MINISTRY OF HEALTH

NATIONAL TUBERCULOSIS, LEPROSY AND LUNG DISEASE PROGRAM

STANDARD OPERATING PROCEDURES FOR THE MANAGEMENT OF TUBERCULOSIS IN CHILDREN

2nd EDITION; DECEMBER, 2016

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Foreword

Children with TB comprise about 10-12% of the total TB cases diagnosed in the country. This burden is likely to be higher given the challenges in diagnosing TB in children. The symptoms of TB in children mimic those of other childhood diseases. Children do not readily expectorate and they have pauci-bacillary TB hence some will be missed using bacteriological tests. The government has however introduced GeneXpert molecular testing that is more sensitive than microscopy in detecting TB. Health care workers therefore need a reference guide to obtaining sputum from children for testing.

Treatment of TB in children has been reviewed and now includes Ethambutol. There are now improved pediatric friendly TB medicines for treatment of TB in children and health care workers need a reference guide to enable them accurately dispense the TB medicine to children.

Malnutrition is a common predisposing factor for TB in children. On the other hand, TB predisposes children to malnutrition or worsens an existing state of malnutrition. Nutrition care and support forms an integral part of treatment for a child with TB disease. Nutrition assessment in children varies with the age of the child and several reference charts are used to determine the nutrition status of the children once anthropometric measurements are taken.

All efforts should be made towards ensuring that children with TB are diagnosed and treated according to the recommended guidelines. This will involve health care workers in all child health departments. Summarizing the key diagnostic algorithms, treatment, follow up and nutrition assessment tools will provide a quick and effective reference tool for these health workers during child TB care and management.

Dr. Jackson Kioko
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QUICK SCREENING OF A CHILD FOR POSSIBLE TB

At triage ask if child has any of the following symptoms suggestive of TB:

- **Cough for over 2 weeks**
- **Fever (please rule out common childhood illness e.g. malaria)**
- **Weight loss /poor weight gain/ clothes not fitting (check growth chart)**
- **Lethargy, less playful than usual**

If the answer is yes for two or more of these questions, evaluate the child for TB using the diagnostic algorithm for TB diagnosis in children

ALGORITHM FOR PULMONARY TB DIAGNOSIS IN CHILDREN

History of presenting illness

For all children presenting to a health facility ask for the following suggestive symptoms:

Cough, fever, poor weight gain, lethargy or reduced playfulness

Suspect TB if the child has **two or more** of these suggestive symptoms.

Clinical evaluation

Examine the child and check for:

- Temperature > 37.5 (fever)
- Weight (to confirm poor weight gain, weight loss) - check growth monitoring curve)
- Respiratory rate (fast breathing)
- Respiratory system examination – any abnormal findings

Examine other systems for abnormal signs suggestive of extra-pulmonary TB#

Investigations

Obtain specimen* for Xpert MTB/RIF (and culture when indicated**)

Do a chest Xray (where available)

Diagnosis

Bacteriologically confirmed TB: Diagnose if specimen is positive for MTB

Make a Clinical Diagnosis of PTB if:

*Child has **two or more** of the following suggestive symptoms:*

- Persistent cough, fever, poor weight gain, lethargy

*PLUS **two or more** of the following:*

- Positive contact, abnormal respiratory signs, abnormal CXR, positive Mantoux

Treatment

Treat for TB as follows:

✓ All children with **bacteriologically confirmed TB**

✓ All children with a **clinical diagnosis of TB**

NB: In children who do not have an Xpert result, or their Xpert result is negative, **but** they have clinical signs and symptoms suggestive of TB they should be treated for TB

*All forms of TB (Except TB meningitis, bone and joint TB): **Treat for 6 months (2 RHZE / 4 RH)***

*Specimen may include: Expectorated sputum (child > 5 years), induced sputum, nasopharyngeal aspirate and gastric aspirate. **Attempt to obtain specimen in every child**

**Do a culture and DST for the following children:

1. Rifampicin resistance detected by the Xpert test
2. Refugees and children in contact with anyone who has Drug Resistant TB

3. Those not responding to TB treatment
4. Those with Indeterminate Xpert results

*** This may include IGRA in facilities where it is available

Refer to the table on diagnosis of Extra-pulmonary TB

Diagnosis of Extra-pulmonary TB in children

Site of EPTB	Typical clinical presentation	Investigations*	Action
Cervical Lymphadenitis (TB adenitis)	-Asymmetrical, matted, non-tender lymph node enlargement for more than one month +/- discharging sinus -Commonly in neck area	-Fine needle aspiration ±Mantoux test	Treat for TB for 6 months
Hilar lymphadenopathy	-May or may not have cough -Noisy breathing -Fast breathing, progressive breathlessness -Asymmetrical wheeze not responsive to bronchodilators	-Chest X-ray ±Mantoux test	-Treat for TB for 6 months -Include steroid therapy -Admit if having features of respiratory distress
TB meningitis	-Headache -Irritability/abnormal behavior -Lethargic/reduced level of consciousness, convulsions, neck stiffness, bulging fontanel, cranial nerve palsies	-Lumbar puncture to obtain CSF[2] -Infants-cranial ultrasound -Older child; do CT scan brain ±Mantoux test	-Treat for TB for 12 months -Hospitalize for TB treatment -Include steroid therapy
Pleural TB	-Shortness of breadth -Dullness on percussion and reduced breath sounds +/-chest pain	-CXR -Pleural tap[1] ±Mantoux test	-If pleural fluid is straw colored, treat for TB for 6 months. -Add steroid therapy -If pleural tap reveals
Abdominal TB	-Painless abdominal swelling with ascites	-Ascitic tap[1] -Abdominal ultra-sound[4] -±Mantoux test	-Treat for TB for 6 months
Spinal TB	-Painless deformity of spine -May have lower limb weakness/paralysis -Gibbus	-AP and Lateral X-ray spine -±Mantoux test	Treat for TB for 12 months Physiotherapy and occupational therapy if indicated

Pericardial TB	-Cardiac failure -Distant heart sounds -Apex beat difficult to palpate	-CXR -Echocardiogram -±Mantoux test	Hospitalize for TB treatment Treat for TB for 6 months
TB bone and joint (excluding spine)	-Painless, non-tender swelling end of long bones with limitation of movement -Painless, non-tender unilateral effusion of usually knee or hip	-X-ray of affected bone and/or joint -Joint tap - Mantoux test	Treat for TB for 12 months

[1]Typical findings: straw colored fluid, exudates with high protein (forms a web on standing), white blood cells especially lymphocytes

[2]Require 2 - 5ml of CSF. Do not attempt if there are signs of raised intracranial pressure (projectile vomiting, focal neurological deficit, deteriorating mental status)

[3]Referral may be necessary for investigation procedure and laboratory support as well as clinical care. If referral is difficult or not readily available, start anti-TB treatment. The above table highlights the more common forms of EPTB; however, TB may infect other organs.

[4]Abdominal ultra-sound illustrates abdominal lymphadenopathy and shows complex ascites +/- septation

*For all pediatric specimens except blood, Xpert MTB/Rif is the test of choice.

Investigations for TB diagnosis

Bacteriological investigations*		
Laboratory test	**Target**	**Purpose**
MTB/Rif GeneXpert	• The first line test for all presumptive or suspected TB in Infants, children and adolescents • Surveillance for Drug Resistant TB among children previously treated for TB , child contacts of DRTB patients, refugees, prisones, children not improving on first line TB treatment	For diagnosis of TB To determine rifampicin susceptibility Done for child specimens of sputum, CSF, Gastric aspirate, Nasopharyngeal aspirates, Pleural fluid, Pericardial fluid, Ascitic fluid, FNA
Smear microscopy (Fluorescent and Light microscopy)	Infants, children and adolescents with presumptive Pulmonary TB	Only used in situations where Xpert is not accesible Monitoring smear positive and/or gene xpert positive TB patients on treatment at months 2, 5 and 6
Radiological investigations		
X-ray	Chest Xray for all infants, children and adolescents with presumptive TB Xrays of the affected bone, joint, spine as appropriate	Diagnosis of TB and EPTB in all children where xray services are available For children obtain Anteroposterior and lateral CXR views
Ultrasound	Abdominal ultrasound Chest ultrasound	Diagnosis of abdominal TB Detection of pleural effusion
CT Scan or MRI	Head CT, Chest CT as needed MRI of the abdomen, head, chest or spine as needed	Evaluation of severe or complicated cases
Immunologic Tests		
Tuberculin skin test	Children	Useful test to detect TB exposure in children and

		support presumptive clinical diagnosis in situations where there is no obvious close TB contact to the child
Interferon gamma reaction assay (IGRA)	Children	Similar role to TST but more expensive.
Whenever possible try to make a bacteriological diagnosis of TB in infants and older children by obtaining specimens and sending them for Gene Xpert (preferred first line test), AFB microscopy or TB culture.		

**This includes tests that detect the TB bacillus or its antigens*

Adjunct tests for use in selected situations

Laboratory Test	Target	Purpose
Line Probe Assay (LPA)	Children who are: • MTB positive rifampicin sensitive, and are at high risk for DRTB • MTB positive rifampicin resistant, and are either high or low risk for DRTB	To determine if isoniazid resistance is present
Culture and DST	Children who are: • Eligible for LPA should also have a culture and DST requested • Children with clinically suspected TB whose Xpert is negative • Children who are on treatment for TB who are failing to respond to therapy	To diagnose TB To determine the drug sensitivity pattern To diagnose infections with non-tuberculous mycobacteria
Histology	All presumptive extra-pulmonary TB where FNA is indeterminant	Tissue diagnosis in suspected EPTB e.g TB adenitis

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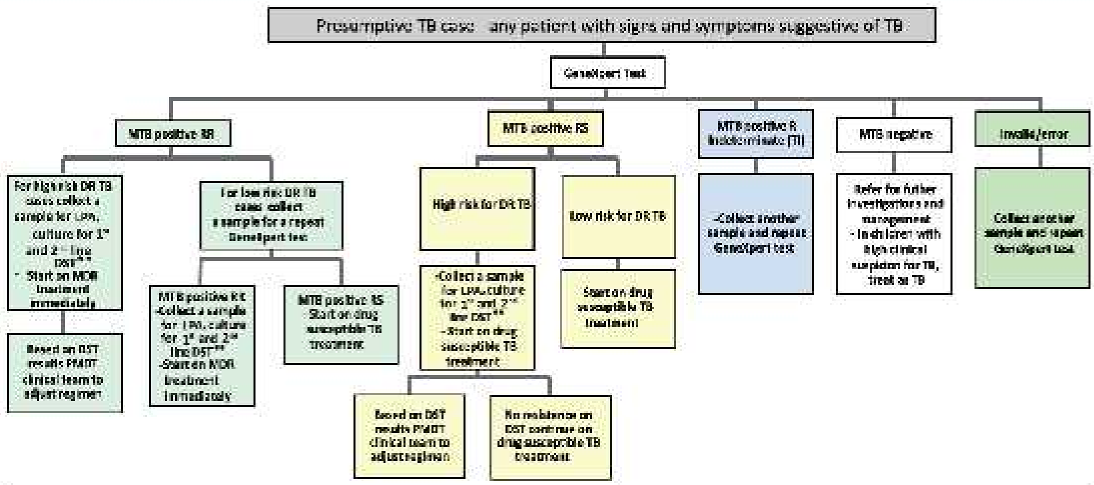
GENEXPERT ALGORITHM

GeneXpert test is the preferred first test for TB diagnosis and identification of Rifampicin resistance in all presumptive TB cases*

Patients diagnosed using GeneXpert should be followed up using smear microscopy



High risk for DR TB

- Previously treated TB patients: treatment failures, relapses, treatment after loss to follow up
- Drug Resistant TB patient contacts
- TB patients with a positive smear result at month 2 or month 3 of TB treatment
- [illegible]
- Health care Workers with TB symptoms
- Prisoners with TB symptoms
- Refugees with TB symptoms

Low risk for DR TB

All presumptive TB cases who are not in the high risk group including:

- People living with HIV with TB symptoms
- Children <15 years with TB symptoms
- All presumptive TB cases with a negative smear microscopy result

*In situations where GeneXpert is not available, smear microscopy may be used for initial TB diagnosis and concurrently, a sample specimen sent for GeneXpert test

KEY:
MTB RR= Mycobacterium Tuberculosis positive, Rifampicin resistant
MTB RS= Mycobacterium Tuberculosis positive, Rifampicin sensitive
TI=Indeterminate GeneXpert results
MDR = Multi Drug Resistant Tuberculosis
LPA= Line probe assay
DST=Drug susceptibility testing
PMDT= Programmatic Management of Drug Resistant Tuberculosis
** LPA, Culture & 1st and 2nd line DST

Samples for GeneXpert

- Sputum
- CSF
- Gastric aspirate
- Nasopharyngeal aspirate
- Pleural fluid
- Pericardial fluid
- Ascitic fluid
- FNA
- Lymph node biopsy

Drug Susceptible TB Treatment Regimen

TYPE OF TB	REGIMEN
Pulmonary TB Extra pulmonary (all other except bone TB and TB Meningitis)	[illegible]
Extra pulmonary (Bone TB and TB Meningitis)	[illegible]

- Follow up smears should be done for all bacteriologically confirmed TB cases at end of month 2, 5 and 6 of TB treatment using smear microscopy
- Follow up of RR TB and DR-TB should be done as per PMDT guidelines

POSITIVE SMEAR RESULT AT	ACTION
MONTH 2	Request for GeneXpert (refer to GeneXpert algorithm) Continue drug susceptible TB treatment - Treat based on GeneXpert results - If there is no rifampicin resistance, repeat GeneXpert test at month 3 and treat according to GeneXpert results
MONTH 5	Declare treatment failure - Request for GeneXpert (refer to genexpert algorithm) - Treat based on GeneXpert results
MONTH 6	Declare treatment failure Request for GeneXpert (refer to GeneXpert algorithm) - Treat based on GeneXpert results - Evaluate patient adherence to treatment and advice on next treatment options

Once TB treatment is started it should be completed regardless of duration of treatment

Procedure for expectoration

Background

All sputum specimens produced by children should be sent for Xpert MTB/Rif and where available, mycobacterial culture. Where access to Xpert MTB/Rif is not possible, the specimen may be subjected to AFB microscopy.

Children who can produce a sputum specimen may be infectious, so, as with adults, they should be asked to expectorate outside in open, well ventilated places and not in enclosed spaces (such as toilets) unless there is a room specially equipped for this purpose.

For diagnosis, two specimens at least 4 hours apart are collected.

Procedure

1. Give the child confidence by explaining to him or her (and any family members) the reason for sputum collection.
2. Instruct the child to rinse his or her mouth with water before producing the specimen. This will help to remove food and any contaminating bacteria in the mouth.
3. Instruct the child to take two deep breaths, holding the breath for a few seconds after each inhalation and then exhaling slowly. Ask him or her to breathe in a third time and then forcefully blow the air out. Ask him or her to breath in again and then cough. This should produce sputum from deep in the lungs. Ask the child to hold the sputum container close to the lips and to spit into it gently after a productive cough.
4. If the amount of sputum is insufficient, encourage the patient to cough again until a satisfactory specimen is obtained. Remember that many patients cannot produce sputum from deep in the respiratory track in only a few minutes. Give the child sufficient time to produce an expectoration which he or she feels is produced by a deep cough. If there is no expectoration, consider the container used and dispose of it in the appropriate manner.

Procedure for Gastric aspiration

Background

Gastric aspiration is a technique used to collect gastric contents to try to confirm the diagnosis of TB by Xpert MTB/Rif in children with presumptive PTB who cannot expectorate or sputum cannot be induced using hypertonic saline.

During sleep, the lung's mucociliary system beats mucus containing Mycobacterium TB up into the throat. The mucus is swallowed and remains in the stomach until the stomach empties. Therefore, the highest yield specimens are obtained first thing in the morning.

Performing the test properly usually requires two people (one doing the test and an assistant). Children not fasted for at least 4 hours (3 hours for infants) prior to the procedure and children with a low platelet count or bleeding tendency should not undergo the procedure.
The following equipments are needed:

- Gloves
- Nasogastric tube (usually 10 French or larger)
- 5, 10, 20 or 30 cc syringe, with appropriate connector for the nasogastric tube
- Litmus paper
- Specimen container
- Pen (to label specimens)
- Laboratory requisition forms
- Sterile water or normal saline (0.9% NaCl) Sodium bicarbonate solution
- (8%) Alcohol/chlorhexidine.

Procedure

The procedure can be carried out as:

- An inpatient: first thing in the morning when the child wakes up, at the child's bedside or in a procedure-room on the ward (if one is available), or as
- An outpatient. The child should have fasted for at least 4 hours (infants for 3 hours) before the procedure.

1. Find an assistant to help.
2. Prepare all equipment before starting the procedure.
3. Place a plain sheet (or a papoose board if available) on a couch.
4. Position the child on his or her back with the arms straight against the side.
5. Wrap the child with the sheet tucking the sheet under the child. The assistant should help to hold the child.

