

Taking Measurements

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Accurate anthropometric measurement is a skill requiring specific training. A number of tools are available and additional references and sources are provided in Appendix 6. Training requires step-by-step procedures to follow when taking measurements. Standardizing methods helps ensure that the measurements will be correct and makes comparisons possible. Comparisons may be

done between data collected from different areas of a country, between different surveys or between measurements and the reference standards. None of these comparisons will be possible without a standard method for taking measurements. This section will cover the necessary field equipment and methods for taking measurements.

5.1. Interviewer Field Materials

The checklist below includes the equipment and materials interviewers should have with them in the field. All of these items may not be necessary for every survey.

- Equipment bag
- List of assigned households and their addresses (or location)
- Map of the area
- Log book
- Pre-numbered questionnaires for assigned households
- Spare questionnaires
- Waterproof envelopes for blank and completed questionnaires
- Weighing scale
- Scale hooks
- Weighing pants or hanging swing
- Storage bag for pants
- Piece of rope for scales
- Storage box for scales
- Height/length measuring board
- Sliding head/foot pieces
- Clipboard
- Stapler and box of staples
- Pencils and pencil sharpener
- Eraser
- Pens
- Spare paper

5.2. Procedures Before Measuring

There are a few preparatory procedures and decisions that should be addressed prior to obtaining measurements. Guidelines to make the field experience easier are:

Initial preparation. Ensure that the mother or caretaker understands what is happening to the child. The measurement of weight and length can be traumatic. Participants need to be comfortable with the process. The equipment should be cool, clean and safely secured. Work out of direct sunlight since it can interfere with reading scales and other equipment and it is more comfortable for the measurer and child.

Ethically handling anthropometric data in surveys. Taking measurements on individuals can be intrusive and time consuming. It is the responsibility of the survey team to minimize the discomfort and inconvenience of the survey and anthropometric measurement. There are principles that need to be applied in conducting surveys and it is the responsibility of the organizers to ensure that the survey is conducted in accordance with national or international standards for the ethical treatment of participants in research and surveys. These procedures are especially relevant when dealing with biological tests such as the drawing of blood and clinical assessment.

Since simple anthropometric measurements have minimal intrusion on the time and privacy of individual respondents and the benefits of the survey are shared by the community with better program design and implementation, the requirements are manageable. It is necessary to explain in a non-threatening and culturally relevant manner the purpose and contents of the survey while providing the listener an opportunity to ask questions and decline participation if necessary.

Informed consent from caregivers for the survey is necessary. Secure consent prior to administering a survey questionnaire or undertaking any measurement. Consent is sought from each participant (or caregiver) from the sample frame. In general, literate participants are asked to read and sign a consent form, while the form is read out to illiterate participants, who then give verbal

consent. Consent for any research study must be secured at a national and community level through the appropriate ethical board or other authority. The requirement for approval for population surveys and anthropometric measurements as part of program activities is often not clear but it is necessary to check. In the case of an externally funded survey, the funding country may also expect to review and clear the protocol for the proposed work.

When anthropometric measurements will be linked to any biological test results, it is essential that approval be sought and the respondent or caregiver be explained as to how the information will be used and by whom. Confidentiality of the information collected must be assured and maintained.

On-the-spot diagnosis presents special challenges. The survey organizers must decide about responsibilities for treatment or referral for those reporting or found to be suffering from illness or malnutrition. Research studies obtaining health and nutrition information usually require participants to be advised of the test results and treatment provided where necessary. This has not, however, been the case in population-based surveys. In anthropometric surveys, it is often difficult for enumerators to inform caregivers of the nutritional status of the child. This is due to the calculations needed to convert measurements into indices at the time of measurement due to computation requirements at the time of measurement.

Sharing results and referral in situations where a diagnosis is made or measurements can be interpreted with on-site generation or where there is overt signs of severe malnutrition and/or illness, enumerators should refer the person to the nearest health facility or professional for treatment.

Two trained people required. When possible, two trained people should measure a child's height and length. The measurer holds the child and takes the measurements. The assistant helps hold the child and records the measurements on the questionnaire. If only one trained person is available to take the measurements, then the child's mother

can help. The measurer would also record the measurements on the questionnaire.

Measuring board and scale placement.

There will usually be several choices on where to place the measuring board or scale, but the choice should be made carefully. Be sure that you have a sturdy, flat surface for measuring boards, a strong place to hang scales from and adequate light so the measurements can be read with precision.

When to weigh and measure. Weighing and measuring should not be the first thing you do when you start an interview. It is better to begin with questions that need to be answered. This helps make the mother and child feel more comfortable before the measurements begin.

Weigh and measure one child at a time.

You should complete the questions and measurements for one child at a time. This avoids potential problems with mix-ups that might occur if you have several children to measure.

