ANTHROPOMETRY

WEIGHT

If a newborn is to be weighed it should be on a digital weighing machine with at least 10 gm accuracy. This machine should be calibrated frequently. Newborn/infant should be weighed naked

If the child is 2 years or older and will stand still, weigh the child alone. If the child jumps on the scale or will not stand still, use the tared weighing procedure instead.

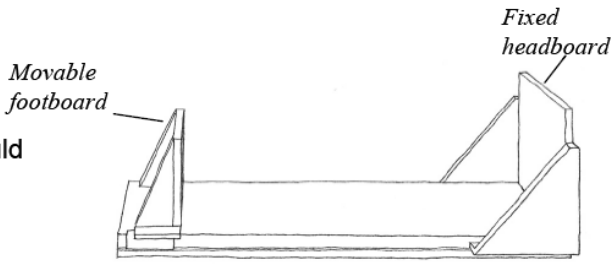
Ask the mother to help the child remove shoes and outer clothing. Talk with the child about the need to stand still.

- To turn on the scale, cover the solar panel for a second. When the number 0.0 appears, the scale is ready.
- Ask the child to stand in the middle of the scale, feet slightly apart (on the footprints, if marked), and to remain still until the weight appears on the display.
- Record the child's weight to the nearest 0.1 kg.

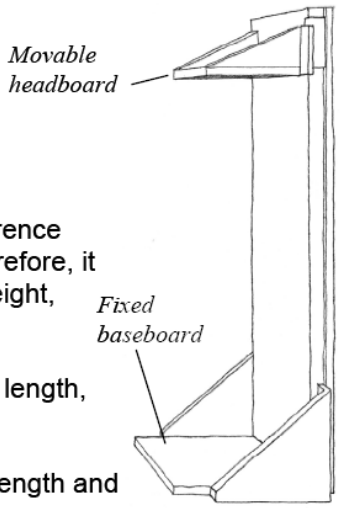
LENGTH/HEIGHT

Depending on a child's age and ability to stand, measure the child's length or height.

- **If a child is less than 2 years old,** measure the child's **length** lying down (recumbent) using a length board which should be placed on a flat, stable surface such as a table.



- **If the child is aged 2 years or older**, measure standing **height** unless the child is unable to stand. Use a height board mounted at a right angle between a level floor and against a straight, vertical surface such as a wall or pillar.



Standing height is about 0.7 cm less than recumbent length. This difference was taken into account in developing the WHO growth standards. Therefore, it is important to adjust the measurements if length is taken instead of height, and vice versa.

- If a child less than 2 years old will not lie down for measurement of length, measure standing height and **add 0.7 cm** to convert it to length.
- If a child aged 2 years or older cannot stand, measure recumbent length and **subtract 0.7 cm** to convert it to height.

Preparing to measure length or height

Be prepared to measure length/height immediately after weighing, while the child's clothes are off. Before weighing:

- Remove the child's shoes and socks.
- Undo braids and remove hair ornaments if they will interfere with the measurement of length/height.

If a baby is weighed naked, a dry diaper can be put back on to avoid getting wet while measuring length.

If the room is cool and there is any delay, keep the child warm in a blanket until length/height can be measured.

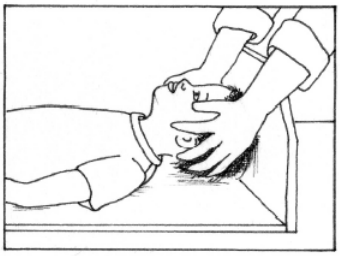
Explain all procedures to the mother and enlist her help.

Measuring length

Cover the length board with a thin cloth or soft paper for hygiene and for the baby's comfort.

Explain to the mother that she will need to place the baby on the length board herself and then help to hold the baby's head in place while you take the measurement. Show her where to stand when placing the baby down, i.e. opposite you, on the side of the length board away from the tape. Also show her where to place the baby's head (against the fixed headboard) so that she can move quickly and surely without distressing the baby.

