Multiple Deprivation (2006) quintile and gender.

[Pre-school \(children aged approx 3.5 years\)](#) (📄 119KB)

Information is presented for children born between 1995 and 2001.

[Primary 7 \(children aged approx 10 - 12 years\)](#) (📄 98KB)

Information is presented for school children in Primary 7, for school years 2000/01 to 2004/05.

[Secondary 3 \(children aged approx 13 - 15 years\)](#) (📄 93KB)

Information is presented for school children in Secondary 3, for school years 2000/01 to 2004/05.

Key points

Pre-school children born 1995 to 2001

- Among Scottish children born in 2001, 20.7% were overweight by the time they reached 3.5 years of age, including 8.6% who were obese and 4.1% severely obese. The percentage of children falling into each category at 3.5 years of age remained relatively stable for children born between 1995 and 2001.
- In pre-school children, low BMI levels rose slightly over the 7-year period; 5.9% of children born in 2001 were identified as underweight, compared to 5.5% of children born in 1995.

School aged children in school years 2000/01 to 2004/05

- School aged children have higher levels of obesity compared to pre-school children, and the data shows that the proportion of over weight children increases as children get older. In P7, 34.1% were identified as being over weight, including 19.4% obese and 11.2% severely obese. The figures show a small decrease in S3.

- Trend data show that levels of high BMI in school children, for years 2000/01 to 2004/05 have increased by 3.8 percentage points at P7 and 2.9 percentage points at S3. In 2004/05, 34.1% of children in P7 were classified as overweight, including 19.4% obese and 11.2% severely obese, compared with 30.4%, 16.6% and 9.2% respectively in 2000/01.

Other findings

- Overall there is not much difference between boys and girls. Levels of high BMI amongst girls tend to be slightly lower than for boys until S3 when the pattern is reversed.

Background Information

Calculating BMI statistics

Body mass index is calculated by dividing an individual's weight in kilograms by their height in metres squared. For epidemiological purposes, an individual BMI is not meaningful in isolation, only in the context of the distribution of values for a population. Individuals can be assigned to categories e.g. underweight (using their BMI or centiles derived from BMI) to gauge where they lie in relation to the rest of the population - in particular, whether they have an unusually high or low BMI.

In adults, BMI can be directly classified into different categories (for example, the [World Health Organisation international classification](#) of "underweight" is BMI < 18.5) since age in adulthood doesn't greatly affect weight in relation to height. However, these adult BMI category cut-offs aren't appropriate for children since BMI changes markedly as a child ages. A certain BMI at one age may be the norm but for another age the same BMI may be unusually high or low (indicating that the child is overweight or underweight).

Instead, for children, BMI can be converted into centiles, using UK 1990 growth reference data based on sex and age in months. These centiles can then be used to categorise BMI as detailed in the table below:

Category	Definition	What this means
Very low BMI (very underweight)	Less than or equal to 2 nd centile	Children whose BMI is within the bottom 2% of the 1990 UK reference range for their age and sex.
Low BMI (underweight)	Less than or equal to 5 th centile	Children whose BMI is within the bottom 5% of the 1990 UK reference range for their age and sex.
Overweight	Greater than or equal to 85 th centile	Children whose BMI is within the top 15% of the 1990 UK reference range for their age and sex.
Obese	Greater than or equal to 95 th centile	Children whose BMI is within the top 5% of the 1990 UK reference range for their age and sex.

Severely obese	Greater than or equal to 98 th centile	Children whose BMI is within the top 2% of the 1990 UK reference range for their age and sex.
----------------	---	---

The number of children within each of these categories can then be used to calculate the percentage of children reviewed who are: very underweight, underweight, overweight, obese and severely obese. Children with a BMI within the 5th - 85th centile range are considered to be in the normal weight range (although BMI may incorrectly categorise a small minority of children with heavy musculature as being overweight or obese).

Reference standards

1990 UK growth reference standards

In 1995, new reference growth curves for the weight and height of UK children were published, replacing the Tanner-Whitehouse reference curves used since the 1960s. The new curves represent UK children in 1990 and are widely accepted as the reference for growth screening for the UK. The reference data used were collected between 1978 and 1990 (and therefore represent weight relative to height before the recent rise in levels of obesity in children) and were obtained by combining data from 11 distinct surveys that were representative of children in England, Scotland and Wales. From this national dataset, BMI reference curves for children and young people were established providing BMI centiles covering birth to 23 years of age.

We have used 1990 UK Reference data and Cole's LMS method to produce BMI centiles for Scottish children ([Cole TJ, Freeman JV and Preece MA](#). Body mass index reference curves for the UK, 1990. Arch Dis Child 1995; 73 : 25-9) as recommended in [SIGN guidance](#).

International growth reference standards

The [World Health Organisation has published international reference standards](#) for infants and children. These reference standards are derived from growth data from the [Multicentre Growth Study](#) relating to approximately 8500 children from six different countries around the world (Brazil, Ghana, India, Norway, Oman and USA).

Use of international reference standards allows international comparisons to be made (Scottish figures derived using these standards aren't available here).

Thresholds for defining very low BMI, low BMI, overweight, obese and severely obese

These statistics look at the percentage of children classified as very low BMI, low BMI, overweight, obese and severely obese, as defined according to centile cut-offs from the UK 1990 growth reference standards charts (very low BMI \leq 2nd centile, low BMI \leq 5th centile, overweight \geq 85th centile, obese \geq 90th centile, severely obese \geq 98th centile).

The BMI centile cut-offs used to derive the percentages overweight, obese and severely obese are those recommended in SIGN guidance for the purposes of population monitoring and epidemiological research. Use of the corresponding thresholds recommended by SIGN

for clinical practice (overweight \geq 91st centile, obese \geq 98th centile, severely obese \geq 99.6th centile) would result in lower percentages for overweight, obese and severely obese and BMI centile would be only one of a variety of factors taken into consideration before a clinical diagnosis is made.

In the UK, it is generally agreed that the most appropriate clinical cut-off for classifying individual children as being underweight is \leq 2nd centile. There is no agreed definition of underweight for population monitoring purposes but a reasonable threshold would be \leq 5th centile (see Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body mass index cut offs to define thinness in children and adolescents: international survey. *BMJ* 2007; 335: 194-7 and Dinsdale H, Rutter H et al. National Child Measurement Programme: Detailed Analysis of the 2006/07 National Dataset. National Obesity Observatory publication, June 2008).