

# What are growth charts and why do we need them?



## Why do we measure children?

It has long been known that poor growth in infancy is associated with high childhood morbidity and mortality.

### Summary:

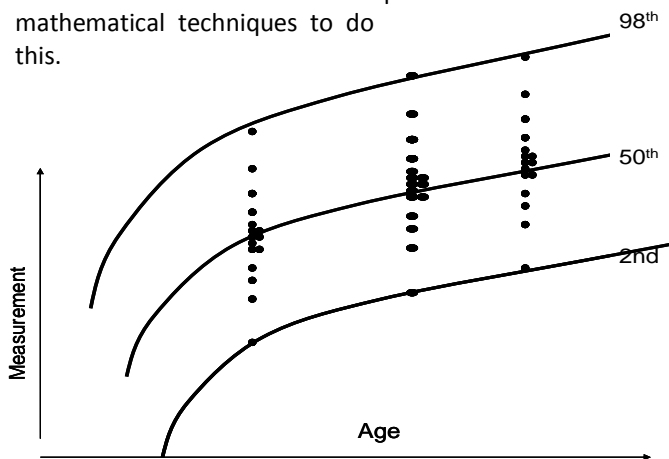
- ✓ Growth is an important measure of health and wellbeing
- ✓ Measurements in children can only be evaluated if plotted on a growth chart
- ✓ Growth charts describe how big or heavy healthy children are expected to be at any age

Historically we have used regular weighing to monitor the sufficiency of infant feeding. In the longer term growth in height is an index of health and wellbeing, with slow or stunted growth associated with many disorders of childhood. Conversely, if a child is growing normally they are unlikely to have any major underlying medical problems. Both acceleration and slowing of head growth can be a sign of important underlying developmental and surgical disorders.

Because children grow at varying rates at different ages and along different tracks, we can only understand **whether a measurement is normal** by comparing it with the normal range of measurements for other children of the same age and gender and this is what growth charts allow us to do.

## Making a growth chart

Growth charts are constructed using measurements from a large number of children at different ages. A series of these cross sectional samples of measurements are then used to construct the chart by 'joining the dots' between key points at each age. When charts were first made this was done by hand but now there are sophisticated mathematical techniques to do this.

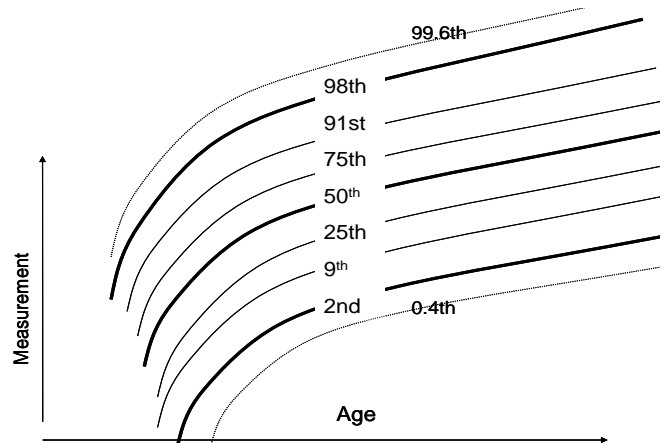


## What do centile lines mean?

Each line at N<sup>th</sup> centile marks the weight or height below which N% of children of that age and gender fall, e.g. 25% of children are below the 25<sup>th</sup> centile. The 50<sup>th</sup> centile represents the median (average) for the population. The 2<sup>nd</sup> and 98<sup>th</sup> centiles are two standard deviations (z scores) above and below the median.

## Standard centile lines

The modern British growth charts consist of nine centile lines (0.4<sup>th</sup>, 2<sup>nd</sup>, 9<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup>, 91<sup>st</sup>, 98<sup>th</sup> and 99.6<sup>th</sup>). The distance between each centile line (2/3 of a standard deviation) is known as a centile space. The lowest centile, the 0.4<sup>th</sup> has been chosen to identify extreme low measurements, below which only 1/250 (0.4%) optimally growing children will fall.



## WHO growth charts

The World Health Organization (WHO) Child Growth Standards for infants and children up to the age of 5 years were published in April 2006. They are based on the growth of healthy breastfed children in optimal conditions from six different countries. Data were collected from around 8,500 children who were exclusively breastfed for the first 4 months, and were living in a well-supported health environment. In consequence the WHO aims to provide for the first time a standard on "how children should grow", rather than a traditional growth reference that describes "how children are growing". This standard was adopted by the UK for children under 4 years and used to construct the UK-WHO charts.

## UK 1990 growth charts

These were constructed using measurements from a large number of British children at different ages, collected in the late 1980s and were the main charts in use until 2009. Because the WHO charts do not include preterm data, the UK 1990 data have been used to make the birth section of the UK-WHO charts, as well as the charts for use after the age of 4. They are a description of typical, but not necessarily healthy, growth in UK children from 1980-90.

## Further Reading

De Onis M, Garza C, Victora CG, Onyango AW, Frongillo EA, Martinez J. 2004. The WHO Multicentre Growth Reference Study: planning, study design, and methodology. *Food Nutr Bull* 25(1):S15-S26.

Wright C, Booth I, Buckler J, Cameron N, Cole T, Healy M, Hulse A, Preece M, Reilly J, Williams A. 2002. Growth Reference Charts For Use In The United Kingdom. *Archives of Disease in Childhood* 86:11-4.