Mini **Anthropometric** Assessment in **Pediatrics**

for children with **cleft lip and palate** for healthcare professionals

Hospital de Reabilitação de Anomalias Craniofaciais
Universidade de São Paulo

SmileTrain

Anthropometric Assessment in **Pediatrics**

Author Dr. Suely Prieto de Barros,
nutritionist

Co-authors

Ms. Maria Júlia Costa de Souza Villela,
pediatrician and immunologist

Ms. Gesiane Cristina Born,
nurse

Ms. Maila Meryellen Ferreira Garcia Manso,
nurse

Dra. Gisele da Silva Dalben
pediatric dentist

Coordination:
Dr. Nivaldo Alonso
Dr. Cristiano Tonello

Editorial Production: Gisele Guerra
Graphic Design and Layout: Thais Ferraz – Casa Paulistana
Illustrations: Milton Rodrigues Alves – Casa Paulistana

2023

Dear Professional,

We have prepared this manual to help you assess, in a simple and practical way, the nutritional status of your patients with cleft lip and palate.

Our first goal is to prevent malnutrition that compromises child growth and development and can lead to irreversible damage, including to the brain and the immune system.

Our second goal is to provide useful guidance to healthcare professionals across all specialties, fostering unity in this collective journey.

Systematically assessing the nutritional status is vital to identify patients experiencing growth faltering, at risk of malnutrition, or already malnourished, and design and implement tailored interventions at the earliest opportunity.

Various methods are available for assessing the nutritional status, including clinical, dietary, anthropometric, and biochemical approaches.

However, in this manual, we will focus on anthropometry due to its universal applicability across all life stages, cost-effectiveness, simplicity, minimal invasiveness, and reliability (Ministry of Health, 2011).

The frequency of anthropometric assessments depends on observed clinical conditions. We recommend at least monthly assessments until the age of two years.

Equally important to taking anthropometric measurements is comparing them to scientifically established references (standards). This is key to monitoring growth trends and ensuring accurate interpretation of how an individual grows and develops.

The Ministry of Health in Brazil recommends using the growth charts provided by the World Health Organization (WHO, 2006; ONIS et al., 2007), which include charts for tracking weight-for-age, length/height-for-age, weight-for-length/height, head circumference-for-age, and Body Mass Index-for-age, categorized by sex.

Between 1993 and 2003, the WHO conducted a multicenter study on child growth involving approximately 8,500 infants and children from six countries (Brazil, Ghana, India, Norway, Oman and the US). These children were all healthy, breastfed, with non-smoking, well-nourished mothers. The study resulted in the creation of growth curves, released in April 2006 for professional use. The WHO recommends the use of these growth charts (or curves) for assessing children worldwide, regardless of country, ethnicity, socioeconomic status, or diet.

The curves shown are:

They can be obtained at:

WHO Curves (2006) - 0 to 5 years old:

https://www.who.int/tools/child-growth-standards

WHO Curves (2007) - 5 to 19 years old:

https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators

Important Information

The following life stages are included in the pediatric group:

Newborns: 0 to 28 days of life

Infants: 29 days to 2 years (exclusive)

Preschool: 2 to 7 years old (exclusive)

School: 7 years to 10 years (exclusive)

Adolescents: 10 to 20 years (exclusive) (Barros et al., 2008)

- In the first days of life, full term newborns typically experience a physiological loss of weight of approximately 5-10%, while preterm newborns may experience losses of 10-15%. However, infants with clefts may incur even higher losses due to feeding difficulties.
- It is important to note that a weight loss exceeding 3% per day indicates undernourishment, often stemming from challenges in establishing effective breastfeeding. In such cases, expressing breast milk and feeding with a cup, or resorting to supplementing with a commercial formula may be considered.
- As infants grow, their weight typically doubles by the 5th-6th month, triples by 1 year, and quadruples by the 3rd year.
- Similarly, length usually increases by around 50% in the 1st year of life.
- Head circumference follows a pattern of doubling in size up to 12 months and then increasing by another 5 cm between 12 to 24 months (Barros et al., 2008).

