One Minute Guide

Use of Body Mass Index (BMI) Centile Charts in Children

What is it?

Body Mass index (BMI) is an index of weight and height. It is a simple and reliable indicator of a healthy body weight in people over the age of two years. In children, the normal range of BMI is different for boys and girls, and it changes with age. BMI centile charts allow a child's BMI to be plotted so that it can be interpreted, taking into account the age and gender of a child. The BMI is at its lowest in early childhood, and gradually increases with age.

Why is it important?

BMI is not a direct measure of body fat but, in children **over the age of two years**, it has been shown to correlate with the health risks of obesity in childhood. BMI is inexpensive to obtain and easy to calculate.

Research shows that parents and health professionals often underestimate the weight of children just by looking at their appearance. Trying to judge just by looking at height and weight on a growth chart can also be misleading. Not only does the normal range of BMI change with age, but over-nourished children grow in height as well as putting on weight (though final heights are not taller than expected as over nourished children tend to go into puberty early).

How do we do it?

BMI is calculated by dividing the child's weight in kilograms by their height in metres twice:

$$\text{BMI} = \frac{\text{Weight (in kg)}}{\text{Height (in m)} \times \text{Height (in m)}}.$$

The NHS online calculator for children will give BMI, the BMI centile and an interpretation. Weight and height can be entered in imperial or metric. However, the maximum centile BMI goes to is the 99th, so it may say that a child's BMI is above the 99th centile and that they are very overweight, but it won't say by how much[1].

It is important that children are measured accurately before calculating BMI. The height is squared in the BMI formula so any inaccuracies will be magnified. Staff responsible for measuring and weighing children should be suitably trained. RCPCH and the National Child Measurement Programme (NCMP) resources detail the equipment and techniques required.[2,3]

How does BMI relate to a child's weight?

Thresholds for overweight and obesity in individual children, as recommended by the National Institute for Health and Care Excellence (NICE):

Classification	BMI centile
Underweight	<2nd
Overweight	≥91st
Obese	≥ 98th

[1] https://www.nhs.uk/live-well/healthy-weight/bmi-calculator/#childrens-bmi

[2] Royal College of Paediatrics and Child Health resources for healthcare professionals (including low resolution charts, training materials, presentations and videos) about how to measure children and how to plot and use growth charts. https://www.rcpch.ac.uk/resources/uk-who-growth-charts-guidance-health-professionals

[3] www.gov.uk/government/publications/national-child-measurement-programme-operational-guidance

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Which charts should I use to measure growth and BMI?

In the UK, growth charts used for children aged 0-4 years are the UK-WHO charts, which describe optimal growth for breastfed children. For those aged 2-18 years, UK 1990 charts are used, which describe measurements taken from 11 British surveys carried out from 1978 to 1990. The BMI centile charts are based on UK90 data.

Many BMI charts currently available on electronic systems are not useful above 99th centile, and so paper charts are used. There are two types of BMI chart available from Harlow Printing[4]:

- An identification chart that goes up to 99.6th centile, where centiles are evenly spaced at 2/3rds of a standard deviation.
- A management chart that shows centile lines and also SD lines at +3.5SDs and +4SD.

The management charts are more useful for knowing when referral to a paediatrician is appropriate, and for monitoring BMI in more obese children.

What about children under the age of two?

BMI is not a good indicator of body fat in children under 2, and there are no simple definitions for overweight or obesity in this age group. Therefore, a clinical judgement has to be made, based on the child's height and weight centiles, their trajectory, the family history and how the child appears. If a child's weight crosses 2 or more major centile lines upwards, it should always be considered whether they might be overweight or obese. The younger the child and the higher the starting centile, the more concerning this is, and the greater the risk of obesity at age 5 and at age 10.

For more information:

The Portsmouth Child Obesity Pathway[5] is a collaborative multiagency document for use across health providers in Portsmouth. It details the thresholds for intervention for children found to be overweight or obese at different ages, including when obesity becomes a safeguarding issue.

Pre-school aged children should generally be referred to health visitors and school aged children to school nurses in the first instance. Referral criteria for paediatricians and dieticians are outlined in the pathway.

[4] Growth charts and BMI charts can be ordered from Harlow printing (if ordering BMI charts to monitor obesity you may consider ordering management charts which go beyond 99.6th centile). https://www.healthforallchildren.com/product-category/shop/growth-charts/page/3/

[5] https://www.portsmouthscb.org.uk/professionals/health-information/