



New Zealand Government

## Health Professionals' Notes

### Girls New Zealand – World Health Organization Growth Chart 0–5 Years

This information is based on original materials developed by and copyright © 2009 Royal College of Paediatrics and Child Health, United Kingdom. It was adapted by the New Zealand Ministry of Health in July 2010.

Please place sticker if available, otherwise write in space provided.

Name.....

NHI No.....

Date of birth .....

#### When to measure

Length or height should be measured at each Well Child/Tamariki Ora check or whenever there are any worries about a child's weight gain, growth or general health. Head circumference should be measured to age 1.

#### Plotting measurements

For babies born at term (37 weeks or later), plot each measurement on the relevant chart by drawing a small dot where a vertical line through the child's age crosses a horizontal line through the measured value. The lettering on the charts ('weight', 'length' etc.) sits on the 50th centile, providing orientation for ease of plotting.

Plot birth weight (and, if measured, length and head circumference) at age 0 on the 0–1 year chart. The coloured arrows at age 0 represent UK birth weight data and show the child's birth centile.

Weight gain in the early days varies a lot from baby to baby, so there are no lines on the chart between 0 and 2 weeks. However, by 2 weeks of age most babies will be on a centile close to their birth centile.

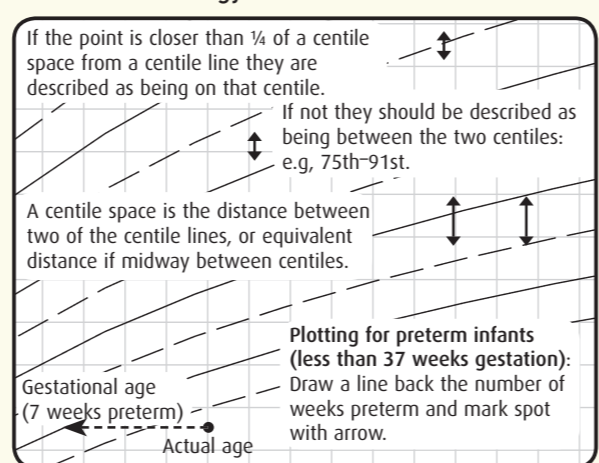
For preterm infants, use a separate low-birthweight chart for infants of less than 32 weeks gestation and any other infant requiring detailed assessment. For healthy infants born from 32 weeks and before 37 weeks, plot all measurements in the preterm section (to the left of the main 0–1 year chart) until 42 weeks gestation, then plot on the 0–1 year chart using gestational correction, as shown below.

The preterm section can also be used to assess the relative size of infants at the margin of 'term' (eg, 37 weeks gestation), but these measurements should also be plotted at age 0 on the 0–1 year chart.

#### Gestational correction

Plot measurements at the child's actual age and then draw a line back the number of weeks the infant was preterm. Mark the spot with an arrow: this is the child's gestationally corrected centile. Gestational correction should continue until one year for infants born 32 to 36 weeks and two years for infants born before 32 weeks.

#### Centile terminology



#### Who should use this chart?

Anyone who measures a child, and/or plots or interprets charts, should be suitably trained or be supervised by someone qualified to do so. For further information and training materials see [www.moh.govt.nz/wellchild](http://www.moh.govt.nz/wellchild) and [www.growthcharts.rcpch.ac.uk](http://www.growthcharts.rcpch.ac.uk)

#### A growth chart for all children

This chart, which is suitable for use with New Zealand children up to age 5 years, combines World Health Organization (WHO) standards with United Kingdom preterm and birth data. The chart from 2 weeks to 5 years of age is based on the WHO growth standard, derived from measurements of healthy, non-deprived, breastfed children of mothers who did not smoke.<sup>1</sup> The chart for birth measurements (32–42 weeks gestation) is based on British children measured around 1990.<sup>2</sup> The charts depict a healthy pattern of growth that is desirable for all children, whether breastfed or formula fed, and of whatever ethnic origin.

#### Weighing and measuring

**Weight:** use only clinical electronic scales in metric setting. For children up to 2 years, remove all clothes and nappy; children older than 2 years should wear minimal clothing only. Always remove shoes.

**Length:** (before 2 years of age): proper equipment is essential (length board or mat). Measurers should be trained. The child's shoes and nappy should be removed.