- Ask her to lay the child on his back with his head against the fixed headboard, compressing the hair.
- Quickly position the head so that an imaginary vertical line from the ear canal to the lower border of the eye socket is perpendicular to the board. (The child's eyes should be looking straight up.) Ask the mother to move behind the headboard and hold the head in this position.

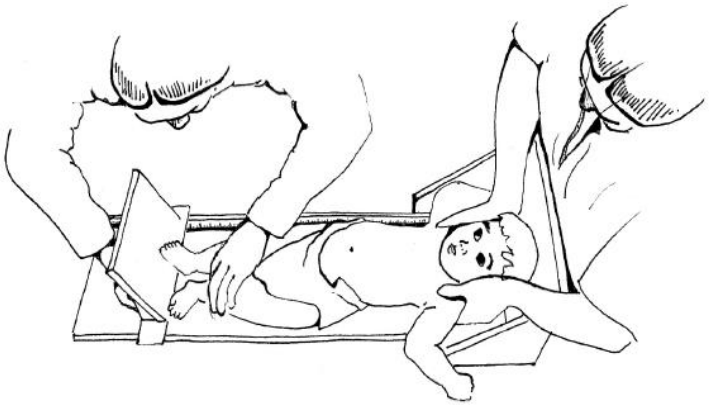


Speed is important. Standing on the side of the length board where you can see the measuring tape and move the footboard:

- Check that the child lies straight along the board and does not change position. Shoulders should touch the board, and the spine should not be arched. Ask the mother to inform you if the child arches the back or moves out of position.
- Hold down the child's legs with one hand and move the footboard with the other. Apply gentle pressure to the knees to straighten the legs as far as they can go without causing injury. Note: it is not possible to straighten the knees of newborns to the same degree as older children. Their knees are fragile and could be injured easily, so apply minimum pressure.

  If a child is extremely agitated and both legs cannot be held in position, measure with one leg in position.
- While holding the knees, pull the footboard against the child's feet. The soles of the feet should be flat against the footboard, toes pointing upwards. If the child bends the toes and prevents the footboard from touching the soles, scratch the soles slightly and slide in the footboard quickly when the child straightens the toes.
- Read the measurement and record the child's length in centimetres to the last completed 0.1 cm in the Visit Notes of the *Growth Record*. This is the last line that you can actually see. (0.1 cm = 1 mm)

Remember: If the child whose length you measured is 2 years old or more, subtract 0.7 cm from the length and record the result as height in the Visit Notes.



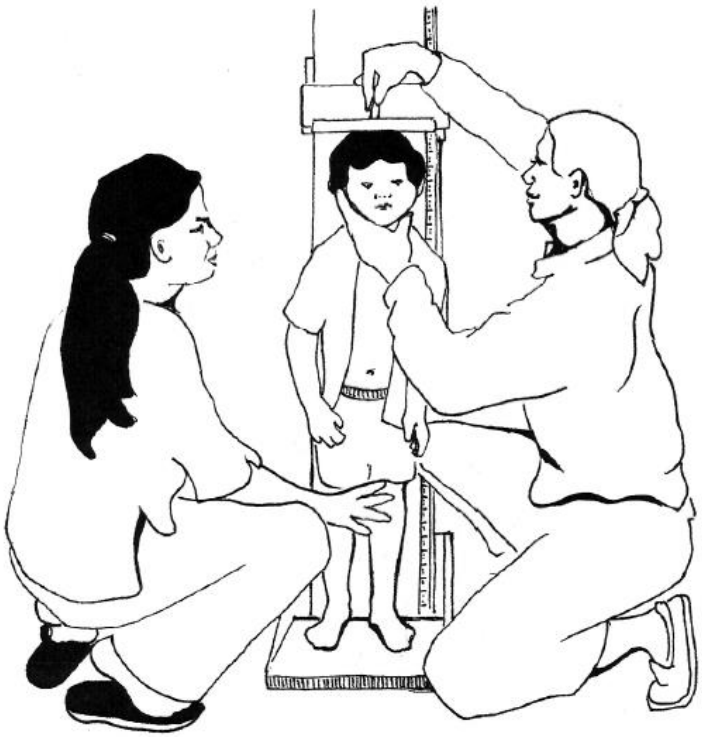
Measuring standing height

Ensure that the height board is on level ground. Check that shoes, socks and hair ornaments have been removed.