Control the child. When you are taking weight and length/height measurements, the child needs to be as calm as possible. A child who is excited or scared can make it difficult to get an accurate measurement.

Recording measurements. All measurements should be recorded in pencil. If a mistake is made when recording a measurement, it can be corrected.

5.3. How to Measure Age, Height, Length, Weight and MUAC

The following suggestions are adapted from *How to Weigh and Measure Children: Assessing the Nutritional Status of Young Children in Household Surveys*, United Nations Department of Technical Cooperation for Development and Statistical Office, 1986.

5.3.1. Age

The child's accurate age is required for sampling, deciding on whether the child is measured standing or reclining for height or length, and for converting height and weight into the standard indices. At the time of measurement, an age estimate is needed for decisions on sampling and for the position on the measuring board. It is recommended the enumerators use simple methods to approximate the age and that the data analyst calculates the age using a computer program which will require the date of birth and date of measurement.

the recording of age is a straightforward procedure, with age measured to the nearest month or year as the case may be. For example, an infant whose date of birth is 13 July, 1996 could be recorded as being 6 months if seen between 13 December, 1996 and 12 January, 1997 (both dates inclusive). Similarly, a child born on 13 July, 1995 could be recorded as 6 years old if seen between 13 July 2001 and 12 July, 2002 (both dates inclusive). If dates cannot be recalled, use of a local calendar will assist mothers in recalling the date of birth. Construction of the local calendar should be done prior to the survey and tested using the enumerators.

To complete the determination, the enumerator needs to examine documentary evidence of the birth date (such as birth, baptismal certificate, clinic care or horoscope). Cross-checking is necessary even if the mother knows the birth date or age of the child as errors in recall are common. Where there is a general registration of births and where ages are generally known,

5.3.2. Height for children 24 months and older (Figure 5.1)

1. Mesurer or assistant: Place the measuring board on a hard flat surface against a wall, table, tree, staircase, etc. Make sure the board is not moving.

2. Mesurer or assistant: Ask the mother to remove the child's shoes and unbraided any hair that would interfere with the height measurement. Ask her to walk the child to the board and to kneel in front of the child. If a Microtoise measure is used, stand the child vertically in the middle of the platform.

3. Assistant: Place the questionnaire and pencil on the ground (Arrow 1). Kneel with both knees on the right side of the child (Arrow 2).

4. Mesurer: Kneel on your right knee on the child's left side (Arrow 3). This will give you maximum mobility.

5. Assistant: Place the child's feet flat and together in the center of and against the back and base of the board/wall. Place your right hand just above the child's ankles on the shins (Arrow 4), your left hand on the child's knees (Arrow 5) and push against the board/wall. Make sure the child's legs are straight and the heels and calves are against the board/wall (Arrows 6 and 7). Tell the mesurer when you have completed positioning the feet and legs.

6. Mesurer: Tell the child to look straight ahead at the mother who should stand in front of the child. Make sure the child's line of sight is level with the ground (Arrow 8). Place your open left hand under the child's chin. Gradually close your hand (Arrow 9). Do not cover the child's mouth or ears. Make sure the shoulders are level (Arrow 10), the hands are at the child's side (Arrow 11), and the head, shoulder blades and buttocks are against the board/wall (Arrows 12, 13, and 14). With your right hand, lower the headpiece on top of the child's head. Make sure you push through the child's hair (Arrow 15).