**Height:** (from 2 years): use a rigid rule with T piece, or stadiometer; the child's shoes should be removed.

**Head circumference:** use a narrow plastic or paper tape to measure where the head circumference is greatest. Any hat or bonnet should be removed. Be aware of cultural issues around touching heads.



#### When to weigh

Babies should be weighed in the first week as part of the assessment of feeding. Recovery of birthweight usually occurs by 10 to 14 days, and indicates that feeding is effective and that the child is well. Once feeding is established, babies should usually be weighed at the time of routine checks. If there is concern, weigh more often; however, weights measured too close together are often misleading, so babies should not be routinely weighed more frequently than at each Well Child/Tamariki Ora check.

#### Data Recording (continued)

| Measurement 11     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 12     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 13     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 14     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 15     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 16     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 17     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

| Measurement 18     |  |
|--------------------|--|
| Recording Date     |  |
| Weight             |  |
| Head Circumference |  |
| Length/Height      |  |
| Location           |  |
| Health worker name |  |

#### Interpreting the chart

##### Assessing weight loss after birth

Most babies lose some weight after birth, but 80% will have regained this by 2 weeks of age. Careful clinical assessment and evaluation of feeding technique is indicated when weight loss exceeds 10% or recovery of birth weight is slow.

Percentage weight loss can be calculated as follows:

$$\text{Weight loss} = \text{current weight} - \text{birth weight}$$

$$\text{Percentage weight loss} = \frac{\text{Weight loss}}{\text{Birth weight}} \times 100\%$$

For example, a child born at 3.500kg who drops to 3.150kg at 5 days has lost 350g or 10%; in a baby born at 3.000kg, a 300g loss is 10%.

##### What do the centiles mean?

A single point on these charts indicates a child's size compared with children of the same age and maturity who have shown optimum growth. When there is more than one point, the chart shows how quickly a child is growing. The centile lines on the chart show the expected range of weights and heights (or lengths); each describes the number of children expected to be below that line (eg, 50% below 50th, 91% below the 91st). Children come in all shapes and sizes, but 99 out of 100 children who are growing optimally will be between the two outer lines (0.4th and 99.6th centiles); half will lie between the 25th and 75th centile lines.

Being very small or very big can sometimes be associated with underlying illness. There is no single threshold below which a child's weight or height is definitely abnormal, but only 4 per 1000 children who are growing optimally are below the 0.4th centile, so these children should be assessed at some point to exclude any problems. Those above the 99.6th centile for height are almost always healthy. Also calculate BMI for children over 2 if weight and height centiles appear very different (more than two centile lines different).

##### What is a normal rate of weight gain and growth?

Babies do not all grow at the same rate, so a baby's weight often does not follow a particular centile line, especially in the first year. Weight is most likely to track within one centile space (the gap between two centile lines, see diagram). In infancy, acute illness can lead to sudden weight loss and a weight centile fall, but on recovery the child's weight usually returns to its normal centile within 2–3 weeks. However, a sustained drop through two or more weight centile spaces is unusual (fewer than 2% of infants) and should be carefully assessed by the primary care team, including measuring length/height.

Because it is difficult to measure length and height accurately in pre-school children, successive measurements commonly show wide variation. If there are worries about growth, it is useful to measure on a few occasions over time; most healthy children will show a stable average position over time. Head circumference centiles usually track within a range of one centile space. After the first few weeks, a drop or rise through two or more centile spaces is unusual (fewer than 1% of infants) and should be carefully assessed.

##### Why do the length/height centiles change at 2 years?

The growth standards show length data up to 2 years of age, and height from age 2 onwards. When a child is measured standing up, the spine is squashed a little, so their height is slightly less than their length; the centile lines shift down slightly at age 2 to allow for this. It is important that this difference does not worry parents; what matters is whether the child continues to follow the same centile after the transition.