6. Measure the distance between the nose and stomach, to estimate distance that will be required to insert the tube into the stomach.
7. Attach a syringe to the nasogastric tube.
8. Gently insert the nasogastric tube through the nose and advance it into the stomach.
9. Withdraw (aspirate) gastric contents (2–5ml) using the syringe attached to the nasogastric tube and pour into a falcon tube. Add
10. To check that the position of the tube is correct, test the gastric contents with litmus paper: blue litmus turns red (in response to the acidic stomach contents). This can also be checked by pushing some air (e.g.3–5ml) from the syringe into the stomach and listening with a stethoscope over the stomach.
11. If no fluid is aspirated, insert 5–10ml sterile water or normal saline and attempt to aspirate again.
12. If still unsuccessful, attempt this again (even if the nasogastric tube is in an incorrect position and water or normal saline is inserted into the airways, the risk of adverse events is still small).
13. Do not repeat more than three times.
14. Withdraw the gastric contents (ideally at least 5–10ml).
15. Transfer gastric fluid from the syringe into a sterile sputum container.
16. Add an equal volume of sodium bicarbonate solution to the specimen (in order to neutralize the acidic gastric contents and so prevent destruction of tubercle bacilli).

After the procedure

Wipe the specimen container with alcohol/chlorhexidine to prevent cross-infection and label the container.

Fill out the laboratory requisition forms.

Transport the specimen (in a cool box) to the laboratory for processing as soon as possible (within 4 hours).

If it is likely to take more than 4 hours for the specimens to be transported, place them in the refrigerator (4–8°C) until transported.

Give the child his or her usual food.

Safety

Gastric aspiration is generally not an aerosol-generating procedure. As young children are also at low risk of transmitting infection, gastric aspiration can be considered a low risk procedure for TB transmission and can safely be performed at the child's bedside or in a routine procedure room.

Procedure for Sputum Induction

Note that, unlike gastric aspiration, sputum induction is an aerosol-generating procedure. Where possible, therefore, this procedure should be performed in an isolation room that has adequate infection control precautions (negative pressure, ultraviolet light (turned on when room is not in use) and an extractor fan).

Sputum induction is regarded as a low-risk procedure. Very few adverse events have been reported, and they include coughing spells, mild wheezing and nosebleeds. Recent studies have shown that this procedure can safely be performed even in young infants, though staff will need to have specialized training and equipment to perform this procedure in such patients.

General approach

Examine children before the procedure to ensure they are well enough to undergo the procedure.
Children with the following characteristics should not undergo sputum induction.

- Inadequate fasting: if a child has not been fasting for at least 3 hours, postpone the procedure until the appropriate time.
- Severe respiratory distress (including rapid breathing, wheezing, hypoxia).
- Children who are intubated.
- Bleeding: low platelet count, bleeding tendency, severe nosebleeds (Symptomatic or platelet count<50/ml blood).
- Reduced level of consciousness.
- History of significant asthma.

Procedure

1. Administer a bronchodilator (e.g. salbutamol) to reduce the risk of wheezing.
2. Administer nebulized hypertonic saline (3%NaCl) for 15 minutes or until 5 cm^3 of solution have been fully administered.
3. Give chest physiotherapy is necessary; this is useful to mobilize secretions.
4. For older children now able to expectorate, follow procedures as described in section A above to collect expectorated sputum.
5. For children unable to expectorate (e.g. young children), carry out either:
    I. Suction of the nasal passages to remove nasal secretions; or
    II. Nasopharyngeal aspiration to collect a suitable specimen.

Any equipment that will be reused will need to be disinfected and sterilized before use for a subsequent patient.

Tuberculin Skin Test

A Tuberculin skin Test (TST) or Mantoux test is the intradermal injection of a combination of mycobacterial antigens which elicit an immune response (delayed-type hypersensitivity), represented by in duration, which can be measured in millimeters. The TST using the Mantoux method is the standard method of identifying people infected with M. tuberculosis. Multiple puncture tests should not be used to determine whether a person is infected, as these tests are unreliable (because the amount of tuberculin injected intradermally cannot be precisely controlled).

Details of how to administer, read and interpret a TST are given below, using 5 tuberculin units (TU) of tuberculin PPD-S. An alternative to 5 TU of tuberculin PPD-S is 2 TU of tuberculin PPD RT23.

Preparation

When preparing to administer the Mantoux tuberculin skin test, make sure that the area for administering the test has a firm, well-lit surface, and that equipment and supplies are ready.

Supplies should include a vial of tuberculin, a single-dose disposable tuberculin syringe, one-quarter to one-half inch, 27-gauge needle with a short bevel, a ruler with millimeter (mm) measurements, 2x2 gauze pads or cotton balls, alcohol swabs, a puncture-resistant sharps disposal container, record-keeping forms for the patient and provider, and a pen.

To avoid reducing the potency of the tuberculin, store it inside a refrigerator so that it remains between 35 and 46 degrees Fahrenheit or between 2 and 8 degrees Centigrade.

Store and transport the tuberculin in the dark as much as possible and avoid exposure to light.

Discuss with the patient why the skin test is given, what is involved in the procedure, and when the patient should return for the test to be read. If a patient can't return within the 72-hour time period, do not administer the test. Instead, schedule another time that allows the patient to come for both the test and the return appointment.

It's also important to encourage the patient to ask questions and talk about any anxieties he or she may have about the test. That way you can answer any questions and ease any fears the patient may have.After providing patient education, you should wash your hands, using an appropriate hand-washing technique, before administering the test or any other procedure involving patient contact.

Administration

1. **Locate andcleaninjectionsite5–10cm(2–4inches)below elbow joint**

Place the forearm palm-side up on a firm, well-lit surface.

Select an area free of any barriers to placing and reading the skin test such as muscle margins, heavy hair, veins, sores, or scars.
Clean the area with an alcohol swab by circling from the center of the site outward. Allow the site to dry completely before the injection. Because some of the tuberculin solution can adhere to the inside of the plastic syringe, the skin test should be given as soon as possible after the syringe is filled.

2. **Prepare syringe**

Look at the vial label to make sure the vial contains tuberculin PPD-S (5 TU per 0.1 ml) and expiration date.
When you open a new vial, write the date and your initials on the label to indicate when the vial was opened and who opened it.
Fill the syringe with 0.1 ml tuberculin.

3. **Inject tuberculin (see Figure 3)**

The Mantoux tuberculin skin test is an intradermal injection.
With the needle bevel against the patient's skin, insert it slowly at a 5 - 15 degree angle. The 5- 15 degree angle is very important because this layer of skin is very thin.
For an intradermal injection, the needle bevel is advanced through the epidermis, the superficial layer of skin, approximately 3 mm so that the entire bevel is covered and lies just under the skin. The injection will produce inadequate results if the needle angle is too deep or too shallow.
When the needle is inserted at the correct angle you can see the bevel of the needle just below the skin surface. Next, release the stretched skin and hold the syringe in place on the forearm.
Now, slowly inject the tuberculin solution. You should feel fairly firm resistance as the tuberculin enters the skin. A tense, pale wheal that's 6 to 10 mm in diameter appears over the needle bevel. Remove the needle without pressing or massaging the area.
Discard the used syringe immediately in the designated puncture-resistant container.

4. **Check injection site**

After injection, a flat intradermal wheal of 8–10 mm diameter should appear. If not, repeat the injection at a site at least 5 cm (2 inches) away from the original site.
In case a drop of blood appears at the injection site, lightly blot the blood away with a gauze pad or cotton ball.
Do not cover the site with an adhesive bandage because the adhesive could cause irritation and interfere with the test.
Immediately and thoroughly wash your hands.

5. **Record information**

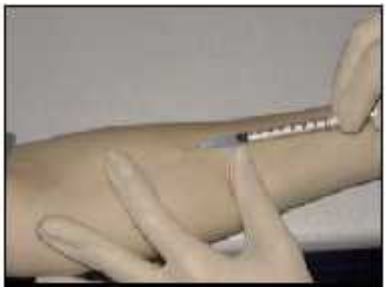
Write the date and the time the test was administered, the name and manufacturer of the injected solution, the lot number, the tuberculin dose administered, the expiration date, the forearm or alternative site in which the injection was given, the site location if you repeat the test, the name of the person who administered the test, and the reason for giving the skin test.

Remind the patient to return.

Explain how to care for the injection site after the test. Tell the patient to avoid scratching the site, keep the site clean and dry, and avoid putting creams, lotions, or adhesive bandages on it. Also mention that getting the site wet with water is not harmful, but the site should not be wiped or scrubbed.

Return the tuberculin vial to the refrigerator, or other cooling container.

Figure 1: Administration of the tuberculin skin test



Reading

The results should be read 72 hours after administration. A patient who does not return within 72 hours will probably need to be rescheduled for another TST.

Have a small, plastic, flexible ruler marked in millimeters to measure the test, a pen to mark the edges of the induration, and an alcohol pad to clean off the pen marks. You'll need the patient's record or other appropriate forms for documenting the measurement results.

1. Inspect site

Visually inspect injection site under good light and on a firm surface.

Use fingertips to find the margins of induration which is a hard, dense, raised formation. This is the area that is measured. Sometimes the site has erythema, a reddening of the skin that can also have swelling. The erythema should NOT be measured.

Mark induration.

2. Measure diameter of induration using a clear flexible ruler

The diameter of the induration is measured across the forearm; from the thumb side of the arm to the little finger side of the arm or vice versa.

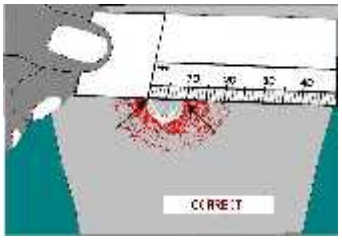
Place "0" of ruler line on the inside-left edge of the induration.

Read ruler line on the inside-right edge of the induration (use lower measurement if between two gradations on mm scale).

3. Record diameter of induration

Do not record as "positive" or "negative". Only record the measurement in millimeters. If no induration, record as 0 mm.

Figure 2: Reading the tuberculin skin test



Interpretation

TST interpretation depends on two factors:

- Diameter of the induration.
- Person's risk of being infected with TB and risk of progression to disease if infected.

Mantoux is positive if induration is:

- 10mm in a well-nourished, HIV negative child
- 5mm in a malnourished, or HIV infected child

A negative mantoux does not rule out TB infection or disease (especially in the HIV positive or malnourished child).

TREATMENT REGIMEN FOR TB IN CHILDREN

TB disease category	Recommended regimen	
	Intensive phase	**Continuation phase**
All forms of TB (Except TB meningitis and TB of the bones and joints)	2 months RHZE	4 months RH
TB meningitis TB of the bones and joints	2 months RHZE	10 months RH
Drug resistant TB	Refer to a DR TB specialist and inform CTLC	

H= Isoniazid R= Rifampicin Z= Pyrazinamide E= Ethambutol

NB: Numerical figures refer to number of months of the regimen e.g. 2 HRZE refers to two months of Isoniazid, Rifampicin, Pyrazinamide and Ethambutol

For previously treated children who present with relapse/recurrence of TB within one year of completing anti-TB, evaluate for drug resistant TB, progressive HIV disease or other chronic lung disease. Refer for paediatrician review, and make every effort to get a specimen for Xpert. For those where specialist review is not possible, initiate the child on TB treatment as per the Xpert results.

Ethambutol is safe and can be used in children in doses not exceeding 25mg/kg/day

Once TB treatment is initiated, it must be completed

DOSAGES FOR PEDIATRIC TB TREATMENT (IMPROVED FORMULATIONS)

DOSAGES FOR A CHILD WEIGHING UP TO 3.9 KG

Weight bands (Kg)	Number of tablets				
	Intensive Phase			Continuation Phase	
	RHZ (75/50/150mg)	E(100mg)	How to reconstitute the medicines	RH(75/50mg)	How to reconstitute the medicines
Less than 2 Kg	¼	¼	Dissolve **one (1)** tablet of RHZ in **20 ml** of safe drinking water. Once fully dissolved, add the completely crushed **one (1)** tablet of Ethambutol and give **5ml (1/4)** of this solution	¼	Dissolve **one (1)** tablet of RH in **20 ml** of safe drinking water. Once fully dissolved, give **5ml (1/4)** of this solution
2 – 2.9	½	½	Dissolve **one (1)** tablet of RHZ in **20 ml** of safe drinking water. Once fully dissolved, add the completely crushed **one (1)** tablet of Ethambutol and give **10ml (1/2)** of this solution	½	Dissolve **one (1)** tablet of RH in **20 ml** of safe drinking water. Once fully dissolved, give **10ml (1/2)** of this solution
3 – 3.9	¾	¾	Dissolve **one (1)** tablet of RHZ in **20 ml** of safe drinking water. Once fully dissolved, add the completely crushed **one (1)** tablet of Ethambutol and give **15ml (3/4)** of this solution	¾	Dissolve **one (1)** tablet of RH in **20 ml** of safe drinking water. Once fully dissolved, give **15ml (3/4)** of this solution

Ethambutol is not dispersible. Crush it completely before adding to the prepared solution of RHZ during the intensive phase. A**fter giving the child their dose for that day, discard the rest of the solution. Prepare a fresh solution every day.**

DOSAGES FOR A CHILD WEIGHING 4-25 KG

Weight bands (Kg)	Number of tablets				
	Intensive Phase			Continuation Phase	
	RHZ (75/50/150mg)	E(100mg)	How to reconstitute the medicines	RH(75/50mg)	How to reconstitute the medicines
4 - 7.9	1	1	Dissolve the tablet(s) of RHZ in **20 ml** of safe drinking water. Once fully dissolved, add the completely crushed tablet(s) of Ethambutol and give **ALL** of this solution to the child	1	Dissolve the tablet(s) of RH in **20 ml** of safe drinking water. Once fully dissolved give **ALL** of this solution to the child.
8 - 11.9	2	2		2	
12 - 15.9	3	3		3	
16 - 24.9	4	4		4	
25 kg and above	Use adult dosages and preparations				

DOSAGES FOR A CHILD WEIGHING 25KGS AND ABOVE (ADULT FORMULATION TABLE)

Weight band (Kg)	Number of tablets	
	Intensive Phase	Continuation Phase
	RHZE (150/75/400/275mg)	RH(150/75mg)
25 – 39	2	2
40 - 54	3	3
55kg and above	4	4

PYRIDOXINE (VITAMIN B6) DOSING FOR CHILDREN ON TB TREATMENT

Weight (Kgs)	Dose in mg	Number of 25mg tablets	Number of 50mg tablets
Less than 5	6.25 mg	Half a tablet 3 TIMES PER WEEK	Not suitable for young infant
5.0 – 7.9	12.5 mg	Half a tablet daily	Half of 50mg tablet 3 TIMES PER WEEK
8.0 – 14.9	25 mg	One tablet daily	Half of 50mg tablet daily
15 kg and above	50 mg	Two tablets daily	One 50mg tablet daily

Follow up of a child on TB treatment

Month	Baseline	1	2	3	4	5	6	7	8	9	10	11	12
Clinical review for both PTB and EPTB (symptom assessment, drug toxicity and adherence)	X	Every week		Every two weeks									
Weight (dose adjustment)	X	Every week		Every two weeks									
Height/Weight for Height Z-score/BMI for age	X						X						X
Xpert MTBRIF (Done for diagnosis. May repeat at any other point if drug resistance is suspected)	X												
Smear for follow up in bacteriologically confirmed TB			X			X	X						
Culture and DST (if not improving/ suspected resistance)	See algorithm												
Viral load (for HIV infected)	X						X						X
CXR	X	Repeat if not responding to treatment at any point											