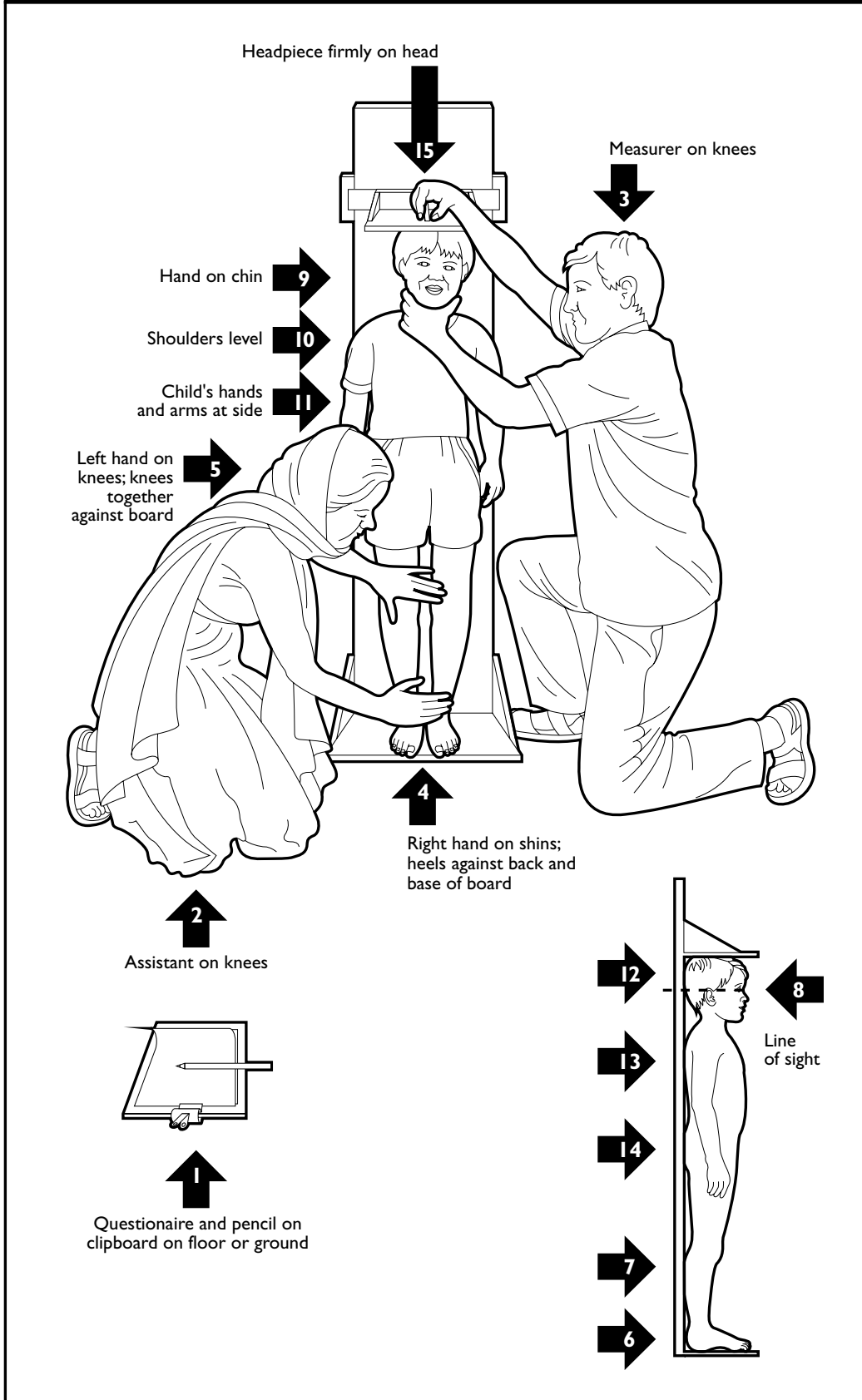
7. Mesurer and assistant: Check the child's position (Arrows 1-15). Repeat any steps as necessary.

8. Mesurer: When the child's position is correct, read and call out the measurement to the nearest 0.1 cm. Remove the headpiece from the child's head and your left hand from the child's chin.

9. Assistant: Immediately record the measurement and show it to the mesurer.

10. Mesurer: Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the assistant to erase and correct any errors.

Figure 5.1. Child Height Measurement - Height for Children 24 Months and Older



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

5.3.3. Length for infants and children 0-23 months (Figure 5.2)

1. Mesurer or assistant: Place the measuring board on a hard flat surface, i.e., ground, floor, or steady table.

2. Assistant: Place the questionnaire and pencil on the ground, floor, or table (Arrow 1). Kneel with both knees behind the base of the board if it is on the ground or floor (Arrow 2).

3. Mesurer: Kneel on the right side of the child so that you can hold the foot piece with your right hand (Arrow 3).

4. Mesurer and assistant: With the mother's help, lay the child on the board by supporting the back of the child's head with one hand and the trunk of the body with the other hand. Gradually lower the child onto the board.

5. Mesurer or assistant: Ask the mother to kneel close on the opposite side of the board facing the mesurer as this will help to keep the child calm.

6. Assistant: Cup your hands over the child's ears (Arrow 4). With your arms comfortably straight (Arrow 5), place the child's head against the base of the board so that the child is looking straight up. The child's line of sight should be perpendicular to the ground (Arrow 6). Your head should be straight over the child's head. Look directly into the child's eyes.

7. Mesurer: Make sure the child is lying flat and in the center of the board (Arrows 7). Place your left hand on the child's shins (above the ankles) or on the knees (Arrow 8). Press them firmly against the board. With your right hand, place the foot piece firmly against the child's heels (Arrow 9).