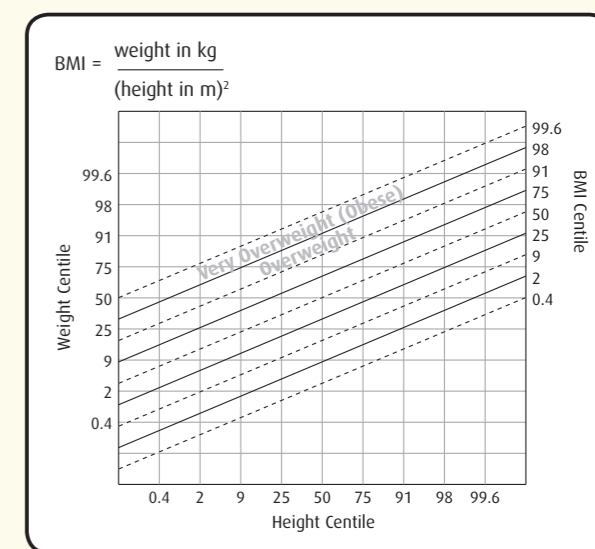
#### Predicting adult height

(Note that this is in the Health Professionals' Notes, but not the Well Child/Tamariki Ora Healthbook.)

Parents like to know how tall their child will be as an adult. The child's most recent height centile (aged 2–5 years) gives a good idea of this for healthy children. Plot this centile on the adult height predictor to the right of the height chart to find the average adult height for children on this centile. Four out of five children will have adult heights that are within 6cm above or below this value.

#### Weight-height to BMI conversion chart

BMI indicates how heavy a child is relative to his or her height and is the simplest measure of underweight or overweight from the age of 2, when height can be measured fairly accurately. This chart<sup>3</sup> provides an approximate BMI centile, accurate to a quarter of a centile space.



|             |  |  |  |  |
|-------------|--|--|--|--|
| Date        |  |  |  |  |
| Age         |  |  |  |  |
| BMI Centile |  |  |  |  |

#### Instructions for use

1. Read off the weight and height centiles from the growth chart.
2. Plot the weight centile (left axis) against the height centile (bottom axis) on the chart above.
3. If between centiles, read across in this position.
4. Read off the corresponding BMI centile from the slanting lines.
5. Record the centile with the date and child's age in the data box.

#### Interpretation

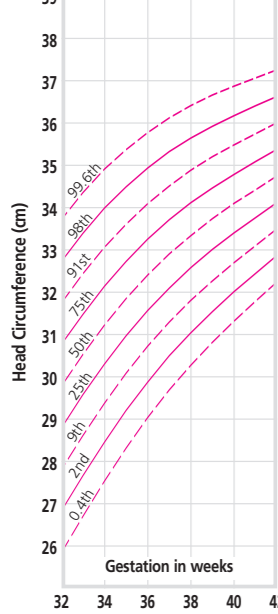
In a child over 2 years of age, the BMI centile is a better indicator of overweight or underweight than the weight centile; a child whose weight is average for their height will have a BMI between the 25th and 75th centiles, whatever their height centile. BMI above the 91st centile suggests that the child is overweight; a child above the 98th centile is very overweight (clinically obese). BMI below the 2nd centile is unusual and may reflect undernutrition.

#### References

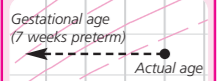
1. [www.who.int/childgrowth/en](http://www.who.int/childgrowth/en)
2. Cole TJ, Freeman JV, Preece MA. 1998. British 1990 growth reference centiles for weight, height, body mass index and head circumference fitted by maximum penalized likelihood. *Stat Med*;17:407–29.
3. Cole TJ. 2002. A chart to link child centiles of body mass index, weight and height. *Eur J Clin Nutr*;56:1194–9.

**Preterm**

**Birth Head Circumference**

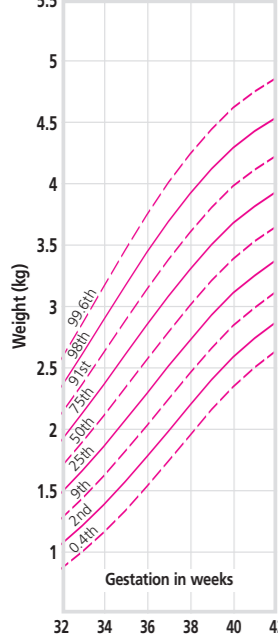


**Plotting preterm infants**  
Use the **low birthweight chart** for infants less than 32 weeks gestation and any other infants requiring detailed assessment.  
Use **this section** for infants of less than 37 weeks gestation. As with term infants there may be some weight loss in the early days. From 42 weeks, plot on the **0-1 year chart** with gestational correction.