Some Concepts

- **Nutritional Status:** refers to the overall condition of an individual's health as influenced by the balance between the body's nutrient intake and energy expenditure (nutrient utilization).
- **Eutrophy or being eutrophic (nutritional adequacy):** refers to a state achieved when there is a balance between nutrient intake and nutritional needs.
- **Nutritional deficiency:** occurs when there is an insufficient quantity and/or quality of nutrient intake relative to nutritional needs.
- **Nutritional disorder:** results from excessive and/or imbalanced nutrient intake compared to nutritional needs (Ministry of Health, 2004).

Birth Weight

Birth weight is the primary parameter utilized to evaluate intrauterine growth and the maturity of newborns (LOPES, 2017).

Low birth weight, typically defined as less than 2,500 grams, is strongly correlated with elevated neonatal and infant mortality. However, it is essential to recognize that low weight can be the result of 2 adverse conditions: prematurity and intrauterine growth restriction, which may occur independently or in combination. In Brazil, the average incidence of low birth weight ranges from 10 to 11% (Rugolo, 2005).

Newborns can be classified based on birth weight as follows:

Normal birth weight: 2.500 g – 3.999g

Low birth weight (LBW): < 2.500 g

Very low birth weight (VLBW): < 1.500 g

Extremely low birth weight: < 1.000 g

Gestational Age

There is a strong correlation between gestational age and infant weight, facilitating the classification of newborns into categories such as adequate gestational age (AGA), small gestational age (SGA), and large for gestational age (LGA) (Boulet et al., 2006; Gardosi et al., 2013). It is important to note that SGA does not always indicate intrauterine growth restriction but suggests the possibility of this condition. The diagnosis of SGA is typically based on birth weight measurement compared to a reference curve, distinguishing between constitutionally small infants and those who experienced restricted intrauterine growth.

In a study by Rodrigues et al., 2015, the curve proposed by Alexander et al., 1996, demonstrated a higher sensitivity in diagnosing of SGA compared to other methods and is thus being regarded as a robust statistical instrument for assessing fetal growth. Table 1 shows birth weights by gestational age in percentiles from 5 to 95.

Therefore, it is established that:

AGA (appropriate for gestational age) = between 10^{th} to 90^{th} percentile

SGA (small for gestational age) = < 10^{th} percentile

LGA (large for gestational age) = > 90 percentile

Table 1. Percentiles of birth weight for gestational age.

Gestational age (week)	Percentiles/Weight in grams				
	5	10	50	90	95
20	249	275	412	772	912
21	280	314	433	790	957
22	330	376	496	826	1023
23	385	440	582	882	1107
24	435	498	674	977	1223
25	480	558	779	1138	1397
26	529	625	899	1362	1640
27	591	702	1035	1635	1927
28	670	798	1196	1977	2237
29	772	925	1394	2361	2553
30	910	1085	1637	2710	2847
31	1088	1278	1918	2986	3108
32	1294	1495	2203	3200	3338
33	1513	1725	2458	3370	3536
34	1735	1950	2667	3502	3697
35	1950	2159	2831	3596	3812
36	2156	2354	2974	3668	3888
37	2357	2541	3117	3755	3956
38	2543	2714	3263	3867	4027
39	2685	2852	3400	3980	4107
40	2761	2929	3495	4060	4185
41	2777	2948	3527	4094	4217
42	2764	2935	3522	4098	4213
43	2741	2907	3505	4096	4178
44	2724	2885	3491	4096	4122

Source: *Alexander et al.*, 1996.

Preterm Newborn

Prematurity, as defined by the WHO, occurs before 37 full weeks of gestation. It can be further categorized into extremely preterm (< 28 weeks), very preterm (28-31 weeks) and moderate preterm (32-36 weeks of gestation).

The Brazilian Society of Pediatrics (2017) has identified prematurity as the leading cause of mortality in the first year of life in Brazil, accounting for 11.5% of deaths. To monitor the nutritional status of premature infants, it is recommended to utilize the INTERGROWTH 21 curves (Intergrowth-21st, 2012; Villar et al., 2015) available for weight, length, and head circumference. These curves are designed to be used up to 64 weeks post-conception, after which the WHO charts are recommended.