ADJUST THE DOSE OF TB MEDICINE IF CHILD HAS GAINED WEIGHT

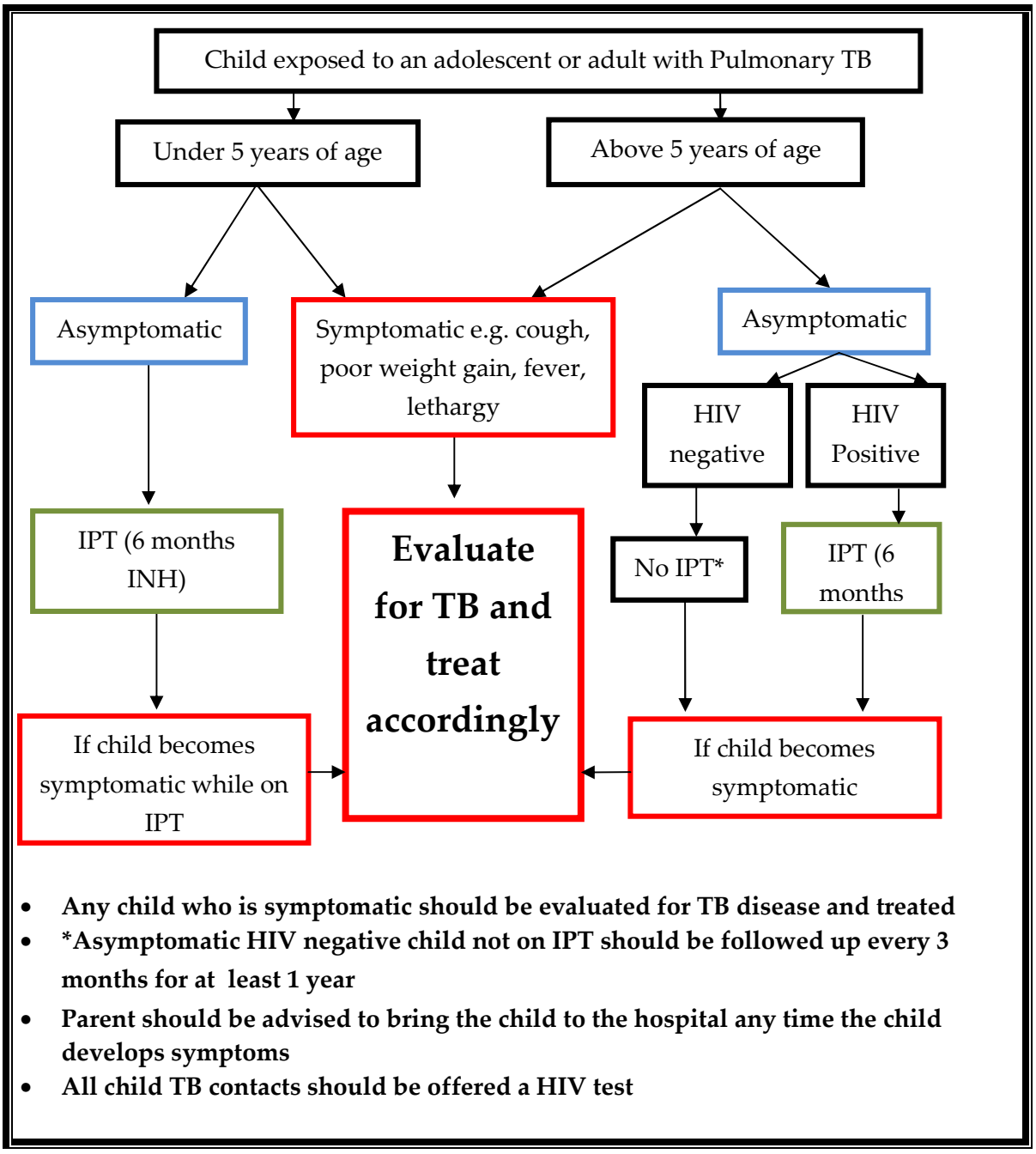
RECORDING & REPORTING OF TB CASES IS VERY IMPORTANT

The following documents have been availed by the government and should be accurately and completely filled for every child treated with TB:

1. **TB treatment card**
2. **TB appointment card**
3. **TB treatment register**

Always refer a child with suspected TB, to a TB treatment centre if unable to record and report

Management of a Child who has been exposed to an adolescent or adult with Pulmonary TB



- **Any child who is symptomatic should be evaluated for TB disease and treated**
- ***Asymptomatic HIV negative child not on IPT should be followed up every 3 months for at least 1 year**
- **Parent should be advised to bring the child to the hospital any time the child develops symptoms**
- **All child TB contacts should be offered a HIV test**

ISONIAZID PREVENTIVE THERAPY (IPT) IN CHILDREN

Which child should receive IPT?

Provide Isoniazid Preventive Therapy (IPT) for the high risk children who have no signs or symptoms of TB disease i.e.

- All children aged under 5 years who have been exposed to a case of infectious TB irrespective of their HIV status
- All HIV infected children above one year
- HIV infected children under one year of age who have been exposed to a case of infectious TB

Follow up of a child on IPT is monthly. If TB disease develops, stop IPT and treat for TB.

All children on IPT should receive pyridoxine at 1-2mg/kg/day.

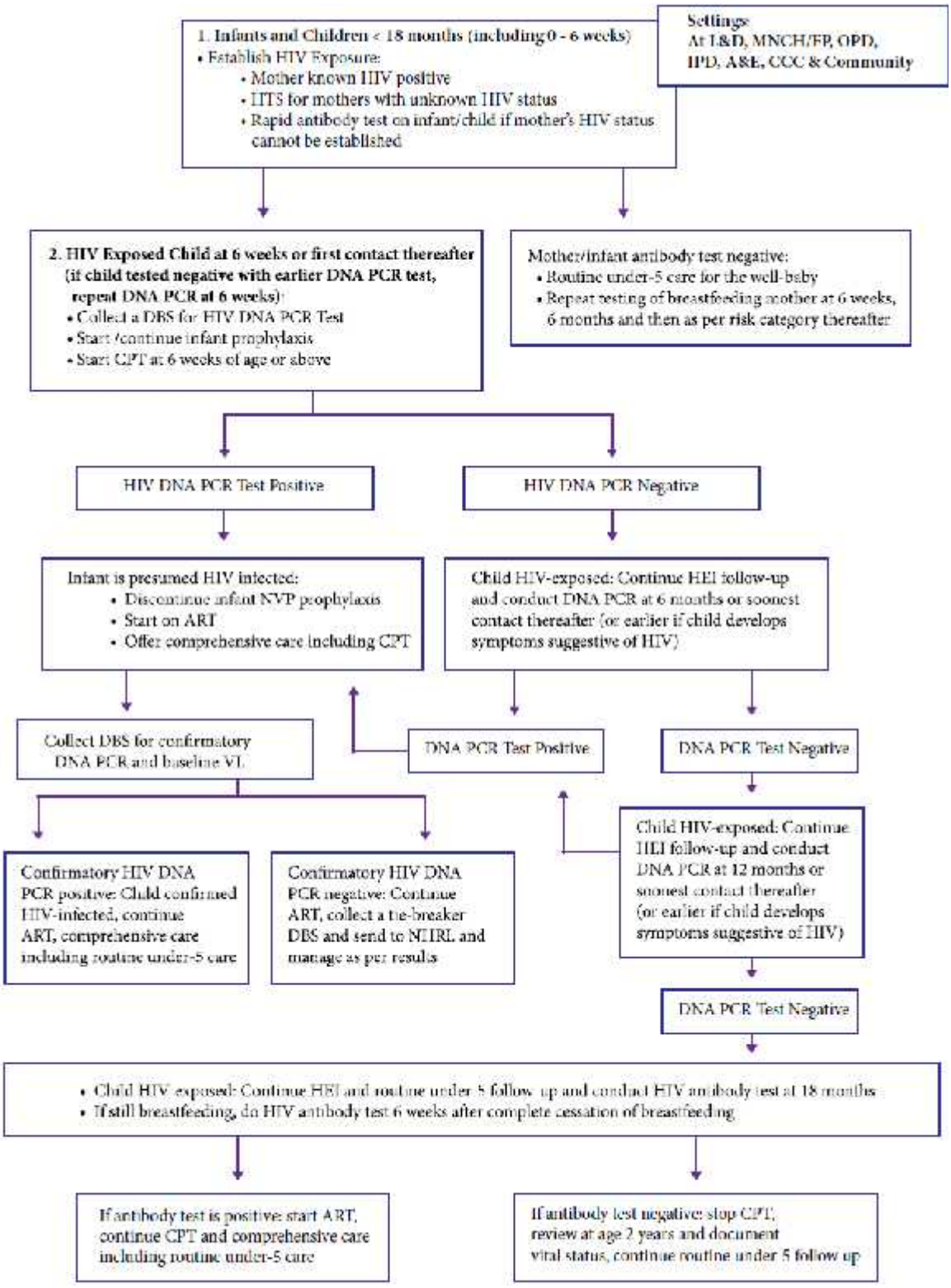
Note: INH preventive therapy should NOT be given to children exposed to an adult with proven MDR/XDR TB. The children should instead be followed up for signs of active TB disease and managed appropriately

TB disease must be ruled out before initiating IPT
Give IPT for 6 months

Weight (kg)	Daily Dose in mg	Number of 100 mg, INH tablets
<5	50	½
5.1 – 9.9	100	1
10-13.9	150	1½
14-19.9	200	2
20-24.9	250	2½
>25	300	3*

*** For children more than 25 kg, one can use 1 adult tablet of 300mg INH once daily**

Algorithm for Early Infant Diagnosis of HIV



Presumptive Diagnosis of HIV in children <18 months while awaiting DNA PCR Results

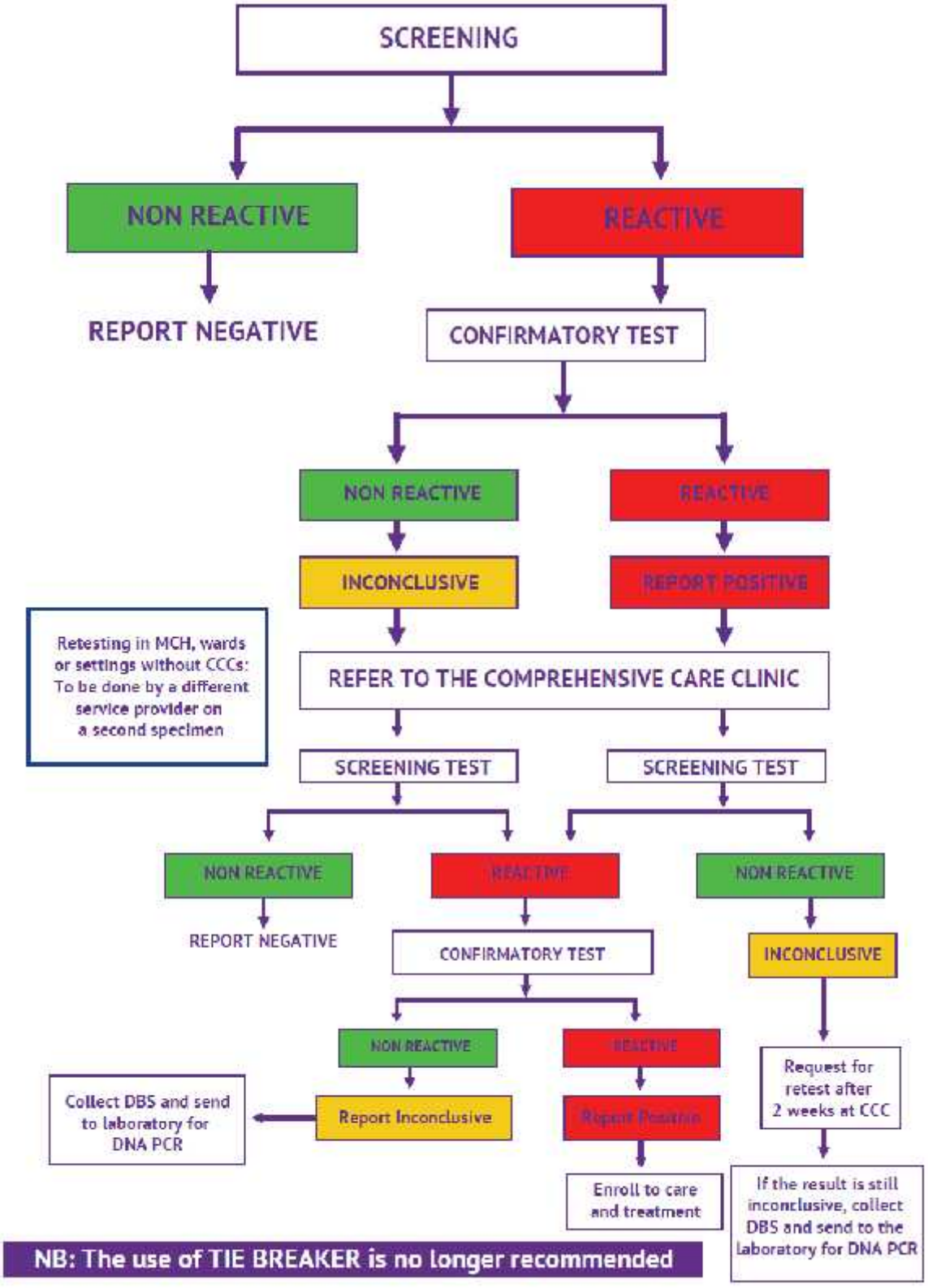
Child < 18months of age; HIV antibody test positive and symptomatic with:
2 or more of the following:

- Oral candidiasis/thrush
- Severe pneumonia
- Severe sepsis

OR, any of the following

- Any WHO Clinical Stage 4 condition
- Recent maternal death or advanced HIV disease in mother
- Child's CD4 < 20%

HIV Testing Services Algorithm for the child >18 months



ART initiation in children

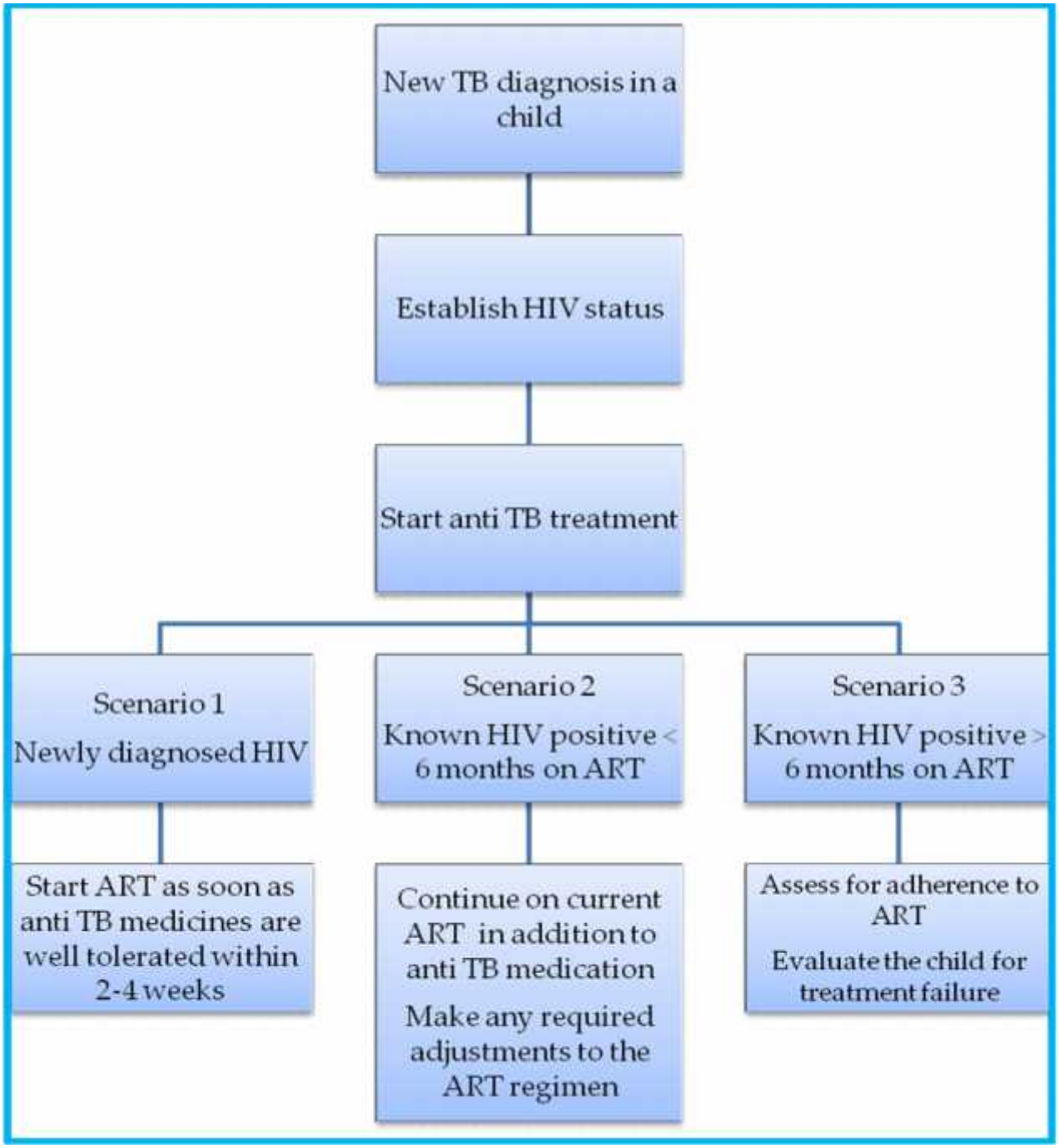
Once a diagnosis of TB is made in a HIV infected child, TB treatment should be initiated as a matter of urgency, regardless of whether the child is on ART or not.

All PLHIV qualify for ART irrespective of CD4 cell count or percentage, WHO clinical stage, age, pregnancy status, or co-morbidities. ART should be initiated as soon as the patient is ready to start, preferably within two weeks from time of HIV diagnosis.

Any child with active tuberculosis should begin TB treatment immediately; and begin ART as soon as the TB treatment is tolerated; i.e. no nausea or vomiting and no on-going or evolving adverse drug events, usually 2 to 8 weeks into TB therapy.