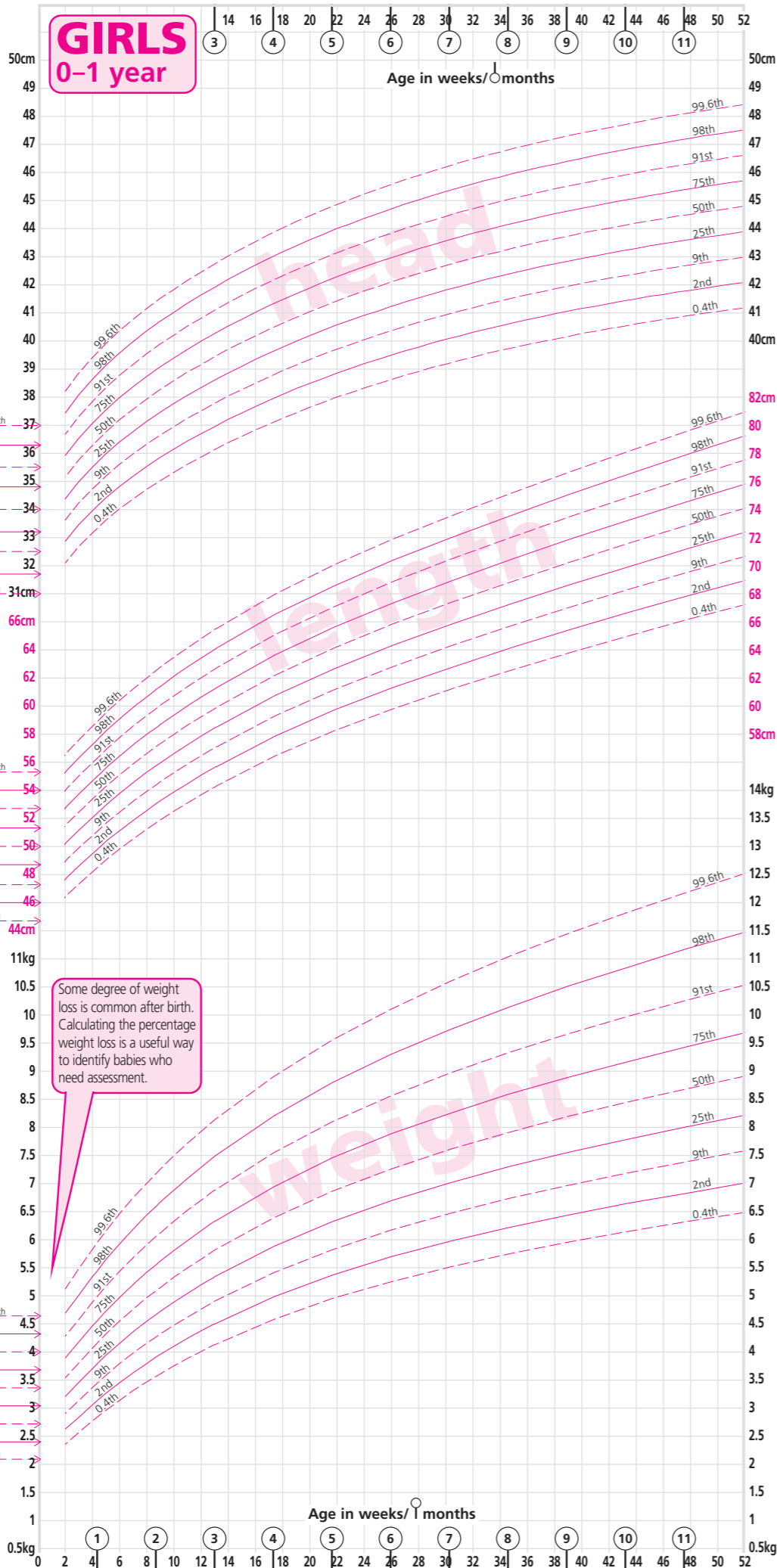


**Gestational correction**  
Plot actual age then draw a line back the number of weeks the infant was preterm and mark the spot with an arrow; this is the gestationally corrected centile.