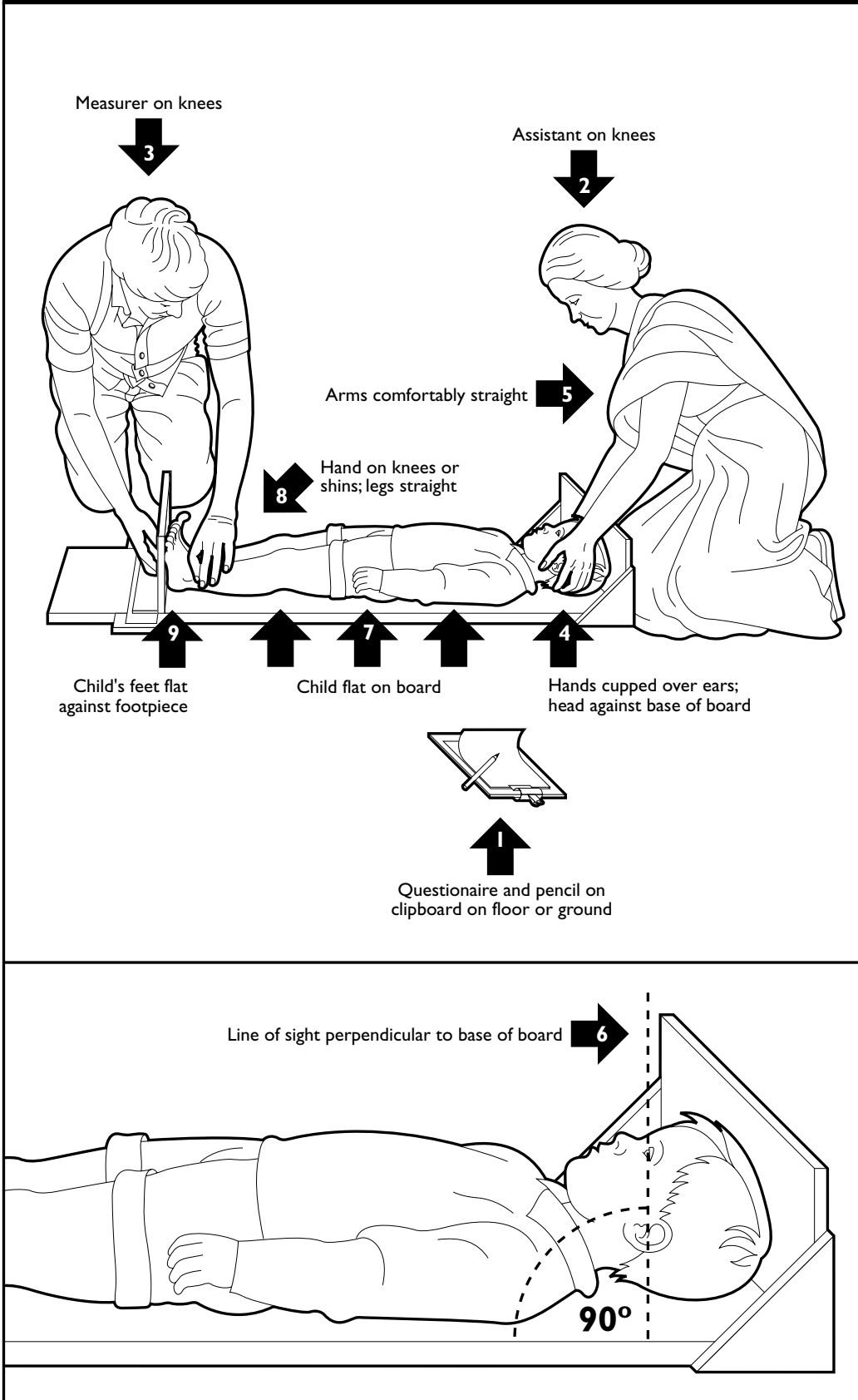
8. Mesurer and assistant: Check the child's position (Arrows 1-9). Repeat any steps as necessary.

9. Mesurer: When the child's position is correct, read and call out the measurement to the nearest 0.1 cm. Remove the foot piece and release your left hand from the child's shins or knees.

10. Assistant: Immediately release the child's head, record the measurement, and show it to the mesurer.

11. Mesurer: Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the assistant to erase and correct any errors.

Figure 5.2. Child Length Measurement - For Infants and Children 0-23 Months



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

5.3.4.a. Weight Using Salter-like Hanging Scale (Figure 5.3)

1. Measurer or assistant: Hang the scale from a secure place like the ceiling beam. You may need a piece of rope to hang the scale at eye level. Ask the mother to undress the child as much as possible.

2. Measurer: Attach a pair of the empty weighing pants to the hook of the scale and adjust the scale to zero, then remove from the scale.

3. Measurer: Have the mother hold the child. Put your arms through the leg holes of the pants (Arrow 1). Grasp the child's feet and pull the legs through the leg holes (Arrow 2). Make certain the strap of the pants is in front of the child.