Laboratory assessment is not a prerequisite to ART initiation. It should not cause undue delay in starting ART following treatment preparation and clinical evaluation by history and physical examination

Management of HIV in a child with TB



Preferred ART Regimens for TB/HIV Co-infection for Children Newly Initiating 1st Line ART

Age	1st Line if TB/HIV Co-infection
< 4 weeks	Start anti-TB treatment immediately Start ART after 4 weeks of age, once tolerating anti-TB drugs (follow the regimen recommendations for children 4 weeks to < 3 years of age)
4 weeks - < 3 years	• ABC + 3TC + LPV/r + RTV([1,2]) • If not able to tolerate super-boosted LPV/r+ RTV then use AZT + ABC + 3TC for duration of TB treatment • After completion of TB treatment revert back to the recommended 1st line regimen (ABC + 3TC + LPV/r)
3-15 years (< 35 kg body weight)	ABC + 3TC + EFV
3-15 years (≥ 35 kg body weight)	TDF + 3TC + EFV
>15 years	TDF + 3TC + EFV
PWID >15 years	TDF + 3TC + ATV/r (using Rifabutin-based anti-TB treatment)

[1] Use "super-boosted" LPV/r by adding additional Ritonavir suspension to manage the drug interaction between LPV/r and Rifampicin (see Table 25 for LPV/r dosing recommendations). As soon as TB treatment is completed the child should go back to standard LPV/r dosing. For children who cannot tolerate LPV/r + RTV (usually because of GI side-effects), the alternative regimen is AZT+ABC+3TC; as soon as TB treatment is completed the child should go back to ABC+3TC+LPV/r, because of the increased risk of developing treatment failure while on a triple-NRTI regimen

[2] EFV is no longer recommended for children < 3 years old because of highly variable EFV metabolism at that age

Preferred ART Regimens for TB/HIV Co-infection for Patients Currently on 1st Line ART [1, 2]

Current Regimen[3]	Age	Recommended Substitution
PI/r-based AZT + 3TC + LPV/r ABC + 3TC + LPV/r TDF + 3TC + LPV/r ABC + 3TC + ATV/r AZT + 3TC + ATV/r TDF + 3TC + ATV/r	< 3 years old	• Super-boost LPV/r with additional RTV[4] • If not able to tolerate super-boosted LPV/r + RTV then use AZT + ABC + 3TC for the duration of TB treatment[5] • After completion of TB treatment revert back to the original regimen
	3 years – 15 years (weight < 35kg)	Switch to EFV. If EFV cannot be used, super- boost LPV/r with additional RTV to a ratio of 1:1
	Child <15 years and ≥ 35 kg	Continue PI/r; use Rifabutin[6] for anti-TB treatment
	> 15 years (any weight)	Continue PI/r; use Rifabutin for anti-TB treatment
EFV-based ABC + 3TC + EFV TDF + 3TC + EFV AZT + 3TC + EFV	Any age	Continue same regimen
NVP-based[7] AZT + 3TC + NVP ABC + 3TC + NVP TDF + 3TC + NVP	< 3 years old	Switch to AZT + ABC + 3TC (as soon as TB treatment is completed switch back or original regimen)
	≥ 3 years old	Switch to EFV
RAL-based ABC + 3TC+RAL AZT + 3TC+RAL RAL + 3TC + DRV + RTV AZT + RAL + 3TC + DRV + RTV AZT + RAL + 3TC + DRV + RTV	All ages	Give double the standard dose of RAL
DTG-based	All ages	Give standard dose of DTG twice

DTG + 3TC + DRV + RTV AZT + DTG + 3TC + DRV + RTV AZT + DTG + 3TC + DRV + RTV		daily (i.e. double the daily dose)

[1] Always assess for HIV treatment failure in patients who develop TB after being on ART for _ 6 months

[2] For patients on 2nd line ART, subsequent regimens, or nonstandard drugs such as RAL or DTG who require regimen change because of TB treatment, consult the Regional or National HIV Clinical TWG (ulizanascop@gmail.com)

[3] NRTIs in the patient's current regimen do not require any adjustments with anti-TB treatment

[4] Use "super-boosted" LPV/r by adding additional Ritonavir suspension to manage the drug interaction between LPV/r and Rifampicin (see Table 8.7 for dosing recommendations). As soon as TB treatment is completed the child should go back to standard LPV/r dosing

[5] For children who cannot tolerate LPV/r+ RTV (usually because of GI side-effects), the alternative regimen is AZT+ABC+3TC; as soon as TB treatment is completed the child should go back to ABC+3TC+LPV/r, because of the increased risk of developing treatment failure while on a triple-NRTI regimen

[6] Rifabutin 150 mg once daily in place of Rifampicin. When using Rifabutin, closely monitor for side effects e.g. neutropenia, neurotoxicity and uveitis

[7] Guidelines recommend LPV/r for children < 3 years, however some children < 3 years maybe on NVP due to LPV/r toxicity

Abbreviations and Names of Antiretroviral Drugs

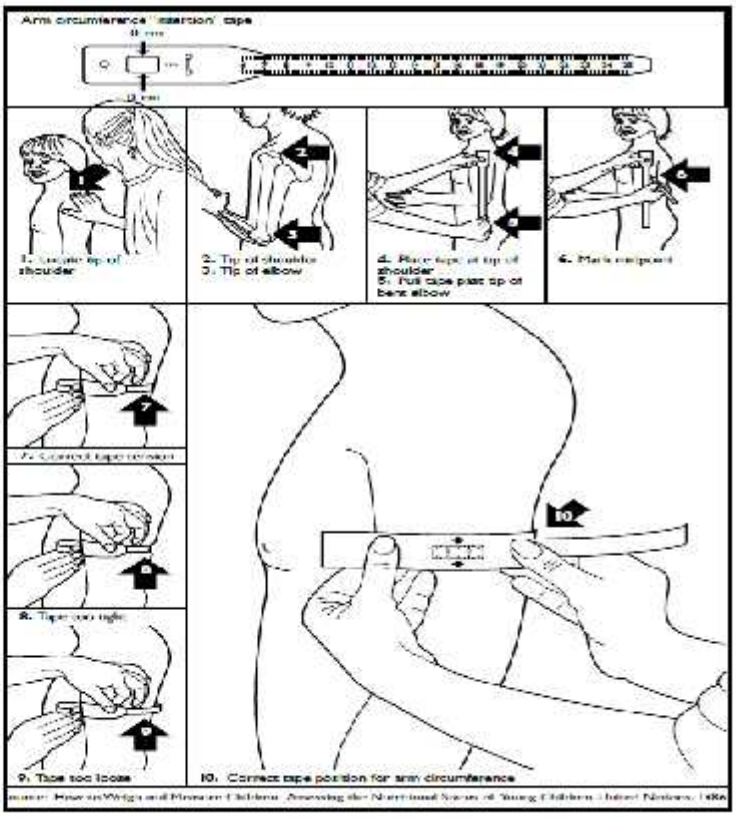
3TC	Lamivudine	**DRV**	Darunavir	**LPV/r**	Lopinavir/ Ritonavir
ABC	Abacavir	**DRV/r**	Darunavir/ Ritonavir	**NVP**	Nevirapine
ATV	Atazanavir	**DTG**	Dolutegravir	**RAL**	Raltegravir
ATV/r	Atazanavir/ Ritonavir	**EFV**	Efavirenz	**RTV**	Ritonavir
AZT	Zidovudine	**LPV**	Lopinavir	**TDF**	Tenofovir Disoproxil Fumarate

Taking a Child's Middle Upper Arm Circumference (MUAC)

MUAC is an alternative way to measure "thinness" (alternative to weight for height). It is especially used for children six months old to five years old.

Figure 1.1: How to Measure MUAC

- Ask the mother to remove any clothing covering the child's left arm.
- Calculate the midpoint of the child's left upper arm: first locate the tip of the child's shoulder (arrows 1 and 2 in diagram below) with your finger tips.
- Bend the child's elbow to make the right angle (arrow 3).
- Place the tape at zero, which is indicated by two arrows, on the tip of the shoulder (arrow 4) and pull the tape straight down past the tip of the elbow (arrow 5).
- Read the number at the tip of the elbow to the nearest centimetre. Divide this number by two to estimate the midpoint. As an alternative, bend the tape up to the middle length to estimate the midpoint. A piece of string can also be used for this purpose; it is more convenient and avoids damage to the tape.
- Mark the midpoint with a pen on the arm (arrow 6).
- Straighten the child's arm and wrap the tape around the arm at the midpoint. Make sure the numbers are right side up. Make sure the tape is flat around the skin (arrow 7).
- Inspect the tension of the tape on the child's arm. Make sure the tape has the proper tension (arrow 7) and is not too tight or too loose (arrows 8 and 9). Repeat any step as necessary
- When the tape is in the correct position on the arm with correct tension, read and call out the measurement to the nearest 0.1cm (arrow 10).
- Immediately record the measurement.



Taking a Child's Weight

Children are weighed with a 25 kg hanging sprint scale, graduated to 0.100 kg. Do not forget to re-adjust the scale to zero before each weighing.

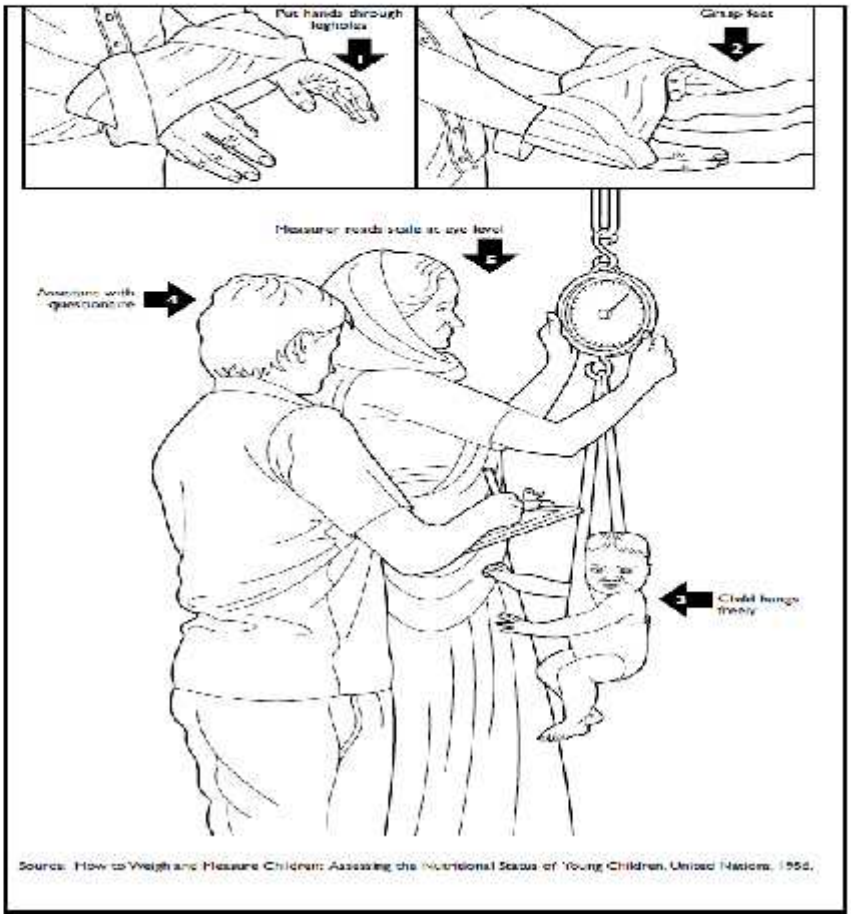
A plastic wash basin should be supported by four ropes that attach (are knotted) underneath the basin. The basin is close to the ground in case the child falls out and to make the child feel secure during weighing. If the basin is soiled, first clean it with disinfectant. The basin is more comfortable and familiar for the child, can be used for ill children, and is easily cleaned. In the absence of a basin, weighing pants can be used although are sometimes inappropriate for very sick children. When the pant is soiled, it can be cleaned and disinfected to reduce the risk to pass an infection to the next patient.

When the child is steady in the basin or pant, record the measurement to the nearest 100 grams, recording with the frame of the scale at eye level. The scales must be checked for accuracy by using a known weight on a regular basis, i.e. weekly.

Figure 1.2: Taking a child's weight

Instructions on Taking the Weight

1. Before weighing the child, take all his/her clothes off
2. Zero the weighing scale (i.e. make sure the arrow is on 0)
3. Ensure that the weighing scale is at eye level
4. Place the child in the weighing pans
5. Make sure the child is not holding onto anything
6. Read the child's weight. The arrow must be steady.
7. Record the weight in kg to the nearest 100g e.g. 6.6 kg
8. Do not hold the scale when reading the weight



Source: How to Weigh and Measure Children: Assessing the Nutritional Status of Young Children, United Nations, 1986.

Taking a Child's Length

Figure 1.3: Taking a child's length
For children less than 87 cm the measuring board is placed on the ground.

1. The child is placed lying down along the middle of the board
2. The assistant holds the sides of the child's head and positions the head until it firmly touches the fixed headboard with the hair compressed
3. The measurer places her hands on the child's legs, gently stretches the child and then keeps one hand on the thighs to prevent flexion.
4. While positioning the child's legs, the sliding foot-plate is pushed firmly against the bottom of the child's feet.
5. To read the height measurement, the foot plate must be perpendicular to the axis of the board and vertical
6. The height is read to the nearest 0.1cm

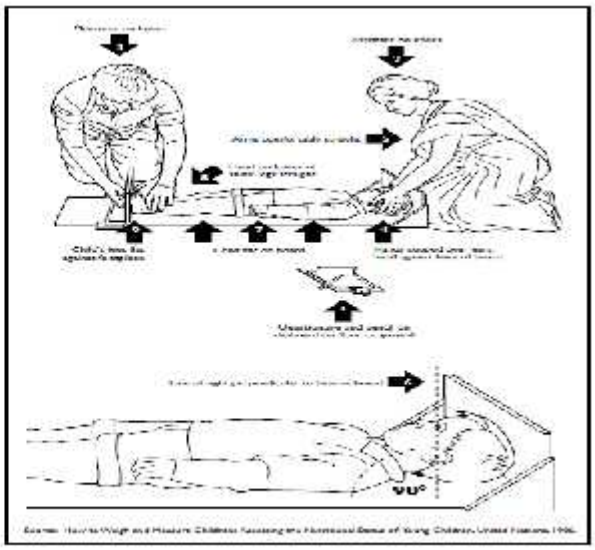
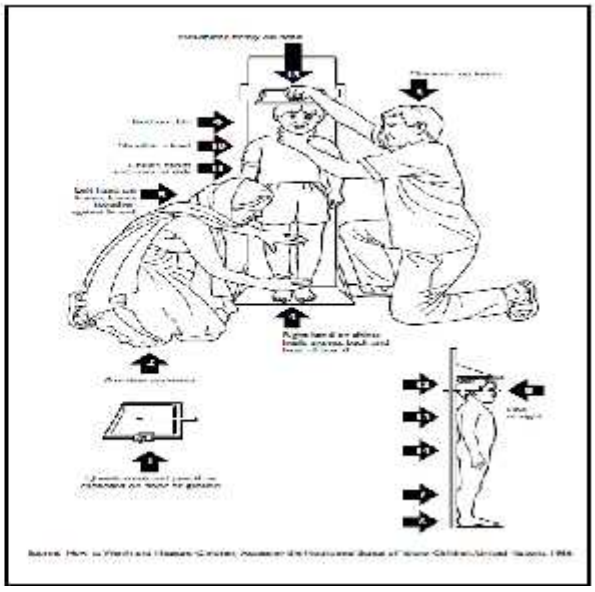


Figure 1.4: Taking a child's height
For children taller than 87 cm the measuring board is fixed upright on level ground.

1. The child stands, upright against the middle of the measuring board
2. The child's head, shoulders, buttocks, knees, and heels are held against the board by the assistant
3. The measurer positions the head and the cursor.
4. The height is read to the nearest 0.1 cm
5. Measurement is recorded immediately



For children 0-59 months of age, age, weight and height/ length is taken and Z –Scores documented as per the reference charts. For children 5-17 years, age, weight and height are used to assess the BMI for age.

Instructions for using the Z-score chart

Always ensure the child is less than 5 years when using these charts.

Step 1: Measurement

Infants and children less than 2 years or if under 87cm, measure the length in "cm" while lying down (supine.) Children over 2 years or above 87cm, measure height in "cm" while standing. Measure the weight in "kg" and record in the patient record card.

Step 2: Read the chart

Identify the child's age and gender. Confirm if the child's age corresponds to the chart for 0-2 years or 2-5 years and identify the correct chart.

Identify the length/height column on the chart.

a) Find where the measured length/height of the child is on the chart and place your finger on this cell.

b) Move along the row where height was identified and identify the cell with weight that is equal to or less than the actual recorded weight of the child.

Step 3: Classification

Classify and report the child's weight for height Z score corresponding to the identified weight from the SD rows at the top of the chart.

Step 4: Intervention

All children with a Z-score of -2SD and below have moderate to severe malnutrition and are eligible for Food by Prescription.