Working with the mother, and kneeling in order to get down to the level of the child:

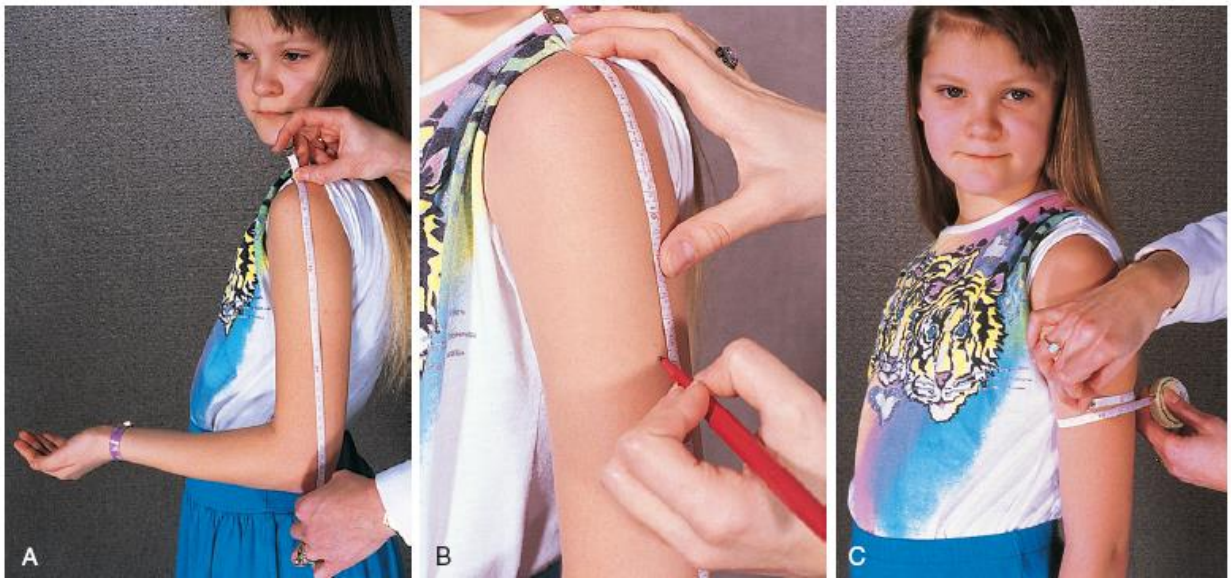
- Help the child to stand on the baseboard with feet slightly apart. The back of the head, shoulder blades, buttocks, calves, and heels should all touch the vertical board.
- Ask the mother to hold the child's knees and ankles to help keep the legs straight and feet flat, with heels and calves touching the vertical board. Ask her to focus the child's attention, soothe the child as needed, and inform you if the child moves out of position.
- Position the child's head so that a horizontal line from the ear canal to the lower border of the eye socket runs parallel to the base board. To keep the head in this position, hold the bridge between your thumb and forefinger over the child's chin.
- If necessary, push gently on the tummy to help the child stand to full height.
- Still keeping the head in position, use your other hand to pull down the headboard to rest firmly on top of the head and compress the hair.
- Read the measurement and record the child's height in centimetres to the last completed 0.1 cm in the Visit Notes of the *Growth Record*. This is the last line that you can actually see. (0.1 cm = 1 mm)

  Remember: If the child whose height you measured is less than 2 years old, add 0.7 cm to the height and record the result as length in the Visit Notes.