The INTERGROWTH 21 curves are prescriptive and multiethnic, employing the best anthropometric methodology and aligning closely with the WHO curves.

CLASSIFICATION

Ideally, the data collected from the baby should closely align with the 50th percentile, representing the center point or median (highlighted in green), which is considered indicative of ''normal'' growth.

To access:
https://intergrowth21.tghn.org/standards-tools/

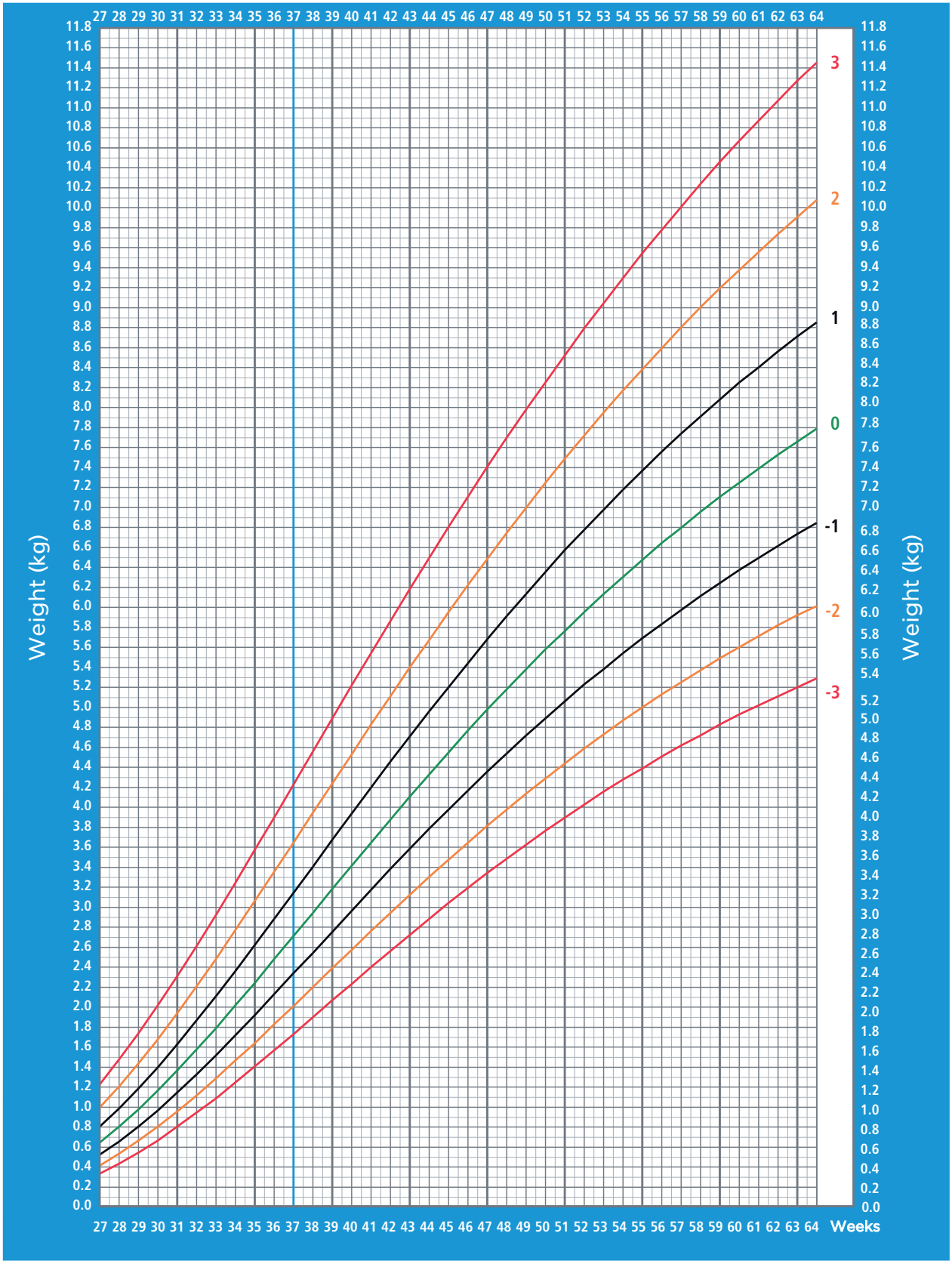
The Z-score and percentile can be calculated for each sex using:
http://intergrowth21.ndog.ox.ac.uk/en/ManualEntry