Weight-for-length BOYS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
45.0	1.9	2.0	2.2	2.4	2.7	3.0	3.3
45.5	1.9	2.1	2.3	2.5	2.8	3.1	3.4
46.0	2.0	2.2	2.4	2.6	2.9	3.1	3.5
46.5	2.1	2.3	2.5	2.7	3.0	3.2	3.6
47.0	2.1	2.3	2.5	2.8	3.0	3.3	3.7
47.5	2.2	2.4	2.6	2.9	3.1	3.4	3.8
48.0	2.3	2.5	2.7	2.9	3.2	3.6	3.9
48.5	2.3	2.6	2.8	3.0	3.3	3.7	4.0
49.0	2.4	2.6	2.9	3.1	3.4	3.8	4.2
49.5	2.5	2.7	3.0	3.2	3.5	3.9	4.3
50.0	2.6	2.8	3.0	3.3	3.6	4.0	4.4
50.5	2.7	2.9	3.1	3.4	3.8	4.1	4.5
51.0	2.7	3.0	3.2	3.5	3.9	4.2	4.7
51.5	2.8	3.1	3.3	3.6	4.0	4.4	4.8
52.0	2.9	3.2	3.5	3.8	4.1	4.5	5.0
52.5	3.0	3.3	3.6	3.9	4.2	4.6	5.1
53.0	3.1	3.4	3.7	4.0	4.4	4.8	5.3
53.5	3.2	3.5	3.8	4.1	4.5	4.9	5.4
54.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6
54.5	3.4	3.7	4.0	4.4	4.8	5.3	5.8
55.0	3.6	3.8	4.2	4.5	5.0	5.4	6.0
55.5	3.7	4.0	4.3	4.7	5.1	5.6	6.1
56.0	3.8	4.1	4.4	4.8	5.3	5.8	6.3
56.5	3.9	4.2	4.6	5.0	5.4	5.9	6.5
57.0	4.0	4.3	4.7	5.1	5.6	6.1	6.7
57.5	4.1	4.5	4.9	5.3	5.7	6.3	6.9
58.0	4.3	4.6	5.0	5.4	5.9	6.4	7.1
58.5	4.4	4.7	5.1	5.6	6.1	6.6	7.2
59.0	4.5	4.8	5.3	5.7	6.2	6.8	7.4
59.5	4.6	5.0	5.4	5.9	6.4	7.0	7.6

Weight-for-length BOYS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
60.0	4.7	5.1	5.5	6.0	6.5	7.1	7.8
60.5	4.8	5.2	5.6	6.1	6.7	7.3	8.0
61.0	4.9	5.3	5.8	6.3	6.8	7.4	8.1
61.5	5.0	5.4	5.9	6.4	7.0	7.6	8.3
62.0	5.1	5.6	6.0	6.5	7.1	7.7	8.5
62.5	5.2	5.7	6.1	6.7	7.2	7.9	8.6
63.0	5.3	5.8	6.2	6.8	7.4	8.0	8.8
63.5	5.4	5.9	6.4	6.9	7.5	8.2	8.9
64.0	5.5	6.0	6.5	7.0	7.6	8.3	9.1
64.5	5.6	6.1	6.6	7.1	7.8	8.5	9.3
65.0	5.7	6.2	6.7	7.3	7.9	8.6	9.4
65.5	5.8	6.3	6.8	7.4	8.0	8.7	9.6
66.0	5.9	6.4	6.9	7.5	8.2	8.9	9.7
66.5	6.0	6.5	7.0	7.6	8.3	9.0	9.9
67.0	6.1	6.6	7.1	7.7	8.4	9.2	10.0
67.5	6.2	6.7	7.2	7.9	8.5	9.3	10.2
68.0	6.3	6.8	7.3	8.0	8.7	9.4	10.3
68.5	6.4	6.9	7.5	8.1	8.8	9.6	10.5
69.0	6.5	7.0	7.6	8.2	8.9	9.7	10.6
69.5	6.6	7.1	7.7	8.3	9.0	9.8	10.8
70.0	6.6	7.2	7.8	8.4	9.2	10.0	10.9
70.5	6.7	7.3	7.9	8.5	9.3	10.1	11.1
71.0	6.8	7.4	8.0	8.6	9.4	10.2	11.2
71.5	6.9	7.5	8.1	8.8	9.5	10.4	11.3
72.0	7.0	7.6	8.2	8.9	9.6	10.5	11.5
72.5	7.1	7.6	8.3	9.0	9.8	10.6	11.6
73.0	7.2	7.7	8.4	9.1	9.9	10.8	11.8
73.5	7.2	7.8	8.5	9.2	10.0	10.9	11.9
74.0	7.3	7.9	8.6	9.3	10.1	11.0	12.1
74.5	7.4	8.0	8.7	9.4	10.2	11.2	12.2
75.0	7.5	8.1	8.8	9.5	10.3	11.3	12.3

Weight-for-length BOYS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
75.5	7.5	8.2	8.8	9.6	10.4	11.4	12.5
76.0	7.6	8.3	8.9	9.7	10.6	11.5	12.6
76.5	7.7	8.3	9.0	9.8	10.7	11.6	12.7
77.0	7.8	8.4	9.1	9.9	10.8	11.7	12.8
77.5	7.9	8.5	9.2	10.0	10.9	11.9	13.0
78.0	7.9	8.6	9.3	10.1	11.0	12.0	13.1
78.5	8.0	8.7	9.4	10.2	11.1	12.1	13.2
79.0	8.1	8.7	9.5	10.3	11.2	12.2	13.3
79.5	8.2	8.8	9.5	10.4	11.3	12.3	13.4
80.0	8.2	8.9	9.6	10.4	11.4	12.4	13.6
80.5	8.3	9.0	9.7	10.5	11.5	12.5	13.7
81.0	8.4	9.1	9.8	10.6	11.6	12.6	13.8
81.5	8.5	9.1	9.9	10.7	11.7	12.7	13.9
82.0	8.5	9.2	10.0	10.8	11.8	12.8	14.0
82.5	8.6	9.3	10.1	10.9	11.9	13.0	14.2
83.0	8.7	9.4	10.2	11.0	12.0	13.1	14.3
83.5	8.8	9.5	10.3	11.2	12.1	13.2	14.4
84.0	8.9	9.6	10.4	11.3	12.2	13.3	14.6
84.5	9.0	9.7	10.5	11.4	12.4	13.5	14.7
85.0	9.1	9.8	10.6	11.5	12.5	13.6	14.9
85.5	9.2	9.9	10.7	11.6	12.6	13.7	15.0
86.0	9.3	10.0	10.8	11.7	12.8	13.9	15.2
86.5	9.4	10.1	11.0	11.9	12.9	14.0	15.3
87.0	9.5	10.2	11.1	12.0	13.0	14.2	15.5
87.5	9.6	10.4	11.2	12.1	13.2	14.3	15.6
88.0	9.7	10.5	11.3	12.2	13.3	14.5	15.8
88.5	9.8	10.6	11.4	12.4	13.4	14.6	15.9
89.0	9.9	10.7	11.5	12.5	13.5	14.7	16.1
89.5	10.0	10.8	11.6	12.6	13.7	14.9	16.2
90.0	10.1	10.9	11.8	12.7	13.8	15.0	16.4
90.5	10.2	11.0	11.9	12.8	13.9	15.1	16.5

Weight-for-length BOYS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
91.0	10.3	11.1	12.0	13.0	14.1	15.3	16.7
91.5	10.4	11.2	12.1	13.1	14.2	15.4	16.8
92.0	10.5	11.3	12.2	13.2	14.3	15.6	17.0
92.5	10.6	11.4	12.3	13.3	14.4	15.7	17.1
93.0	10.7	11.5	12.4	13.4	14.6	15.8	17.3
93.5	10.7	11.6	12.5	13.5	14.7	16.0	17.4
94.0	10.8	11.7	12.6	13.7	14.8	16.1	17.6
94.5	10.9	11.8	12.7	13.8	14.9	16.3	17.7
95.0	11.0	11.9	12.8	13.9	15.1	16.4	17.9
95.5	11.1	12.0	12.9	14.0	15.2	16.5	18.0
96.0	11.2	12.1	13.1	14.1	15.3	16.7	18.2
96.5	11.3	12.2	13.2	14.3	15.5	16.8	18.4
97.0	11.4	12.3	13.3	14.4	15.6	17.0	18.5
97.5	11.5	12.4	13.4	14.5	15.7	17.1	18.7
98.0	11.6	12.5	13.5	14.6	15.9	17.3	18.9
98.5	11.7	12.6	13.6	14.8	16.0	17.5	19.1
99.0	11.8	12.7	13.7	14.9	16.2	17.6	19.2
99.5	11.9	12.8	13.9	15.0	16.3	17.8	19.4
100.0	12.0	12.9	14.0	15.2	16.5	18.0	19.6
100.5	12.1	13.0	14.1	15.3	16.6	18.1	19.8
101.0	12.2	13.2	14.2	15.4	16.8	18.3	20.0
101.5	12.3	13.3	14.4	15.6	16.9	18.5	20.2
102.0	12.4	13.4	14.5	15.7	17.1	18.7	20.4
102.5	12.5	13.5	14.6	15.9	17.3	18.8	20.6
103.0	12.6	13.6	14.8	16.0	17.4	19.0	20.8
103.5	12.7	13.7	14.9	16.2	17.6	19.2	21.0
104.0	12.8	13.9	15.0	16.3	17.8	19.4	21.2
104.5	12.9	14.0	15.2	16.5	17.9	19.6	21.5
105.0	13.0	14.1	15.3	16.6	18.1	19.8	21.7
105.5	13.2	14.2	15.4	16.8	18.3	20.0	21.9
106.0	13.3	14.4	15.6	16.9	18.5	20.2	22.1

Weight-for-length BOYS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
106.5	13.4	14.5	15.7	17.1	18.6	20.4	22.4
107.0	13.5	14.6	15.9	17.3	18.8	20.6	22.6
107.5	13.6	14.7	16.0	17.4	19.0	20.8	22.8
108.0	13.7	14.9	16.2	17.6	19.2	21.0	23.1
108.5	13.8	15.0	16.3	17.8	19.4	21.2	23.3
109.0	14.0	15.1	16.5	17.9	19.6	21.4	23.6
109.5	14.1	15.3	16.6	18.1	19.8	21.7	23.8
110.0	14.2	15.4	16.8	18.3	20.0	21.9	24.1

WHO Child Growth Standards

Weight-for-height BOYS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
65.0	5.9	6.3	6.9	7.4	8.1	8.8	9.6
65.5	6.0	6.4	7.0	7.6	8.2	8.9	9.8
66.0	6.1	6.5	7.1	7.7	8.3	9.1	9.9
66.5	6.1	6.6	7.2	7.8	8.5	9.2	10.1
67.0	6.2	6.7	7.3	7.9	8.6	9.4	10.2
67.5	6.3	6.8	7.4	8.0	8.7	9.5	10.4
68.0	6.4	6.9	7.5	8.1	8.8	9.6	10.5
68.5	6.5	7.0	7.6	8.2	9.0	9.8	10.7
69.0	6.6	7.1	7.7	8.4	9.1	9.9	10.8
69.5	6.7	7.2	7.8	8.5	9.2	10.0	11.0
70.0	6.8	7.3	7.9	8.6	9.3	10.2	11.1
70.5	6.9	7.4	8.0	8.7	9.5	10.3	11.3
71.0	6.9	7.5	8.1	8.8	9.6	10.4	11.4
71.5	7.0	7.6	8.2	8.9	9.7	10.6	11.6
72.0	7.1	7.7	8.3	9.0	9.8	10.7	11.7
72.5	7.2	7.8	8.4	9.1	9.9	10.8	11.8
73.0	7.3	7.9	8.5	9.2	10.0	11.0	12.0
73.5	7.4	7.9	8.6	9.3	10.2	11.1	12.1
74.0	7.4	8.0	8.7	9.4	10.3	11.2	12.2
74.5	7.5	8.1	8.8	9.5	10.4	11.3	12.4
75.0	7.6	8.2	8.9	9.6	10.5	11.4	12.5
75.5	7.7	8.3	9.0	9.7	10.6	11.6	12.6
76.0	7.7	8.4	9.1	9.8	10.7	11.7	12.8
76.5	7.8	8.5	9.2	9.9	10.8	11.8	12.9
77.0	7.9	8.5	9.2	10.0	10.9	11.9	13.0
77.5	8.0	8.6	9.3	10.1	11.0	12.0	13.1
78.0	8.0	8.7	9.4	10.2	11.1	12.1	13.3
78.5	8.1	8.8	9.5	10.3	11.2	12.2	13.4
79.0	8.2	8.8	9.6	10.4	11.3	12.3	13.5
79.5	8.3	8.9	9.7	10.5	11.4	12.4	13.6

Weight-for-height BOYS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
80.0	8.3	9.0	9.7	10.6	11.5	12.6	13.7
80.5	8.4	9.1	9.8	10.7	11.6	12.7	13.8
81.0	8.5	9.2	9.9	10.8	11.7	12.8	14.0
81.5	8.6	9.3	10.0	10.9	11.8	12.9	14.1
82.0	8.7	9.3	10.1	11.0	11.9	13.0	14.2
82.5	8.7	9.4	10.2	11.1	12.1	13.1	14.4
83.0	8.8	9.5	10.3	11.2	12.2	13.3	14.5
83.5	8.9	9.6	10.4	11.3	12.3	13.4	14.6
84.0	9.0	9.7	10.5	11.4	12.4	13.5	14.8
84.5	9.1	9.9	10.7	11.5	12.5	13.7	14.9
85.0	9.2	10.0	10.8	11.7	12.7	13.8	15.1
85.5	9.3	10.1	10.9	11.8	12.8	13.9	15.2
86.0	9.4	10.2	11.0	11.9	12.9	14.1	15.4
86.5	9.5	10.3	11.1	12.0	13.1	14.2	15.5
87.0	9.6	10.4	11.2	12.2	13.2	14.4	15.7
87.5	9.7	10.5	11.3	12.3	13.3	14.5	15.8
88.0	9.8	10.6	11.5	12.4	13.5	14.7	16.0
88.5	9.9	10.7	11.6	12.5	13.6	14.8	16.1
89.0	10.0	10.8	11.7	12.6	13.7	14.9	16.3
89.5	10.1	10.9	11.8	12.8	13.9	15.1	16.4
90.0	10.2	11.0	11.9	12.9	14.0	15.2	16.6
90.5	10.3	11.1	12.0	13.0	14.1	15.3	16.7
91.0	10.4	11.2	12.1	13.1	14.2	15.5	16.9
91.5	10.5	11.3	12.2	13.2	14.4	15.6	17.0
92.0	10.6	11.4	12.3	13.4	14.5	15.8	17.2
92.5	10.7	11.5	12.4	13.5	14.6	15.9	17.3
93.0	10.8	11.6	12.6	13.6	14.7	16.0	17.5
93.5	10.9	11.7	12.7	13.7	14.9	16.2	17.6
94.0	11.0	11.8	12.8	13.8	15.0	16.3	17.8
94.5	11.1	11.9	12.9	13.9	15.1	16.5	17.9
95.0	11.1	12.0	13.0	14.1	15.3	16.6	18.1

Weight-for-height BOYS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
95.5	11.2	12.1	13.1	14.2	15.4	16.7	18.3
96.0	11.3	12.2	13.2	14.3	15.5	16.9	18.4
96.5	11.4	12.3	13.3	14.4	15.7	17.0	18.6
97.0	11.5	12.4	13.4	14.6	15.8	17.2	18.8
97.5	11.6	12.5	13.5	14.7	15.9	17.4	18.9
98.0	11.7	12.6	13.7	14.8	16.1	17.5	19.1
98.5	11.8	12.8	13.8	14.9	16.2	17.7	19.3
99.0	11.9	12.9	13.9	15.1	16.4	17.9	19.5
99.5	12.0	13.0	14.0	15.2	16.5	18.0	19.7
100.0	12.1	13.1	14.2	15.4	16.7	18.2	19.9
100.5	12.2	13.2	14.3	15.5	16.9	18.4	20.1
101.0	12.3	13.3	14.4	15.6	17.0	18.5	20.3
101.5	12.4	13.4	14.5	15.8	17.2	18.7	20.5
102.0	12.5	13.6	14.7	15.9	17.3	18.9	20.7
102.5	12.6	13.7	14.8	16.1	17.5	19.1	20.9
103.0	12.8	13.8	14.9	16.2	17.7	19.3	21.1
103.5	12.9	13.9	15.1	16.4	17.8	19.5	21.3
104.0	13.0	14.0	15.2	16.5	18.0	19.7	21.6
104.5	13.1	14.2	15.4	16.7	18.2	19.9	21.8
105.0	13.2	14.3	15.5	16.8	18.4	20.1	22.0
105.5	13.3	14.4	15.6	17.0	18.5	20.3	22.2
106.0	13.4	14.5	15.8	17.2	18.7	20.5	22.5
106.5	13.5	14.7	15.9	17.3	18.9	20.7	22.7
107.0	13.7	14.8	16.1	17.5	19.1	20.9	22.9
107.5	13.8	14.9	16.2	17.7	19.3	21.1	23.2
108.0	13.9	15.1	16.4	17.8	19.5	21.3	23.4
108.5	14.0	15.2	16.5	18.0	19.7	21.5	23.7
109.0	14.1	15.3	16.7	18.2	19.8	21.8	23.9
109.5	14.3	15.5	16.8	18.3	20.0	22.0	24.2
110.0	14.4	15.6	17.0	18.5	20.2	22.2	24.4
110.5	14.5	15.8	17.1	18.7	20.4	22.4	24.7