4. Measurer: Attach the strap of the pants to the hook of the scale. **DO NOT CARRY THE CHILD BY THE STRAP ONLY.** Gently lower the child and allow the child to hang freely (Arrow 3).

5. Assistant: Stand behind and to one side of the measurer ready to record the measurement. Have the questionnaire ready (Arrow 4).

6. Measurer and assistant: Check the child's position. Make sure the child is hanging freely and not touching anything. Repeat any steps as necessary.

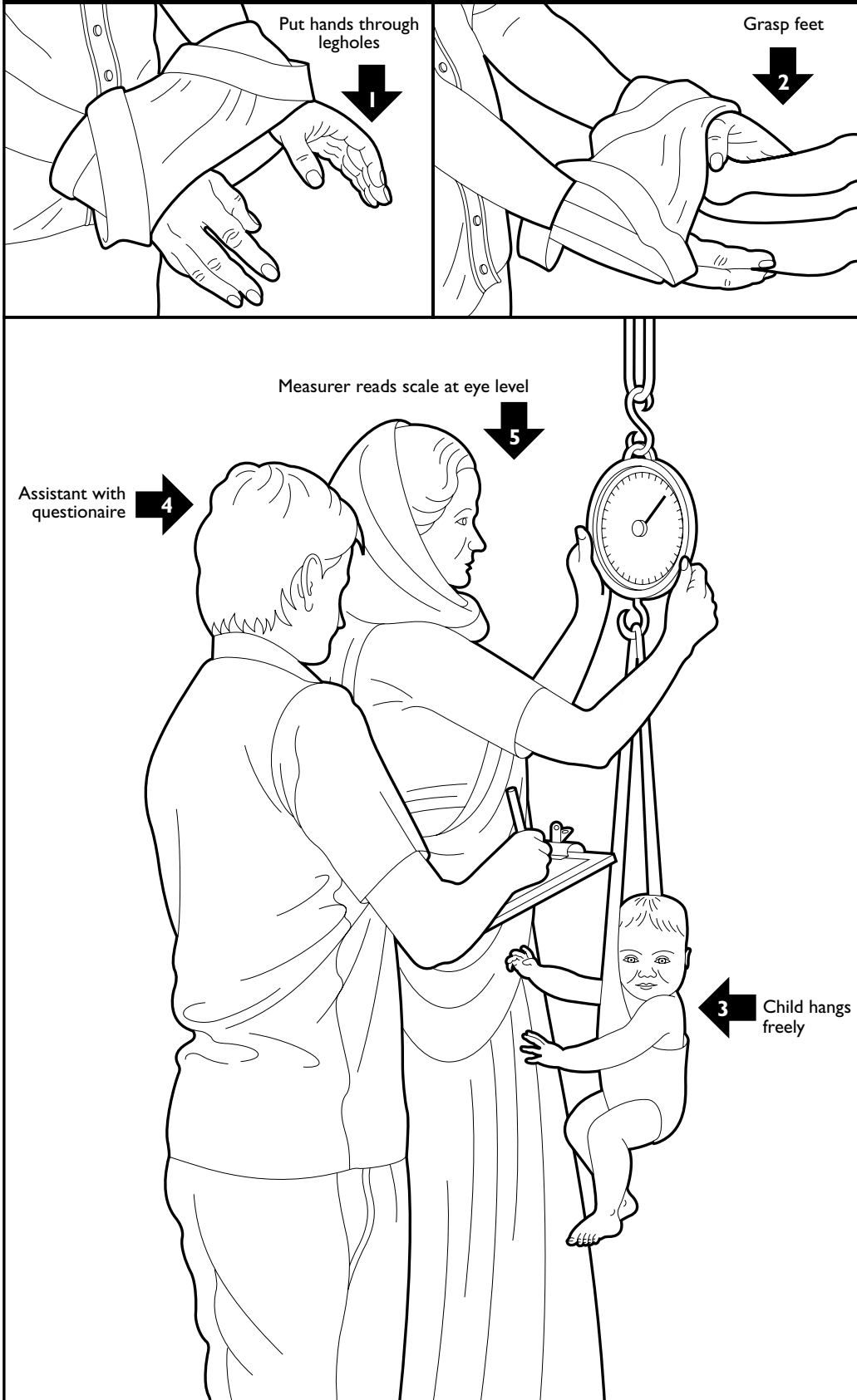
7. Measurer: Hold the scale and read the weight to the nearest 0.1 kg (Arrow 5). Call out the measurement when the child is still and the scale needle is stationary. Even children who are very active, which causes the needle to wobble greatly, will become still long enough to take a reading. **WAIT FOR THE NEEDLE TO STOP MOVING.**

8. Assistant: Immediately record the measurement and show it to the measurer.

9. Measurer: As the assistant records the measurement, gently lift the child by the body. **DO NOT LIFT THE CHILD BY THE STRAP OF THE WEIGHING PANTS.** Release the strap from the hook of the scale.