MAC

This is measured on the left upper arm mid-way between the acromion and olecranon processes. It measures 9.8 cm at birth, 14.5 cm around 1 year with slow increase from 14.8 cm to 16.2 cm between 1 year and 5 years of age. In field surveys, it helps in diagnosis of mal/undernutrition:a value more than 13.5 cm is taken as normal nourished, 12.5–13.4 cm as borderline, 11.5–12.4 cm as mild to moderate undernutrition and less than 11.5 cm as severe undernutrition



HEAD CIRCUMFERENCE

This is measured over the most prominent part of the occipital and just above the supraorbital ridges, using a flexible, nonstretchable tape. Position the tape just above the eyebrows, above the ears and around the biggest part on the back of the head. Pull the tape snugly to compress the hair and take reading nearest to 0.1 cm. The head circumference measurement in infancy serves as a guide to brain growth; it is related to intelligence and cognition. Large infants have larger head circumference
Take three values if they are same your technique is correct

BODY MASS INDEX

Body mass index (BMI) is the ratio of weight in kilogram to the square of height in meters (wt/ht_2). This is a good indicator of variability of energy status. If more than 95th centile, it suggests obesity and less than 5th centile, undernutrition (thin). In adolescents, calculate with the weight and height values in relation to the sexual maturity. The BMI values for Indian children are different than the National Center for Health Statistics (NCHS)—BMI valuesBMI

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2\ (\text{M}^2)}$$

SKINFOLD THICKNESS

Around 50% of body fat is located under the skin.Measurement of triceps and biceps skinfold thickness (SFT) gives estimate of peripheral fat, and subscapular and suprailiac SFT indicates amount of central fat. The Lange's or Harpenden's skinfold calipers are used. Measurements are done as follows:

o Biceps: At the midpoint of their muscle belly, a point generally opposite the nipple

o Triceps: Between the tip of olecranon process of ulna (elbow) and the acromion process of the scapula (shoulder), a point is marked on the back of the arm **o Subscapular:** Below inferior angle of scapula 45° to vertical

o Suprailiac: Above iliac crest in midaxillary line ip(approximately 2.5 cm above hip bone).

ARM SPAN

Span: This is measured as the distance between the tip of the middle fingeron either side when the arms are stretched sideways with the child facing a wall. Normally it is equal to the height with a minor difference of 1-2 cm. In Marfan's syndrome, homocysteinuria and primary hypogonadism, the span is more than the height

Interpretation

Span is 2 cm less than height in under five children.In the age group between 5 to 10 years the difference is less than 1cm. Span equals height at 10 years and in adults it is 2 cm more than height. The value is disproportionately more than height/length in conditions with short trunk- short stature, arachnodactyly, coarctation of aorta, eunuchoidism, homocystinuria, Klinefelter syndrome and Marfan syndromeJ

LS/US RATIO

When the height/length is measured, the distance from the vertex to the pubic symphysis is taken as the upper segment and the rest as the lower segment. Generally the lower segment and the total length are measured and the upper segment is calculated by subtraction.

This ratio is important to interpret whether the stature is proportionate or disproportionate for the age of the child. Hypopituitarism produces proportionate dwarfing whereas hypothyroidism produces disproportionate dwarfing as infantile proportions will be retained in hypothyroidism. Skeletal dysplasias produce disproportionate dwarfing either short trunk or short limb dwarfism. At birth the midpoint of the body is umbilicus and in adults, it is pubic symphysis

- The US:LS ratio is 1.7:1 at birth
- 1.6:1 at 6 months
- 1.5:1 at one year
- 1.4:1 at two years
- 1.3:1 at three years
- 1.2:1 at four years and
- 1:1 at 9-10 years.

Waist-to-Height Ratio

Values less than 0.5 exclude central obesity but values more than 0.5 indicate central obesity even in children with normal weight and height. Waist-to-height ratio may predict cardio-metabolic risk in normal weight as well as in overweight/obese children, according to results from the Bogalusa Heart Study, 2011.