Weight-for-height BOYS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
111.0	14.6	15.9	17.3	18.9	20.7	22.7	25.0
111.5	14.8	16.0	17.5	19.1	20.9	22.9	25.2
112.0	14.9	16.2	17.6	19.2	21.1	23.1	25.5
112.5	15.0	16.3	17.8	19.4	21.3	23.4	25.8
113.0	15.2	16.5	18.0	19.6	21.5	23.6	26.0
113.5	15.3	16.6	18.1	19.8	21.7	23.9	26.3
114.0	15.4	16.8	18.3	20.0	21.9	24.1	26.6
114.5	15.6	16.9	18.5	20.2	22.1	24.4	26.9
115.0	15.7	17.1	18.6	20.4	22.4	24.6	27.2
115.5	15.8	17.2	18.8	20.6	22.6	24.9	27.5
116.0	16.0	17.4	19.0	20.8	22.8	25.1	27.8
116.5	16.1	17.5	19.2	21.0	23.0	25.4	28.0
117.0	16.2	17.7	19.3	21.2	23.3	25.6	28.3
117.5	16.4	17.9	19.5	21.4	23.5	25.9	28.6
118.0	16.5	18.0	19.7	21.6	23.7	26.1	28.9
118.5	16.7	18.2	19.9	21.8	23.9	26.4	29.2
119.0	16.8	18.3	20.0	22.0	24.1	26.6	29.5
119.5	16.9	18.5	20.2	22.2	24.4	26.9	29.8
120.0	17.1	18.6	20.4	22.4	24.6	27.2	30.1

WHO Child Growth Standards

Weight-for-length GIRLS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
45.0	1.9	2.1	2.3	2.5	2.7	3.0	3.3
45.5	2.0	2.1	2.3	2.6	2.8	3.1	3.4
46.0	2.0	2.2	2.4	2.6	2.9	3.2	3.5
46.5	2.1	2.3	2.5	2.7	3.0	3.3	3.6
47.0	2.2	2.4	2.6	2.8	3.1	3.4	3.7
47.5	2.2	2.4	2.6	2.9	3.2	3.5	3.8
48.0	2.3	2.5	2.7	3.0	3.3	3.6	4.0
48.5	2.4	2.6	2.8	3.1	3.4	3.7	4.1
49.0	2.4	2.6	2.9	3.2	3.5	3.8	4.2
49.5	2.5	2.7	3.0	3.3	3.6	3.9	4.3
50.0	2.6	2.8	3.1	3.4	3.7	4.0	4.5
50.5	2.7	2.9	3.2	3.5	3.8	4.2	4.6
51.0	2.8	3.0	3.3	3.6	3.9	4.3	4.8
51.5	2.8	3.1	3.4	3.7	4.0	4.4	4.9
52.0	2.9	3.2	3.5	3.8	4.2	4.6	5.1
52.5	3.0	3.3	3.6	3.9	4.3	4.7	5.2
53.0	3.1	3.4	3.7	4.0	4.4	4.9	5.4
53.5	3.2	3.5	3.8	4.2	4.6	5.0	5.5
54.0	3.3	3.6	3.9	4.3	4.7	5.2	5.7
54.5	3.4	3.7	4.0	4.4	4.8	5.3	5.9
55.0	3.5	3.8	4.2	4.5	5.0	5.5	6.1
55.5	3.6	3.9	4.3	4.7	5.1	5.7	6.3
56.0	3.7	4.0	4.4	4.8	5.3	5.8	6.4
56.5	3.8	4.1	4.5	5.0	5.4	6.0	6.6
57.0	3.9	4.3	4.6	5.1	5.6	6.1	6.8
57.5	4.0	4.4	4.8	5.2	5.7	6.3	7.0
58.0	4.1	4.5	4.9	5.4	5.9	6.5	7.1
58.5	4.2	4.6	5.0	5.5	6.0	6.6	7.3
59.0	4.3	4.7	5.1	5.6	6.2	6.8	7.5
59.5	4.4	4.8	5.3	5.7	6.3	6.9	7.7

Weight-for-length GIRLS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
60.0	4.5	4.9	5.4	5.9	6.4	7.1	7.8
60.5	4.6	5.0	5.5	6.0	6.6	7.3	8.0
61.0	4.7	5.1	5.6	6.1	6.7	7.4	8.2
61.5	4.8	5.2	5.7	6.3	6.9	7.6	8.4
62.0	4.9	5.3	5.8	6.4	7.0	7.7	8.5
62.5	5.0	5.4	5.9	6.5	7.1	7.8	8.7
63.0	5.1	5.5	6.0	6.6	7.3	8.0	8.8
63.5	5.2	5.6	6.2	6.7	7.4	8.1	9.0
64.0	5.3	5.7	6.3	6.9	7.5	8.3	9.1
64.5	5.4	5.8	6.4	7.0	7.6	8.4	9.3
65.0	5.5	5.9	6.5	7.1	7.8	8.6	9.5
65.5	5.5	6.0	6.6	7.2	7.9	8.7	9.6
66.0	5.6	6.1	6.7	7.3	8.0	8.8	9.8
66.5	5.7	6.2	6.8	7.4	8.1	9.0	9.9
67.0	5.8	6.3	6.9	7.5	8.3	9.1	10.0
67.5	5.9	6.4	7.0	7.6	8.4	9.2	10.2
68.0	6.0	6.5	7.1	7.7	8.5	9.4	10.3
68.5	6.1	6.6	7.2	7.9	8.6	9.5	10.5
69.0	6.1	6.7	7.3	8.0	8.7	9.6	10.6
69.5	6.2	6.8	7.4	8.1	8.8	9.7	10.7
70.0	6.3	6.9	7.5	8.2	9.0	9.9	10.9
70.5	6.4	6.9	7.6	8.3	9.1	10.0	11.0
71.0	6.5	7.0	7.7	8.4	9.2	10.1	11.1
71.5	6.5	7.1	7.7	8.5	9.3	10.2	11.3
72.0	6.6	7.2	7.8	8.6	9.4	10.3	11.4
72.5	6.7	7.3	7.9	8.7	9.5	10.5	11.5
73.0	6.8	7.4	8.0	8.8	9.6	10.6	11.7
73.5	6.9	7.4	8.1	8.9	9.7	10.7	11.8
74.0	6.9	7.5	8.2	9.0	9.8	10.8	11.9
74.5	7.0	7.6	8.3	9.1	9.9	10.9	12.0
75.0	7.1	7.7	8.4	9.1	10.0	11.0	12.2

Weight-for-length GIRLS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
75.5	7.1	7.8	8.5	9.2	10.1	11.1	12.3
76.0	7.2	7.9	8.5	9.3	10.2	11.2	12.4
76.5	7.3	7.9	8.6	9.4	10.3	11.4	12.5
77.0	7.4	8.0	8.7	9.5	10.4	11.5	12.6
77.5	7.4	8.1	8.8	9.6	10.5	11.6	12.8
78.0	7.5	8.2	8.9	9.7	10.6	11.7	12.9
78.5	7.6	8.2	9.0	9.8	10.7	11.8	13.0
79.0	7.7	8.3	9.1	9.9	10.8	11.9	13.1
79.5	7.7	8.4	9.1	10.0	10.9	12.0	13.3
80.0	7.8	8.5	9.2	10.1	11.0	12.1	13.4
80.5	7.9	8.6	9.3	10.2	11.2	12.3	13.5
81.0	8.0	8.7	9.4	10.3	11.3	12.4	13.7
81.5	8.1	8.8	9.5	10.4	11.4	12.5	13.8
82.0	8.1	8.8	9.6	10.5	11.5	12.6	13.9
82.5	8.2	8.9	9.7	10.6	11.6	12.8	14.1
83.0	8.3	9.0	9.8	10.7	11.8	12.9	14.2
83.5	8.4	9.1	9.9	10.9	11.9	13.1	14.4
84.0	8.5	9.2	10.1	11.0	12.0	13.2	14.5
84.5	8.6	9.3	10.2	11.1	12.1	13.3	14.7
85.0	8.7	9.4	10.3	11.2	12.3	13.5	14.9
85.5	8.8	9.5	10.4	11.3	12.4	13.6	15.0
86.0	8.8	9.7	10.5	11.5	12.6	13.8	15.2
86.5	9.0	9.8	10.6	11.6	12.7	13.9	15.4
87.0	9.1	9.9	10.7	11.7	12.8	14.1	15.5
87.5	9.2	10.0	10.9	11.8	13.0	14.2	15.7
88.0	9.3	10.1	11.0	12.0	13.1	14.4	15.9
88.5	9.4	10.2	11.1	12.1	13.2	14.5	16.0
89.0	9.5	10.3	11.2	12.2	13.4	14.7	16.2
89.5	9.6	10.4	11.3	12.3	13.5	14.8	16.4
90.0	9.7	10.5	11.4	12.5	13.7	15.0	16.5
90.5	9.8	10.6	11.5	12.6	13.8	15.1	16.7

Weight-for-length GIRLS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
91.0	9.9	10.7	11.7	12.7	13.9	15.3	16.9
91.5	10.0	10.8	11.8	12.8	14.1	15.5	17.0
92.0	10.1	10.9	11.9	13.0	14.2	15.6	17.2
92.5	10.1	11.0	12.0	13.1	14.3	15.8	17.4
93.0	10.2	11.1	12.1	13.2	14.5	15.9	17.5
93.5	10.3	11.2	12.2	13.3	14.6	16.1	17.7
94.0	10.4	11.3	12.3	13.5	14.7	16.2	17.9
94.5	10.5	11.4	12.4	13.6	14.9	16.4	18.0
95.0	10.6	11.5	12.6	13.7	15.0	16.5	18.2
95.5	10.7	11.6	12.7	13.8	15.2	16.7	18.4
96.0	10.8	11.7	12.8	14.0	15.3	16.9	18.6
96.5	10.9	11.8	12.9	14.1	15.4	17.0	18.7
97.0	11.0	12.0	13.0	14.2	15.6	17.1	18.9
97.5	11.1	12.1	13.1	14.4	15.7	17.3	19.1
98.0	11.2	12.2	13.3	14.5	15.9	17.5	19.3
98.5	11.3	12.3	13.4	14.6	16.0	17.6	19.5
99.0	11.4	12.4	13.5	14.8	16.2	17.8	19.6
99.5	11.5	12.5	13.6	14.9	16.3	18.0	19.8
100.0	11.6	12.6	13.7	15.0	16.5	18.1	20.0
100.5	11.7	12.7	13.9	15.2	16.6	18.3	20.2
101.0	11.8	12.8	14.0	15.3	16.8	18.5	20.4
101.5	11.9	13.0	14.1	15.5	17.0	18.7	20.6
102.0	12.0	13.1	14.3	15.6	17.1	18.9	20.8
102.5	12.1	13.2	14.4	15.8	17.3	19.0	21.0
103.0	12.3	13.3	14.5	15.9	17.5	19.2	21.3
103.5	12.4	13.5	14.7	16.1	17.6	19.4	21.5
104.0	12.5	13.6	14.8	16.2	17.8	19.6	21.7
104.5	12.6	13.7	15.0	16.4	18.0	19.8	21.9
105.0	12.7	13.8	15.1	16.5	18.2	20.0	22.2
105.5	12.8	14.0	15.3	16.7	18.4	20.2	22.4
106.0	13.0	14.1	15.4	16.9	18.5	20.5	22.6

Weight-for-length GIRLS
Birth to 2 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
106.5	13.1	14.3	15.6	17.1	18.7	20.7	22.9
107.0	13.2	14.4	15.7	17.2	18.9	20.9	23.1
107.5	13.3	14.5	15.9	17.4	19.1	21.1	23.4
108.0	13.5	14.7	16.0	17.6	19.3	21.3	23.6
108.5	13.6	14.8	16.2	17.8	19.5	21.6	23.9
109.0	13.7	15.0	16.4	18.0	19.7	21.8	24.2
109.5	13.9	15.1	16.5	18.1	20.0	22.0	24.4
110.0	14.0	15.3	16.7	18.3	20.2	22.3	24.7

WHO Child Growth Standards

Weight-for-height GIRLS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
65.0	5.6	6.1	6.6	7.2	7.9	8.7	9.7
65.5	5.7	6.2	6.7	7.4	8.1	8.9	9.8
66.0	5.8	6.3	6.8	7.5	8.2	9.0	10.0
66.5	5.8	6.4	6.9	7.6	8.3	9.1	10.1
67.0	5.9	6.4	7.0	7.7	8.4	9.3	10.2
67.5	6.0	6.5	7.1	7.8	8.5	9.4	10.4
68.0	6.1	6.6	7.2	7.9	8.7	9.5	10.5
68.5	6.2	6.7	7.3	8.0	8.8	9.7	10.7
69.0	6.3	6.8	7.4	8.1	8.9	9.8	10.8
69.5	6.3	6.9	7.5	8.2	9.0	9.9	10.9
70.0	6.4	7.0	7.6	8.3	9.1	10.0	11.1
70.5	6.5	7.1	7.7	8.4	9.2	10.1	11.2
71.0	6.6	7.1	7.8	8.5	9.3	10.3	11.3
71.5	6.7	7.2	7.9	8.6	9.4	10.4	11.5
72.0	6.7	7.3	8.0	8.7	9.5	10.5	11.6
72.5	6.8	7.4	8.1	8.8	9.7	10.6	11.7
73.0	6.9	7.5	8.1	8.9	9.8	10.7	11.8
73.5	7.0	7.6	8.2	9.0	9.9	10.8	12.0
74.0	7.0	7.6	8.3	9.1	10.0	11.0	12.1
74.5	7.1	7.7	8.4	9.2	10.1	11.1	12.2
75.0	7.2	7.8	8.5	9.3	10.2	11.2	12.3
75.5	7.2	7.9	8.6	9.4	10.3	11.3	12.5
76.0	7.3	8.0	8.7	9.5	10.4	11.4	12.6
76.5	7.4	8.0	8.7	9.6	10.5	11.5	12.7
77.0	7.5	8.1	8.8	9.6	10.6	11.6	12.8
77.5	7.5	8.2	8.9	9.7	10.7	11.7	12.9
78.0	7.6	8.3	9.0	9.8	10.8	11.8	13.1
78.5	7.7	8.4	9.1	9.9	10.9	12.0	13.2
79.0	7.8	8.4	9.2	10.0	11.0	12.1	13.3
79.5	7.8	8.5	9.3	10.1	11.1	12.2	13.4

Weight-for-height GIRLS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
80.0	7.9	8.6	9.4	10.2	11.2	12.3	13.6
80.5	8.0	8.7	9.5	10.3	11.3	12.4	13.7
81.0	8.1	8.8	9.6	10.4	11.4	12.6	13.9
81.5	8.2	8.9	9.7	10.6	11.6	12.7	14.0
82.0	8.3	9.0	9.8	10.7	11.7	12.8	14.1
82.5	8.4	9.1	9.9	10.8	11.8	13.0	14.3
83.0	8.5	9.2	10.0	10.9	11.9	13.1	14.5
83.5	8.5	9.3	10.1	11.0	12.1	13.3	14.6
84.0	8.6	9.4	10.2	11.1	12.2	13.4	14.8
84.5	8.7	9.5	10.3	11.3	12.3	13.5	14.9
85.0	8.8	9.6	10.4	11.4	12.5	13.7	15.1
85.5	8.9	9.7	10.5	11.5	12.6	13.8	15.3
86.0	9.0	9.8	10.7	11.6	12.7	14.0	15.4
86.5	9.1	9.9	10.8	11.8	12.9	14.2	15.6
87.0	9.2	10.0	10.9	11.9	13.0	14.3	15.8
87.5	9.3	10.1	11.0	12.0	13.2	14.5	15.9
88.0	9.4	10.2	11.1	12.1	13.3	14.6	16.1
88.5	9.5	10.3	11.2	12.3	13.4	14.8	16.3
89.0	9.6	10.4	11.4	12.4	13.6	14.9	16.4
89.5	9.7	10.5	11.5	12.5	13.7	15.1	16.6
90.0	9.8	10.6	11.6	12.6	13.8	15.2	16.8
90.5	9.9	10.7	11.7	12.8	14.0	15.4	16.9
91.0	10.0	10.9	11.8	12.9	14.1	15.5	17.1
91.5	10.1	11.0	11.9	13.0	14.3	15.7	17.3
92.0	10.2	11.1	12.0	13.1	14.4	15.8	17.4
92.5	10.3	11.2	12.1	13.3	14.5	16.0	17.6
93.0	10.4	11.3	12.3	13.4	14.7	16.1	17.8
93.5	10.5	11.4	12.4	13.5	14.8	16.3	17.9
94.0	10.6	11.5	12.5	13.6	14.9	16.4	18.1
94.5	10.7	11.6	12.6	13.8	15.1	16.6	18.3
95.0	10.8	11.7	12.7	13.9	15.2	16.7	18.5