10. Measurer: Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the assistant to erase and correct any errors.

Figure 5.3. Child Weight Measurement Using Salter-like Hanging Scale

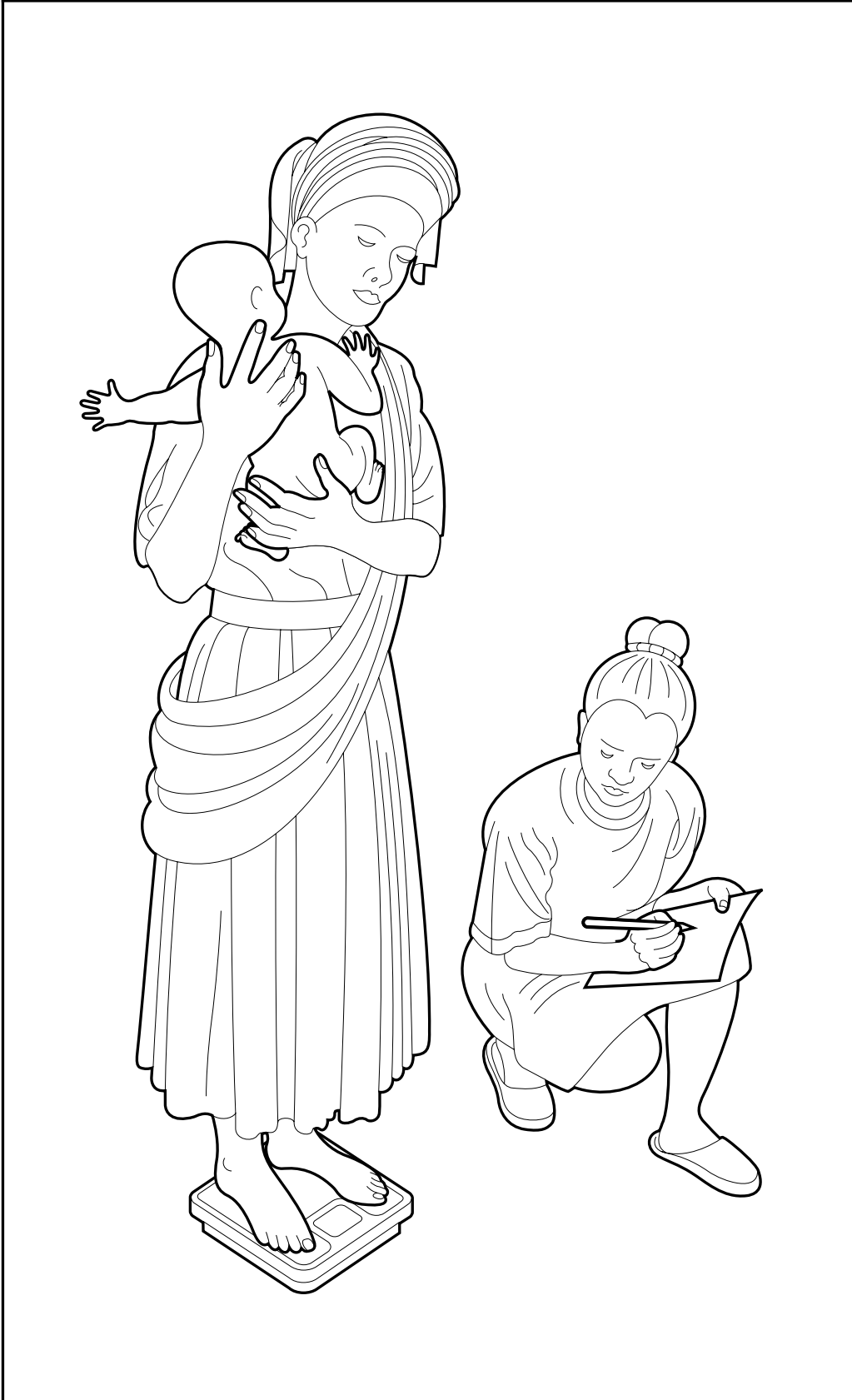


Source: How to Weigh and Measure Children: Assessing the Nutritional Status of Young Children, United Nations, 1986.