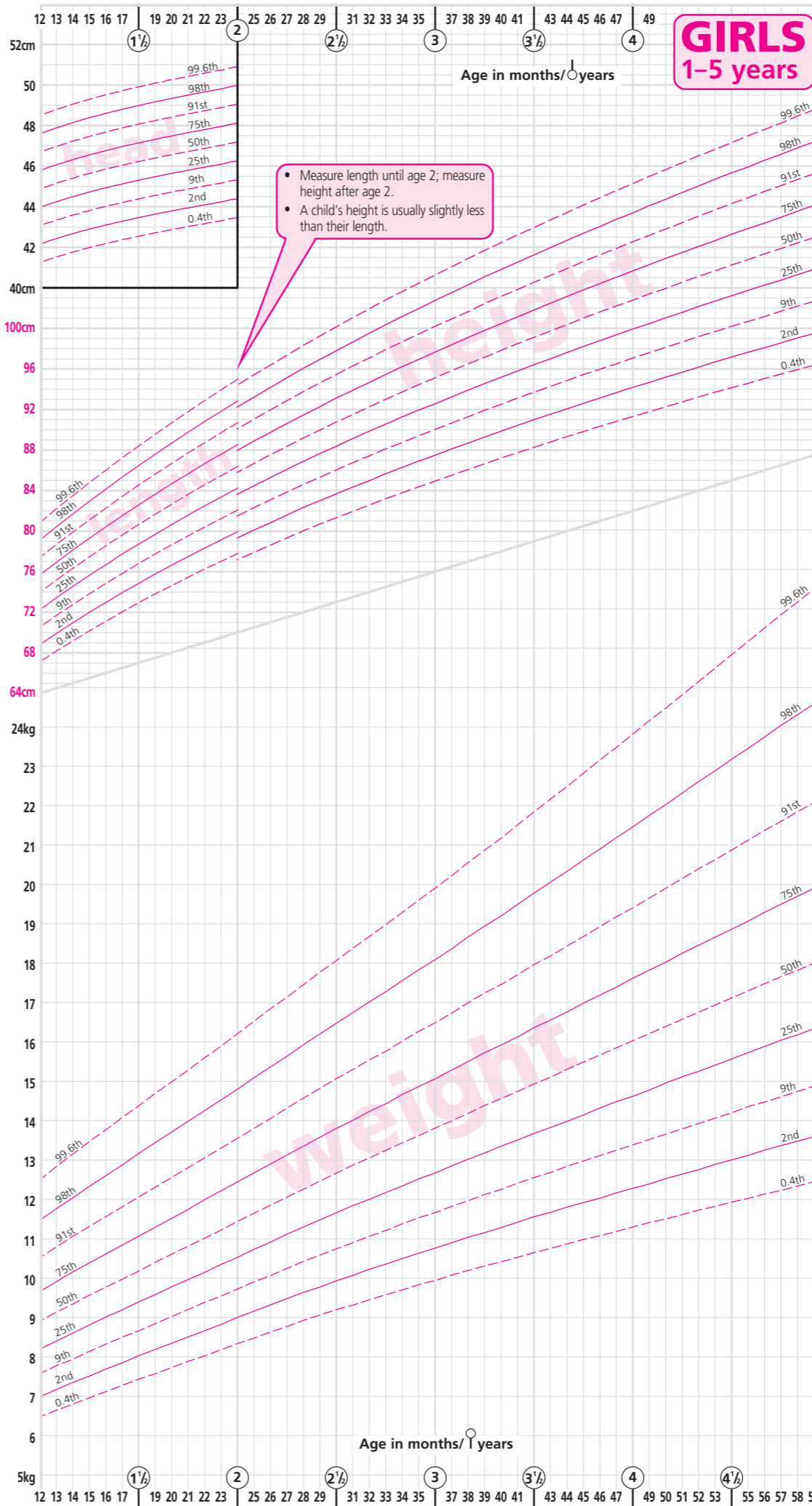
**Birth Weight**



**GIRLS 0-1 year**



Some degree of weight loss is common after birth. Calculating the percentage weight loss is a useful way to identify babies who need assessment.



• Measure length until age 2; measure height after age 2.  
• A child's height is usually slightly less than their length.

Plot child's height centile on the pink lines above; the black numbers show average female adult height for this centile; 80% of children will be within ±6 cm of this value.

| Data Recording           |                    |
|--------------------------|--------------------|
| <b>Birth Measurement</b> |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 2</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 3</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 4</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 5</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 6</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 7</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 8</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 9</b>     |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |
| <b>Measurement 10</b>    |                    |
| Recording Date           | Weight             |
| Head Circumference       | Length/Height      |
| Location                 | Health worker name |