Weight-for-height GIRLS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
95.5	10.8	11.8	12.8	14.0	15.4	16.9	18.6
96.0	10.9	11.9	12.9	14.1	15.5	17.0	18.8
96.5	11.0	12.0	13.1	14.3	15.8	17.2	19.0
97.0	11.1	12.1	13.2	14.4	15.8	17.4	19.2
97.5	11.2	12.2	13.3	14.5	15.9	17.5	19.3
98.0	11.3	12.3	13.4	14.7	16.1	17.7	19.5
98.5	11.4	12.4	13.5	14.8	16.2	17.9	19.7
99.0	11.5	12.5	13.7	14.9	16.4	18.0	19.9
99.5	11.6	12.7	13.8	15.1	16.5	18.2	20.1
100.0	11.7	12.8	13.9	15.2	16.7	18.4	20.3
100.5	11.9	12.9	14.1	15.4	16.9	18.6	20.5
101.0	12.0	13.0	14.2	15.5	17.0	18.7	20.7
101.5	12.1	13.1	14.3	15.7	17.2	18.9	20.9
102.0	12.2	13.3	14.5	15.8	17.4	19.1	21.1
102.5	12.3	13.4	14.6	16.0	17.5	19.3	21.4
103.0	12.4	13.5	14.7	16.1	17.7	19.5	21.6
103.5	12.5	13.6	14.9	16.3	17.9	19.7	21.8
104.0	12.6	13.8	15.0	16.4	18.1	19.9	22.0
104.5	12.8	13.9	15.2	16.6	18.2	20.1	22.3
105.0	12.9	14.0	15.3	16.8	18.4	20.3	22.5
105.5	13.0	14.2	15.5	16.9	18.6	20.5	22.7
106.0	13.1	14.3	15.6	17.1	18.8	20.8	23.0
106.5	13.3	14.5	15.8	17.3	19.0	21.0	23.2
107.0	13.4	14.6	15.9	17.5	19.2	21.2	23.5
107.5	13.5	14.7	16.1	17.7	19.4	21.4	23.7
108.0	13.7	14.9	16.3	17.8	19.6	21.7	24.0
108.5	13.8	15.0	16.4	18.0	19.8	21.9	24.3
109.0	13.9	15.2	16.6	18.2	20.0	22.1	24.5
109.5	14.1	15.4	16.8	18.4	20.3	22.4	24.8
110.0	14.2	15.5	17.0	18.6	20.5	22.6	25.1
110.5	14.4	15.7	17.1	18.8	20.7	22.9	25.4

Weight-for-height GIRLS
2 to 5 years (z-scores)

World Health Organization

cm	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
111.0	14.5	15.8	17.3	19.0	20.9	23.1	25.7
111.5	14.7	16.0	17.5	19.2	21.2	23.4	26.0
112.0	14.8	16.2	17.7	19.4	21.4	23.6	26.2
112.5	15.0	16.3	17.9	19.6	21.6	23.9	26.5
113.0	15.1	16.5	18.0	19.8	21.8	24.2	26.8
113.5	15.3	16.7	18.2	20.0	22.1	24.4	27.1
114.0	15.4	16.8	18.4	20.2	22.3	24.7	27.4
114.5	15.6	17.0	18.6	20.5	22.6	25.0	27.8
115.0	15.7	17.2	18.8	20.7	22.8	25.2	28.1
115.5	15.9	17.3	19.0	20.9	23.0	25.5	28.4
116.0	16.0	17.5	19.2	21.1	23.3	25.8	28.7
116.5	16.2	17.7	19.4	21.3	23.5	26.1	29.0
117.0	16.3	17.8	19.6	21.5	23.8	26.3	29.3
117.5	16.5	18.0	19.8	21.7	24.0	26.6	29.6
118.0	16.6	18.2	19.9	22.0	24.2	26.9	29.9
118.5	16.8	18.4	20.1	22.2	24.5	27.2	30.3
119.0	16.9	18.5	20.3	22.4	24.7	27.4	30.6
119.5	17.1	18.7	20.5	22.6	25.0	27.7	30.9
120.0	17.3	18.9	20.7	22.8	25.2	28.0	31.2

WHO Child Growth Standards

Instructions for using the BMI for age chart

Always ensure the child is 5-17 years when using these charts.

Step 1: Measurement

1. Confirm the age and gender of the child.
2. Take the child's height in "cm" and weight in "kg" and record.
3. Convert the child's height to 'meters'.
4. Calculate the child's BMI thus: weight (kg) / height (meters) ^{2}

Step 2: Reading the BMI for age

1. Confirm the chart is correct for the gender of the child.
2. On the BMI for age chart, check the column marked "Year. Month" and identify the age of the child.
3. Along this row, choose the cell that is that is equal to or less than the actual BMI you have calculated.
4. This corresponds to the child's BMI for age score.

Step 3: Classification

Classify and report the child's BMI for age corresponding to the identified BMI from the SD rows at the top of the chart.

Step 4: Intervention

All children with a BMI for age of -2SD and below have moderate to severe malnutrition and are eligible for Food by Prescription.

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
5: 1	61	11.8	12.7	13.9	15.2	16.9	18.9	21.3
5: 2	62	11.8	12.7	13.9	15.2	16.9	18.9	21.4
5: 3	63	11.8	12.7	13.9	15.2	16.9	18.9	21.5
5: 4	64	11.8	12.7	13.9	15.2	16.9	18.9	21.5
5: 5	65	11.7	12.7	13.9	15.2	16.9	19.0	21.6
5: 6	66	11.7	12.7	13.9	15.2	16.9	19.0	21.7
5: 7	67	11.7	12.7	13.9	15.2	16.9	19.0	21.7
5: 8	68	11.7	12.7	13.9	15.3	17.0	19.1	21.8
5: 9	69	11.7	12.7	13.9	15.3	17.0	19.1	21.9
5: 10	70	11.7	12.7	13.9	15.3	17.0	19.1	22.0
5: 11	71	11.7	12.7	13.9	15.3	17.0	19.2	22.1
6: 0	72	11.7	12.7	13.9	15.3	17.0	19.2	22.1
6: 1	73	11.7	12.7	13.9	15.3	17.0	19.3	22.2
6: 2	74	11.7	12.7	13.9	15.3	17.0	19.3	22.3
6: 3	75	11.7	12.7	13.9	15.3	17.1	19.3	22.4
6: 4	76	11.7	12.7	13.9	15.3	17.1	19.4	22.5
6: 5	77	11.7	12.7	13.9	15.3	17.1	19.4	22.6
6: 6	78	11.7	12.7	13.9	15.3	17.1	19.5	22.7
6: 7	79	11.7	12.7	13.9	15.3	17.2	19.5	22.8
6: 8	80	11.7	12.7	13.9	15.3	17.2	19.6	22.9
6: 9	81	11.7	12.7	13.9	15.4	17.2	19.6	23.0
6: 10	82	11.7	12.7	13.9	15.4	17.2	19.7	23.1
6: 11	83	11.7	12.7	13.9	15.4	17.3	19.7	23.2
7: 0	84	11.8	12.7	13.9	15.4	17.3	19.8	23.3
7: 1	85	11.8	12.7	13.9	15.4	17.3	19.8	23.4
7: 2	86	11.8	12.8	14.0	15.4	17.4	19.9	23.5
7: 3	87	11.8	12.8	14.0	15.5	17.4	20.0	23.6
7: 4	88	11.8	12.8	14.0	15.5	17.4	20.0	23.7
7: 5	89	11.8	12.8	14.0	15.5	17.5	20.1	23.9
7: 6	90	11.8	12.8	14.0	15.5	17.5	20.1	24.0

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
7: 7	91	11.8	12.8	14.0	15.5	17.5	20.2	24.1
7: 8	92	11.8	12.8	14.0	15.6	17.6	20.3	24.2
7: 9	93	11.8	12.8	14.1	15.6	17.6	20.3	24.4
7: 10	94	11.9	12.9	14.1	15.6	17.6	20.4	24.5
7: 11	95	11.9	12.9	14.1	15.7	17.7	20.5	24.6
8: 0	96	11.9	12.9	14.1	15.7	17.7	20.6	24.8
8: 1	97	11.9	12.9	14.1	15.7	17.8	20.6	24.9
8: 2	98	11.9	13.0	14.2	15.7	17.8	20.7	25.1
8: 3	99	11.9	12.9	14.2	15.8	17.9	20.8	25.2
8: 4	100	11.9	13.0	14.2	15.8	17.9	20.9	25.3
8: 5	101	12.0	13.0	14.2	15.8	18.0	20.9	25.5
8: 6	102	12.0	13.0	14.3	15.9	18.0	21.0	25.6
8: 7	103	12.0	13.0	14.3	15.9	18.1	21.1	25.8
8: 8	104	12.0	13.0	14.3	15.9	18.1	21.2	25.9
8: 9	105	12.0	13.1	14.3	16.0	18.2	21.3	26.1
8: 10	106	12.1	13.1	14.4	16.0	18.2	21.3	26.2
8: 11	107	12.1	13.1	14.4	16.1	18.3	21.4	26.4
9: 0	108	12.1	13.1	14.4	16.1	18.3	21.5	26.5
9: 1	109	12.1	13.2	14.5	16.1	18.4	21.6	26.7
9: 2	110	12.1	13.2	14.5	16.2	18.4	21.7	26.8
9: 3	111	12.2	13.2	14.5	16.2	18.5	21.8	27.0
9: 4	112	12.2	13.2	14.6	16.3	18.6	21.9	27.2
9: 5	113	12.2	13.3	14.6	16.3	18.6	21.9	27.3
9: 6	114	12.2	13.3	14.6	16.3	18.7	22.0	27.5
9: 7	115	12.3	13.3	14.7	16.4	18.7	22.1	27.6
9: 8	116	12.3	13.4	14.7	16.4	18.8	22.2	27.8
9: 9	117	12.3	13.4	14.7	16.5	18.8	22.3	27.9
9: 10	118	12.3	13.4	14.8	16.5	18.9	22.4	28.1
9: 11	119	12.4	13.4	14.8	16.6	19.0	22.5	28.2
10: 0	120	12.4	13.5	14.8	16.6	19.0	22.6	28.4

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
10: 1	121	12.4	13.5	14.9	16.7	19.1	22.7	28.5
10: 2	122	12.4	13.5	14.9	16.7	19.2	22.8	28.7
10: 3	123	12.5	13.6	15.0	16.8	19.2	22.8	28.8
10: 4	124	12.5	13.6	15.0	16.8	19.3	22.9	29.0
10: 5	125	12.5	13.6	15.0	16.9	19.4	23.0	29.1
10: 6	126	12.5	13.7	15.1	16.9	19.4	23.1	29.3
10: 7	127	12.6	13.7	15.1	17.0	19.5	23.2	29.4
10: 8	128	12.6	13.7	15.2	17.0	19.6	23.3	29.6
10: 9	129	12.6	13.8	15.2	17.1	19.6	23.4	29.7
10: 10	130	12.7	13.8	15.3	17.1	19.7	23.5	29.9
10: 11	131	12.7	13.8	15.3	17.2	19.8	23.6	30.0
11: 0	132	12.7	13.9	15.3	17.2	19.9	23.7	30.2
11: 1	133	12.8	13.9	15.4	17.3	19.9	23.8	30.3
11: 2	134	12.8	14.0	15.4	17.4	20.0	23.9	30.5
11: 3	135	12.8	14.0	15.5	17.4	20.1	24.0	30.6
11: 4	136	12.9	14.0	15.5	17.5	20.2	24.1	30.8
11: 5	137	12.9	14.1	15.6	17.5	20.2	24.2	30.9
11: 6	138	12.9	14.1	15.6	17.6	20.3	24.3	31.1
11: 7	139	13.0	14.2	15.7	17.7	20.4	24.4	31.2
11: 8	140	13.0	14.2	15.7	17.7	20.5	24.5	31.4
11: 9	141	13.0	14.3	15.8	17.8	20.6	24.7	31.5
11: 10	142	13.1	14.3	15.8	17.9	20.6	24.8	31.6
11: 11	143	13.1	14.3	15.9	17.9	20.7	24.9	31.8
12: 0	144	13.2	14.4	16.0	18.0	20.8	25.0	31.9
12: 1	145	13.2	14.4	16.0	18.1	20.9	25.1	32.0
12: 2	146	13.2	14.5	16.1	18.1	21.0	25.2	32.2
12: 3	147	13.3	14.5	16.1	18.2	21.1	25.3	32.3
12: 4	148	13.3	14.6	16.2	18.3	21.1	25.4	32.4
12: 5	149	13.3	14.6	16.2	18.3	21.2	25.5	32.6
12: 6	150	13.4	14.7	16.3	18.4	21.3	25.6	32.7

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
12: 7	151	13.4	14.7	16.3	18.5	21.4	25.7	32.8
12: 8	152	13.5	14.8	16.4	18.5	21.5	25.8	33.0
12: 9	153	13.5	14.8	16.4	18.6	21.6	25.9	33.1
12: 10	154	13.5	14.8	16.5	18.7	21.6	26.0	33.2
12: 11	155	13.6	14.9	16.6	18.7	21.7	26.1	33.3
13: 0	156	13.6	14.9	16.6	18.8	21.8	26.2	33.4
13: 1	157	13.6	15.0	16.7	18.9	21.9	26.3	33.6
13: 2	158	13.7	15.0	16.7	18.9	22.0	26.4	33.7
13: 3	159	13.7	15.1	16.8	19.0	22.0	26.5	33.8
13: 4	160	13.8	15.1	16.8	19.1	22.1	26.6	33.9
13: 5	161	13.8	15.2	16.9	19.1	22.2	26.7	34.0
13: 6	162	13.8	15.2	16.9	19.2	22.3	26.8	34.1
13: 7	163	13.9	15.2	17.0	19.3	22.4	26.9	34.2
13: 8	164	13.9	15.3	17.0	19.3	22.4	27.0	34.3
13: 9	165	13.9	15.3	17.1	19.4	22.5	27.1	34.4
13: 10	166	14.0	15.4	17.1	19.4	22.6	27.1	34.5
13: 11	167	14.0	15.4	17.2	19.5	22.7	27.2	34.6
14: 0	168	14.0	15.4	17.2	19.6	22.7	27.3	34.7
14: 1	169	14.1	15.5	17.3	19.6	22.8	27.4	34.7
14: 2	170	14.1	15.5	17.3	19.7	22.9	27.5	34.8
14: 3	171	14.1	15.6	17.4	19.7	22.9	27.6	34.9
14: 4	172	14.1	15.6	17.4	19.8	23.0	27.7	35.0
14: 5	173	14.2	15.6	17.5	19.9	23.1	27.7	35.1
14: 6	174	14.2	15.7	17.5	19.9	23.1	27.8	35.1
14: 7	175	14.2	15.7	17.6	20.0	23.2	27.9	35.2
14: 8	176	14.3	15.7	17.6	20.0	23.3	28.0	35.3
14: 9	177	14.3	15.8	17.6	20.1	23.3	28.0	35.4
14: 10	178	14.3	15.8	17.7	20.1	23.4	28.1	35.4
14: 11	179	14.3	15.8	17.7	20.2	23.5	28.2	35.5
15: 0	180	14.4	15.9	17.8	20.2	23.5	28.2	35.5

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	3 SD	2 SD	1 SD	Median	1 SD	2 SD	3 SD
15: 1	181	14.4	15.9	17.8	20.3	23.6	28.3	35.6
15: 2	182	14.4	15.9	17.8	20.3	23.6	28.4	35.7
15: 3	183	14.4	16.0	17.9	20.4	23.7	28.4	35.7
15: 4	184	14.5	16.0	17.9	20.4	23.7	28.5	35.8
15: 5	185	14.5	16.0	17.9	20.4	23.8	28.5	35.8
15: 6	186	14.5	16.0	18.0	20.5	23.8	28.6	35.8
15: 7	187	14.5	16.1	18.0	20.5	23.9	28.6	35.9
15: 8	188	14.5	16.1	18.0	20.6	23.9	28.7	35.9
15: 9	189	14.5	16.1	18.1	20.6	24.0	28.7	36.0
15: 10	190	14.6	16.1	18.1	20.6	24.0	28.8	36.0
15: 11	191	14.6	16.2	18.1	20.7	24.1	28.8	36.0
16: 0	192	14.6	16.2	18.2	20.7	24.1	28.9	36.1
16: 1	193	14.6	16.2	18.2	20.7	24.1	28.9	36.1
16: 2	194	14.6	16.2	18.2	20.8	24.2	29.0	36.1
16: 3	195	14.6	16.2	18.2	20.8	24.2	29.0	36.1
16: 4	196	14.6	16.2	18.3	20.8	24.3	29.0	36.2
16: 5	197	14.6	16.3	18.3	20.9	24.3	29.1	36.2
16: 6	198	14.7	16.3	18.3	20.9	24.3	29.1	36.2
16: 7	199	14.7	16.3	18.3	20.9	24.4	29.1	36.2
16: 8	200	14.7	16.3	18.3	20.9	24.4	29.2	36.2
16: 9	201	14.7	16.3	18.4	21.0	24.4	29.2	36.3
16: 10	202	14.7	16.3	18.4	21.0	24.4	29.2	36.3
16: 11	203	14.7	16.3	18.4	21.0	24.5	29.3	36.3
17: 0	204	14.7	16.4	18.4	21.0	24.5	29.3	36.3
17: 1	205	14.7	16.4	18.4	21.1	24.5	29.3	36.3
17: 2	206	14.7	16.4	18.4	21.1	24.6	29.3	36.3
17: 3	207	14.7	16.4	18.5	21.1	24.6	29.4	36.3
17: 4	208	14.7	16.4	18.5	21.1	24.6	29.4	36.3
17: 5	209	14.7	16.4	18.5	21.1	24.6	29.4	36.3
17: 6	210	14.7	16.4	18.5	21.2	24.6	29.4	36.3