5.3.4.b. Child Weight Using UNICEF UNISCALE (Figure 5.4)

The UNICEF mother/child electronic scale (Item No. 0141015) requires the mother and child to be weighed simultaneously. Minimize the clothing on the child. Ensure the scale is not over-heated in the sun and is on an even surface enabling the reading to be clear. Ask the mother to stand on the scale. Record the weight and include the reading with one decimal point (e.g. 65.5 kgs). Pass the child to a person nearby. Record the second reading with just the mother (e.g. 58.3 kgs). The difference (e.g. 7.2 kgs) is the weight of the child. Refer to the UNICEF document "How to Use the UNISCALE" (June, 2000) prepared by the Nutrition Section Program Division/UNICEF New York. Contact: UNICEF Supply Division; UNICEF Plads, Freeport; DK-2100 Copenhagen, Denmark; Telephone: (45) 35 27 35 27; Fax: (45) 35 26 94 21; Email: supply@unicef.org; Website: www.supply.unicef.dk. Or contact UNICEF field office: www.unicef.org/uwwide/fo.htm (use Internet Explorer).

Figure 5.4. Child Weight Measurement Using Electronic Scale



Source: How to Use the UNISCALE, UNICEF, 2000.

5.3.5. Child Mid-Upper Arm Circumference (MUAC) Procedure (Figure 5.5)

1. Measurer: Keep your work at eye level. Sit down when possible. Very young children can be held by their mother during this procedure. Ask the mother to remove clothing that may cover the child's left arm.

2. Measurer: Calculate the midpoint of the child's left upper arm by first locating the tip of the child's shoulder (Arrows 1 and 2) with your finger tips. Bend the child's elbow to make a 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 centimeter. 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. Either you or an assistant can mark the midpoint with a pen on the arm (Arrow 6).

3. Measurer: Straighten the child's arm and wrap the tape around the arm at midpoint. Make sure the numbers are right side up. Make sure the tape is flat around the skin (Arrow 7).

4. Measurer and assistant: 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 8-9). Repeat any steps as necessary.

5. Assistant: Have the questionnaire ready.

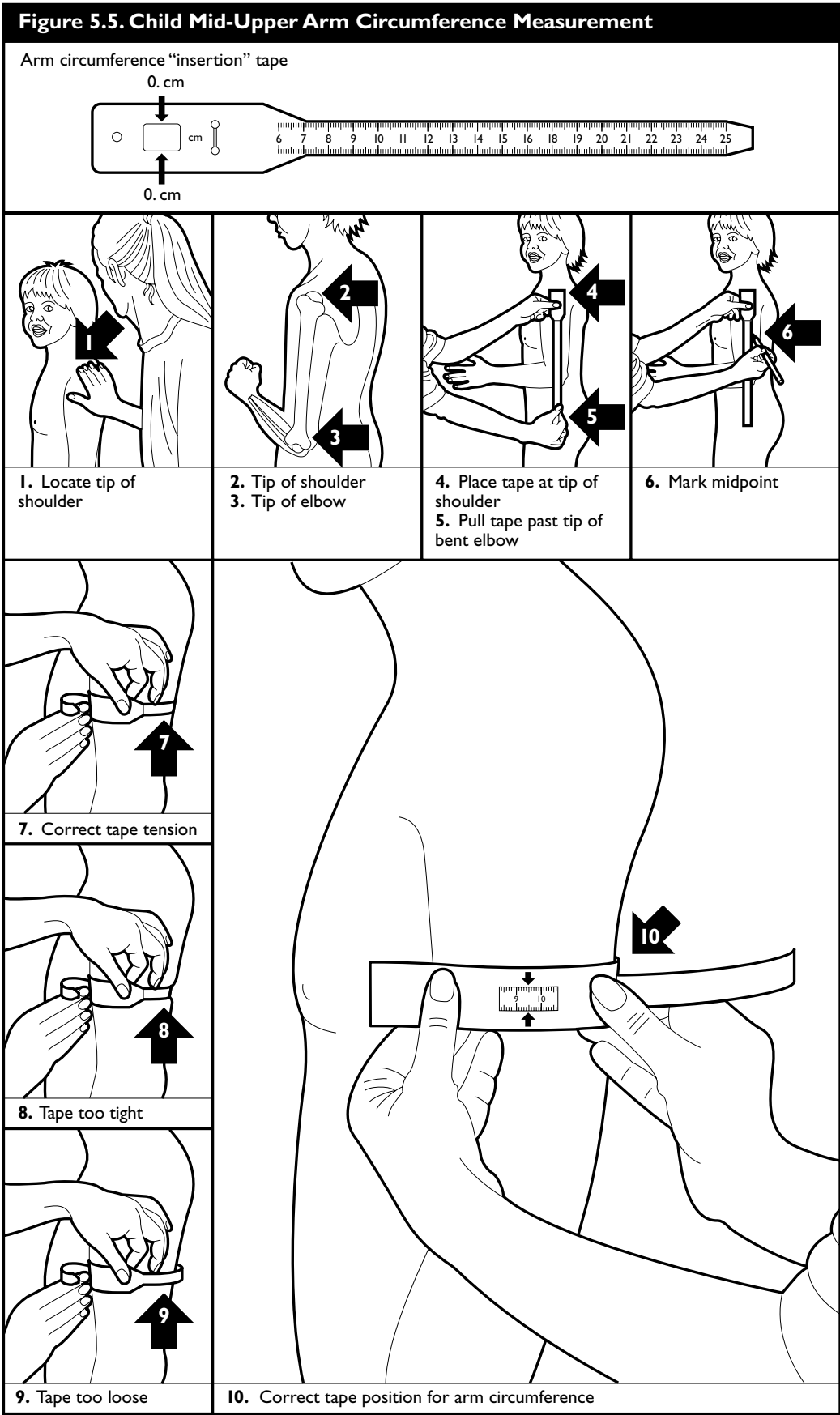
6. Measurer: When the tape is in the correct position on the arm with the correct tension, read and call out the measurement to the nearest 0.1cm (Arrow 10).