Classification according to INTERGROWTH-21st

UNIVERSITY OF OXFORD

International Growth Curves for Children Born Preterm (Boys)

INTERGROWTH-21st

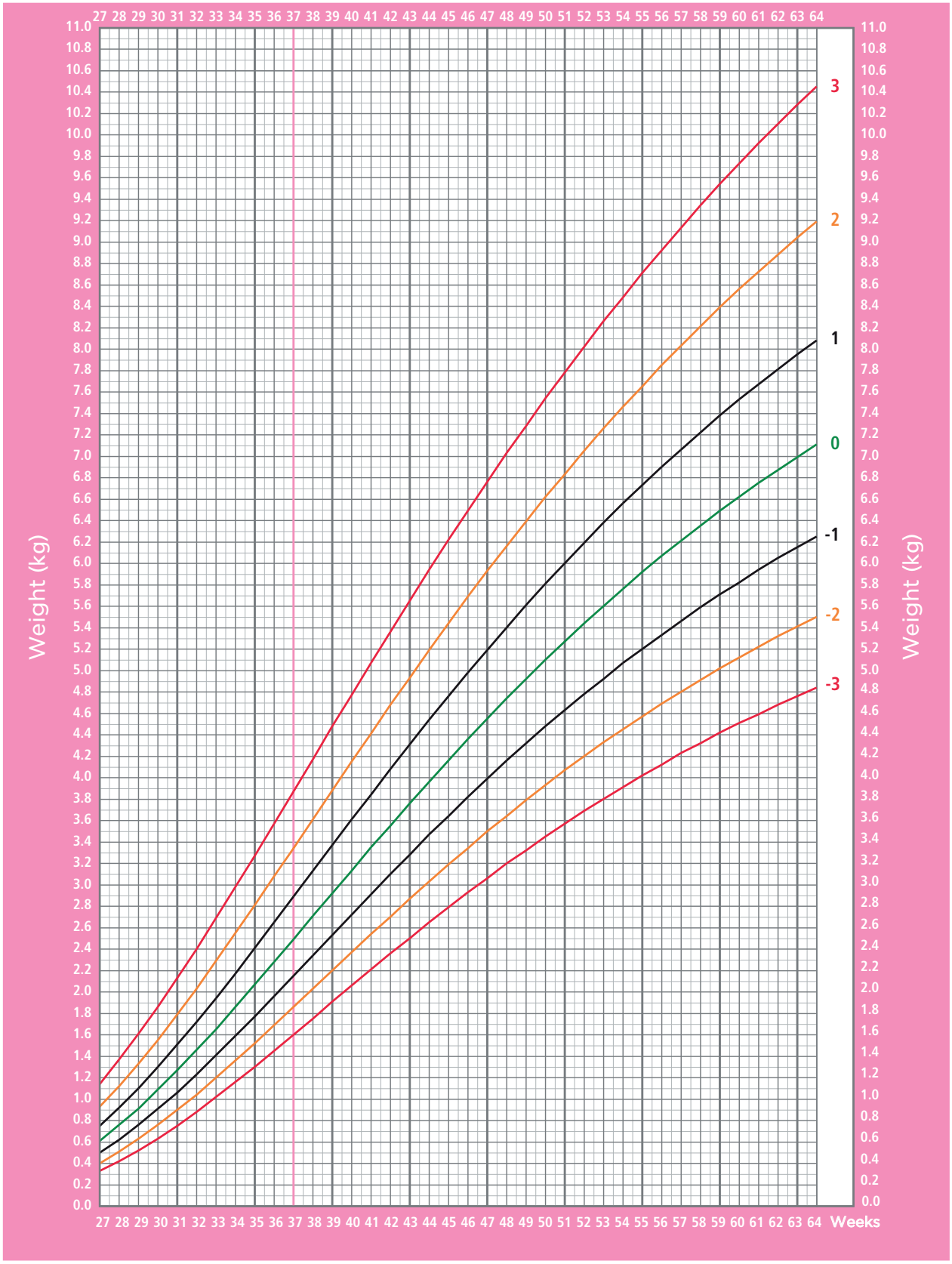


Ref: Villar et al *Lancet Glob Heath* 2015;3:e681-91.