BMI-for-age GIRLS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	3 SD	2 SD	1 SD	Median	1 SD	2 SD	3 SD
17: 7	211	14.7	16.4	18.5	21.2	24.7	29.4	36.3
17: 8	212	14.7	16.4	18.5	21.2	24.7	29.5	36.3
17: 9	213	14.7	16.4	18.5	21.2	24.7	29.5	36.3
17: 10	214	14.7	16.4	18.5	21.2	24.7	29.5	36.3
17: 11	215	14.7	16.4	18.6	21.2	24.8	29.5	36.3
18: 0	216	14.7	16.4	18.6	21.3	24.8	29.5	36.3
18: 1	217	14.7	16.5	18.6	21.3	24.8	29.5	36.3
18: 2	218	14.7	16.5	18.6	21.3	24.8	29.6	36.3
18: 3	219	14.7	16.5	18.6	21.3	24.8	29.6	36.3
18: 4	220	14.7	16.5	18.6	21.3	24.8	29.6	36.3
18: 5	221	14.7	16.5	18.6	21.3	24.9	29.6	36.2
18: 6	222	14.7	16.5	18.6	21.3	24.9	29.6	36.2
18: 7	223	14.7	16.5	18.6	21.4	24.9	29.6	36.2
18: 8	224	14.7	16.5	18.6	21.4	24.9	29.6	36.2
18: 9	225	14.7	16.5	18.7	21.4	24.9	29.6	36.2
18: 10	226	14.7	16.5	18.7	21.4	24.9	29.6	36.2
18: 11	227	14.7	16.5	18.7	21.4	25.0	29.7	36.2
19: 0	228	14.7	16.5	18.7	21.4	25.0	29.7	36.2

2007 WHO Reference

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
5: 1	61	12.1	13.0	14.1	15.3	16.6	18.3	20.2
5: 2	62	12.1	13.0	14.1	15.3	16.6	18.3	20.2
5: 3	63	12.1	13.0	14.1	15.3	16.7	18.3	20.2
5: 4	64	12.1	13.0	14.1	15.3	16.7	18.3	20.3
5: 5	65	12.1	13.0	14.1	15.3	16.7	18.3	20.3
5: 6	66	12.1	13.0	14.1	15.3	16.7	18.4	20.4
5: 7	67	12.1	13.0	14.1	15.3	16.7	18.4	20.4
5: 8	68	12.1	13.0	14.1	15.3	16.7	18.4	20.5
5: 9	69	12.1	13.0	14.1	15.3	16.7	18.4	20.5
5: 10	70	12.1	13.0	14.1	15.3	16.7	18.5	20.6
5: 11	71	12.1	13.0	14.1	15.3	16.7	18.5	20.6
6: 0	72	12.1	13.0	14.1	15.3	16.8	18.5	20.7
6: 1	73	12.1	13.0	14.1	15.3	16.8	18.6	20.8
6: 2	74	12.2	13.1	14.1	15.3	16.8	18.6	20.8
6: 3	75	12.2	13.1	14.1	15.3	16.8	18.6	20.9
6: 4	76	12.2	13.1	14.1	15.4	16.8	18.7	21.0
6: 5	77	12.2	13.1	14.1	15.4	16.9	18.7	21.0
6: 6	78	12.2	13.1	14.1	15.4	16.9	18.7	21.1
6: 7	79	12.2	13.1	14.1	15.4	16.9	18.8	21.2
6: 8	80	12.2	13.1	14.2	15.4	16.9	18.8	21.3
6: 9	81	12.2	13.1	14.2	15.4	17.0	18.9	21.3
6: 10	82	12.2	13.1	14.2	15.4	17.0	18.9	21.4
6: 11	83	12.2	13.1	14.2	15.5	17.0	19.0	21.5
7: 0	84	12.3	13.1	14.2	15.5	17.0	19.0	21.6
7: 1	85	12.3	13.2	14.2	15.5	17.1	19.1	21.7
7: 2	86	12.3	13.2	14.2	15.5	17.1	19.1	21.8
7: 3	87	12.3	13.2	14.3	15.5	17.1	19.2	21.9
7: 4	88	12.3	13.2	14.3	15.6	17.2	19.2	22.0
7: 5	89	12.3	13.2	14.3	15.6	17.2	19.3	22.0
7: 6	90	12.3	13.2	14.3	15.6	17.2	19.3	22.1

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
7: 7	91	12.3	13.2	14.3	15.6	17.3	19.4	22.2
7: 8	92	12.3	13.2	14.3	15.6	17.3	19.4	22.4
7: 9	93	12.4	13.3	14.3	15.7	17.3	19.5	22.5
7: 10	94	12.4	13.3	14.4	15.7	17.4	19.6	22.6
7: 11	95	12.4	13.3	14.4	15.7	17.4	19.6	22.7
8: 0	96	12.4	13.3	14.4	15.7	17.4	19.7	22.8
8: 1	97	12.4	13.3	14.4	15.8	17.5	19.7	22.9
8: 2	98	12.4	13.3	14.4	15.8	17.5	19.8	23.0
8: 3	99	12.4	13.3	14.4	15.8	17.5	19.9	23.1
8: 4	100	12.4	13.4	14.5	15.8	17.6	19.9	23.3
8: 5	101	12.5	13.4	14.5	15.9	17.6	20.0	23.4
8: 6	102	12.5	13.4	14.5	15.9	17.7	20.1	23.5
8: 7	103	12.5	13.4	14.5	15.9	17.7	20.1	23.6
8: 8	104	12.5	13.4	14.5	15.9	17.7	20.2	23.8
8: 9	105	12.5	13.4	14.6	16.0	17.8	20.3	23.9
8: 10	106	12.5	13.5	14.6	16.0	17.8	20.3	24.0
8: 11	107	12.5	13.5	14.6	16.0	17.9	20.4	24.2
9: 0	108	12.6	13.5	14.6	16.0	17.9	20.5	24.3
9: 1	109	12.6	13.5	14.6	16.1	18.0	20.5	24.4
9: 2	110	12.6	13.5	14.7	16.1	18.0	20.6	24.6
9: 3	111	12.6	13.5	14.7	16.1	18.0	20.7	24.7
9: 4	112	12.6	13.6	14.7	16.2	18.1	20.8	24.9
9: 5	113	12.6	13.6	14.7	16.2	18.1	20.8	25.0
9: 6	114	12.7	13.6	14.8	16.2	18.2	20.9	25.1
9: 7	115	12.7	13.6	14.8	16.3	18.2	21.0	25.3
9: 8	116	12.7	13.6	14.8	16.3	18.3	21.1	25.5
9: 9	117	12.7	13.7	14.8	16.3	18.3	21.2	25.6
9: 10	118	12.7	13.7	14.9	16.4	18.4	21.2	25.8
9: 11	119	12.8	13.7	14.9	16.4	18.4	21.3	25.9
10: 0	120	12.8	13.7	14.9	16.4	18.5	21.4	26.1

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
10: 1	121	12.8	13.8	15.0	16.5	18.5	21.5	26.2
10: 2	122	12.8	13.8	15.0	16.5	18.6	21.6	26.4
10: 3	123	12.8	13.8	15.0	16.6	18.6	21.7	26.6
10: 4	124	12.9	13.8	15.0	16.6	18.7	21.7	26.7
10: 5	125	12.9	13.9	15.1	16.6	18.8	21.8	26.9
10: 6	126	12.9	13.9	15.1	16.7	18.8	21.9	27.0
10: 7	127	12.9	13.9	15.1	16.7	18.9	22.0	27.2
10: 8	128	13.0	13.9	15.2	16.8	18.9	22.1	27.4
10: 9	129	13.0	14.0	15.2	16.8	19.0	22.2	27.5
10: 10	130	13.0	14.0	15.2	16.9	19.0	22.3	27.7
10: 11	131	13.0	14.0	15.3	16.9	19.1	22.4	27.9
11: 0	132	13.1	14.1	15.3	16.9	19.2	22.5	28.0
11: 1	133	13.1	14.1	15.3	17.0	19.2	22.5	28.2
11: 2	134	13.1	14.1	15.4	17.0	19.3	22.6	28.4
11: 3	135	13.1	14.1	15.4	17.1	19.3	22.7	28.5
11: 4	136	13.2	14.2	15.5	17.1	19.4	22.8	28.7
11: 5	137	13.2	14.2	15.5	17.2	19.5	22.9	28.8
11: 6	138	13.2	14.2	15.5	17.2	19.5	23.0	29.0
11: 7	139	13.2	14.3	15.6	17.3	19.6	23.1	29.2
11: 8	140	13.3	14.3	15.6	17.3	19.7	23.2	29.3
11: 9	141	13.3	14.3	15.7	17.4	19.7	23.3	29.5
11: 10	142	13.3	14.4	15.7	17.4	19.8	23.4	29.6
11: 11	143	13.4	14.4	15.7	17.5	19.9	23.5	29.8
12: 0	144	13.4	14.5	15.8	17.5	19.9	23.6	30.0
12: 1	145	13.4	14.5	15.8	17.6	20.0	23.7	30.1
12: 2	146	13.5	14.5	15.9	17.6	20.1	23.8	30.3
12: 3	147	13.5	14.6	15.9	17.7	20.2	23.9	30.4
12: 4	148	13.5	14.6	16.0	17.8	20.2	24.0	30.6
12: 5	149	13.6	14.6	16.0	17.8	20.3	24.1	30.7
12: 6	150	13.6	14.7	16.1	17.9	20.4	24.2	30.9

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
12: 7	151	13.6	14.7	16.1	17.9	20.4	24.3	31.0
12: 8	152	13.7	14.8	16.2	18.0	20.5	24.4	31.1
12: 9	153	13.7	14.8	16.2	18.0	20.6	24.5	31.3
12: 10	154	13.7	14.8	16.3	18.1	20.7	24.6	31.4
12: 11	155	13.8	14.9	16.3	18.2	20.8	24.7	31.5
13: 0	156	13.8	14.9	16.4	18.2	20.8	24.8	31.7
13: 1	157	13.8	15.0	16.4	18.3	20.9	24.9	31.8
13: 2	158	13.9	15.0	16.5	18.4	21.0	25.0	31.9
13: 3	159	13.9	15.1	16.5	18.4	21.1	25.1	32.1
13: 4	160	14.0	15.1	16.6	18.5	21.1	25.2	32.2
13: 5	161	14.0	15.2	16.6	18.6	21.2	25.2	32.3
13: 6	162	14.0	15.2	16.7	18.6	21.3	25.3	32.4
13: 7	163	14.1	15.2	16.7	18.7	21.4	25.4	32.6
13: 8	164	14.1	15.3	16.8	18.7	21.5	25.5	32.7
13: 9	165	14.1	15.3	16.8	18.8	21.5	25.6	32.8
13: 10	166	14.2	15.4	16.9	18.9	21.6	25.7	32.9
13: 11	167	14.2	15.4	17.0	18.9	21.7	25.8	33.0
14: 0	168	14.3	15.5	17.0	19.0	21.8	25.9	33.1
14: 1	169	14.3	15.5	17.1	19.1	21.8	26.0	33.2
14: 2	170	14.3	15.6	17.1	19.1	21.9	26.1	33.3
14: 3	171	14.4	15.6	17.2	19.2	22.0	26.2	33.4
14: 4	172	14.4	15.7	17.2	19.3	22.1	26.3	33.5
14: 5	173	14.5	15.7	17.3	19.3	22.2	26.4	33.5
14: 6	174	14.5	15.7	17.3	19.4	22.2	26.5	33.6
14: 7	175	14.5	15.8	17.4	19.5	22.3	26.5	33.7
14: 8	176	14.6	15.8	17.4	19.5	22.4	26.6	33.8
14: 9	177	14.6	15.9	17.5	19.6	22.5	26.7	33.9
14: 10	178	14.6	15.9	17.5	19.6	22.5	26.8	33.9
14: 11	179	14.7	16.0	17.6	19.7	22.6	26.9	34.0
15: 0	180	14.7	16.0	17.6	19.8	22.7	27.0	34.1

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
15: 1	181	14.7	16.1	17.7	19.8	22.8	27.1	34.1
15: 2	182	14.8	16.1	17.8	19.9	22.8	27.1	34.2
15: 3	183	14.8	16.1	17.8	20.0	22.9	27.2	34.3
15: 4	184	14.8	16.2	17.9	20.0	23.0	27.3	34.3
15: 5	185	14.9	16.2	17.9	20.1	23.0	27.4	34.4
15: 6	186	14.9	16.3	18.0	20.1	23.1	27.4	34.5
15: 7	187	15.0	16.3	18.0	20.2	23.2	27.5	34.5
15: 8	188	15.0	16.3	18.1	20.3	23.3	27.6	34.6
15: 9	189	15.0	16.4	18.1	20.3	23.3	27.7	34.6
15: 10	190	15.0	16.4	18.2	20.4	23.4	27.7	34.7
15: 11	191	15.1	16.5	18.2	20.4	23.5	27.8	34.7
16: 0	192	15.1	16.5	18.2	20.5	23.5	27.9	34.8
16: 1	193	15.1	16.5	18.3	20.5	23.6	27.9	34.8
16: 2	194	15.2	16.6	18.3	20.6	23.7	28.0	34.8
16: 3	195	15.2	16.6	18.4	20.7	23.7	28.1	34.9
16: 4	196	15.2	16.7	18.4	20.7	23.8	28.1	34.9
16: 5	197	15.3	16.7	18.5	20.8	23.8	28.2	35.0
16: 6	198	15.3	16.7	18.5	20.8	23.9	28.3	35.0
16: 7	199	15.3	16.8	18.6	20.9	24.0	28.3	35.0
16: 8	200	15.3	16.8	18.6	20.9	24.0	28.4	35.1
16: 9	201	15.4	16.8	18.7	21.0	24.1	28.5	35.1
16: 10	202	15.4	16.9	18.7	21.0	24.2	28.5	35.1
16: 11	203	15.4	16.9	18.7	21.1	24.2	28.6	35.2
17: 0	204	15.4	16.9	18.8	21.1	24.3	28.6	35.2
17: 1	205	15.5	17.0	18.8	21.2	24.3	28.7	35.2
17: 2	206	15.5	17.0	18.9	21.2	24.4	28.7	35.2
17: 3	207	15.5	17.0	18.9	21.3	24.4	28.8	35.3
17: 4	208	15.5	17.1	18.9	21.3	24.5	28.9	35.3
17: 5	209	15.6	17.1	19.0	21.4	24.5	28.9	35.3
17: 6	210	15.6	17.1	19.0	21.4	24.6	29.0	35.3

BMI-for-age BOYS
5 to 19 years (z-scores)

World Health Organization

Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
17: 7	211	15.6	17.1	19.1	21.5	24.7	29.0	35.4
17: 8	212	15.6	17.2	19.1	21.5	24.7	29.1	35.4
17: 9	213	15.6	17.2	19.1	21.6	24.8	29.1	35.4
17: 10	214	15.7	17.2	19.2	21.6	24.8	29.2	35.4
17: 11	215	15.7	17.3	19.2	21.7	24.9	29.2	35.4
18: 0	216	15.7	17.3	19.2	21.7	24.9	29.2	35.4
18: 1	217	15.7	17.3	19.3	21.8	25.0	29.3	35.4
18: 2	218	15.7	17.3	19.3	21.8	25.0	29.3	35.5
18: 3	219	15.7	17.4	19.3	21.8	25.1	29.4	35.5
18: 4	220	15.8	17.4	19.4	21.9	25.1	29.4	35.5
18: 5	221	15.8	17.4	19.4	21.9	25.1	29.5	35.5
18: 6	222	15.8	17.4	19.4	22.0	25.2	29.5	35.5
18: 7	223	15.8	17.5	19.5	22.0	25.2	29.5	35.5
18: 8	224	15.8	17.5	19.5	22.0	25.3	29.6	35.5
18: 9	225	15.8	17.5	19.5	22.1	25.3	29.6	35.5
18: 10	226	15.8	17.5	19.6	22.1	25.4	29.6	35.5
18: 11	227	15.8	17.5	19.6	22.2	25.4	29.7	35.5
19: 0	228	15.9	17.6	19.6	22.2	25.4	29.7	35.5

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