7. Assistant: Immediately record the measurement on the questionnaire and show it to the measurer.

8. Measurer: While the assistant records the measurement, loosen the tape on the child's arm.

9. Measurer: Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the assistant to erase and correct any errors.

10. Measurer: Remove the tape from the child's arm.



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

5.4. Assessing the Accuracy of Measurements

Accuracy is achieved through good training and supervision. There are techniques for measuring the accuracy of the measurements. When taking more than one height or weight measurement on the same person, the two measurements can be averaged. If they are vastly different from each other, the measurements should be disregarded and the measuring should start again (Table 5.1 provides specific parameters).

Table 5.1. Largest acceptable differences between repeated measurements

Anthropometric measurement	Largest acceptable difference
Weight	0.5 kg
Height	1.0 cm
MUAC	0.5 cm

The field supervisor is usually responsible for assessing the accuracy of measurements. There are a few practices a supervisor should employ to make sure that the data collected is of high quality.

These are:

- Checking the measurements recorded and submitted by field staff, to see whether they look reasonable.
- Accompanying field staff on interviews to watch how measurements are taken.
- Conducting repeat visits to some households that have already been interviewed by the field staff. Measurements should be repeated to determine if the previous measurements are supported by the repeat measurements.

Appendix 6 has a section on Anthropometric Standardization tests. These tests can be used during training or at any point during the survey process to check how accurately field staff take measurements. These tests can be especially useful during training to determine who needs more training or who might need a little extra supervision once in the field.

5.5. Entering the Data

A survey questionnaire usually contains a wide range of information to be collected. A questionnaire should be adapted to the needs for measuring anthropometry. Some information will carry over from one module or section to another. The following is an example of one format used for survey work for children under five years of age.

Anthropometry: Basic information: Enter the children's names and identification code numbers, enter the sex and their ages (see Figure 5.6). Be careful not to mix up children when moving from one section of a questionnaire to another.

Child weight: Record the child's weight in kilograms to one decimal. Read the supporting notes carefully as they should be known to all interviewers and supervisors. In the example of Mary (Figure 5.6), her weight was 10.2 kilograms. Had her weight been 9.5 kgs, the

entry would be |0|9:5|. Always note the zeros and the decimals.

Child length: Record the child's length in centimeters to one decimal. In the example of Mary (Figure 5.6), her length was 67.3 centimeters. The entry is made as |0|6|7:3|. Always note the zeros and the decimals. Make sure the information is entered accurately and fully on each child.

- Explanation of specific nutrition indicators;
- Instructions on how to take and record anthropometric measurements and standardization tests (Also see Section 5.2 for information on ethically handling anthropometric data); and
- Administrative details (timetable, log-book, supplies, reports).

5.6.2. Field exercises and standardization

Survey staff should have ample opportunity to practice the skills taught during training. This is especially true with training on taking anthropometric measurements. Trainees' practical skills need to be developed. During practice sessions a supervisor can determine who needs more training. Practice sessions might begin by taking trainees to a school, maternal and child health clinic, hospital or orphanage and letting them practice taking children's measurements. The standardization exercises described in Appendix 6 ensure the trainees have acquired the necessary skills.

By the end of training, all trainees should also have had a chance to practice what they have learned. Choose a village that is close to the training center. The trainees should go through an entire survey with a few households and the supervisor should watch how each trainee performs. This will provide trainees with hands-on experience, make them feel more confident when they go into the field and will give the supervisor a chance to correct any mistakes.

5.6.3. Survey training manual

A training manual should give an overview of the purpose of the survey, an outline of the whole survey process and clearly define what is expected of the field staff. It can also include useful tips and answers to common questions that come up in the field. All field staff should be provided with their own copy of the training manual.