UNIVERSITY OF OXFORD

International Growth Curves for Children Born Preterm (Girls)

INTERGROWTH-21st



Ref: Villar et al *Lancet Glob Heath* 2015;3:e681-91.

Weight

"It represents the magnitude of body mass or volume, comprising both adipose tissue and lean mass. Prone to fluctuations over short periods, its monitoring facilitates early diagnosis of malnutrition and serves as an indicator of nutritional status recovery" (Duarte and Castellani, 2002). It is easy to measure and sensitive to changes, particularly in cases of malnutrition, often used to calculate various nutritional assessment indexes.

Equipment

Up to 2 years old - Pediatric scale with a capacity of 16kg and a graduation of 10g

Above 2 years old - Platform or anthropometric scale with a capacity of 100 to 150kg and a graduation of 100g.

To measure weight: It should be measured in kilograms (kg), with minimal clothing, with the child barefoot and motionless.

If you do not have a pediatric scale, use a floor scale and weigh the baby in the caregiver's arms.

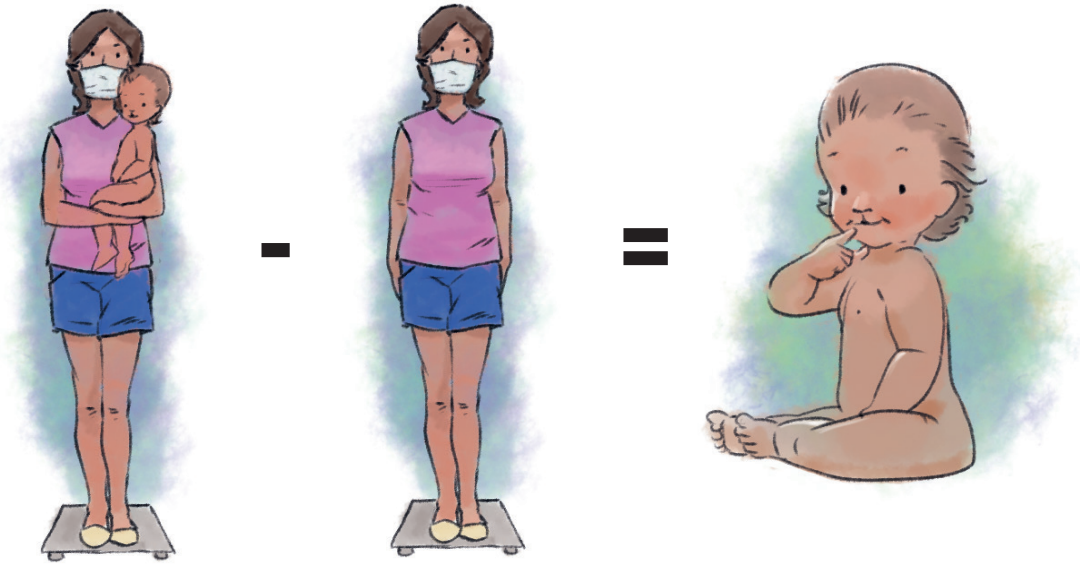
Proceed as follows:

1. Take off the baby's clothes

2. Weigh the baby in the caregiver's arms

3. Weigh only the caregiver, without the baby

4. Subtract the weight of the caregiver from the total weight (baby + caregiver)



5. Ready: We have the baby's weight!

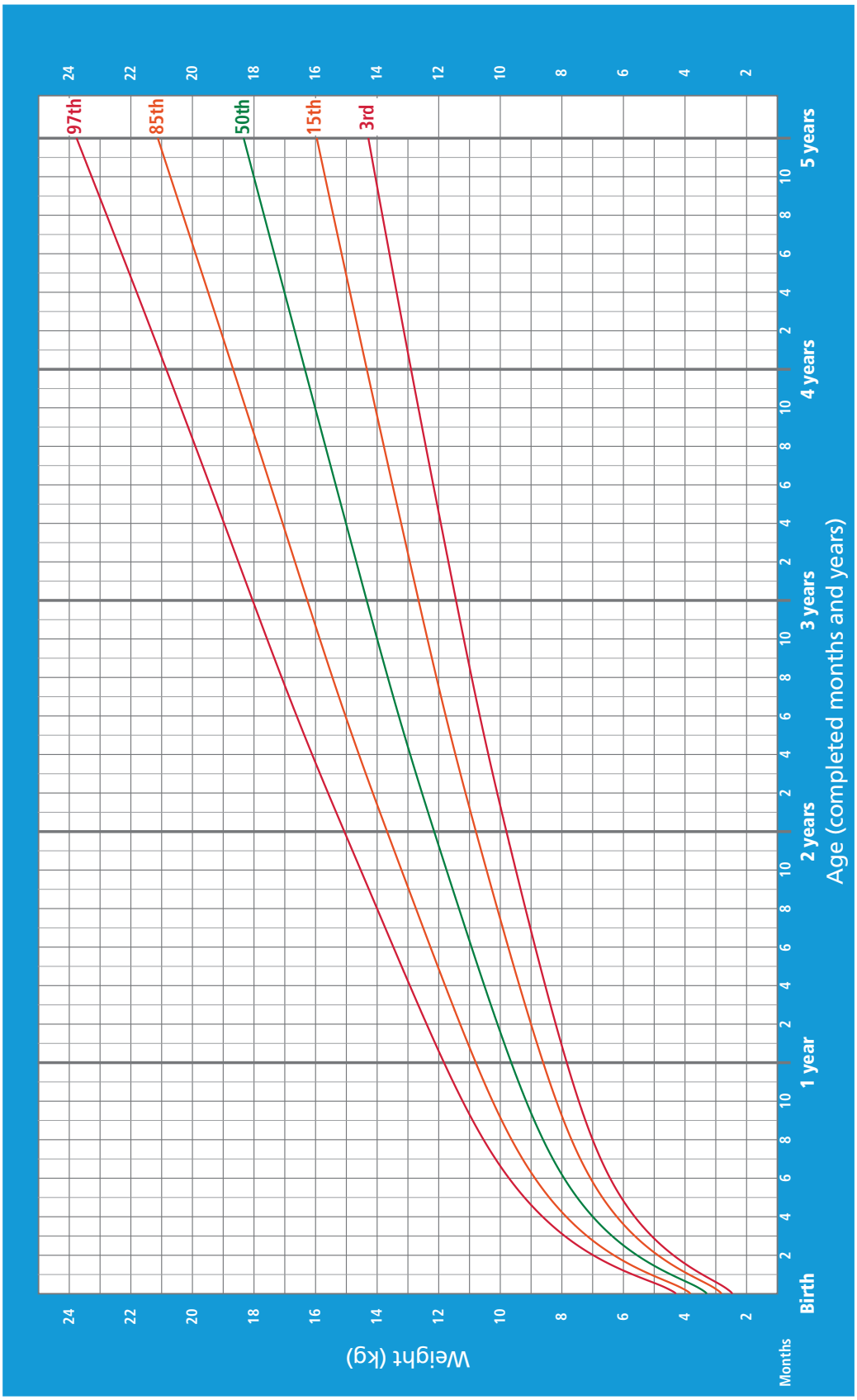
Classification according to the WHO (2006 and 2007) by percentile and Z-score

Weight-for-age

CRITICAL VALUES		NUTRITIONAL DIAGNOSIS
percentile < 0.1	Z-score < -3	Severe underweight
percentile ≥ 0.1 and < 3rd	Z-score ≥ -3 and < -2	Moderate underweight
percentile ≥ 3rd and ≤ 97th	Z-score ≥ -2 and ≤ +2	Weight appropriate for age
percentile > 97th	Z-score > +2	High weight for age

WHO CURVES, 2006

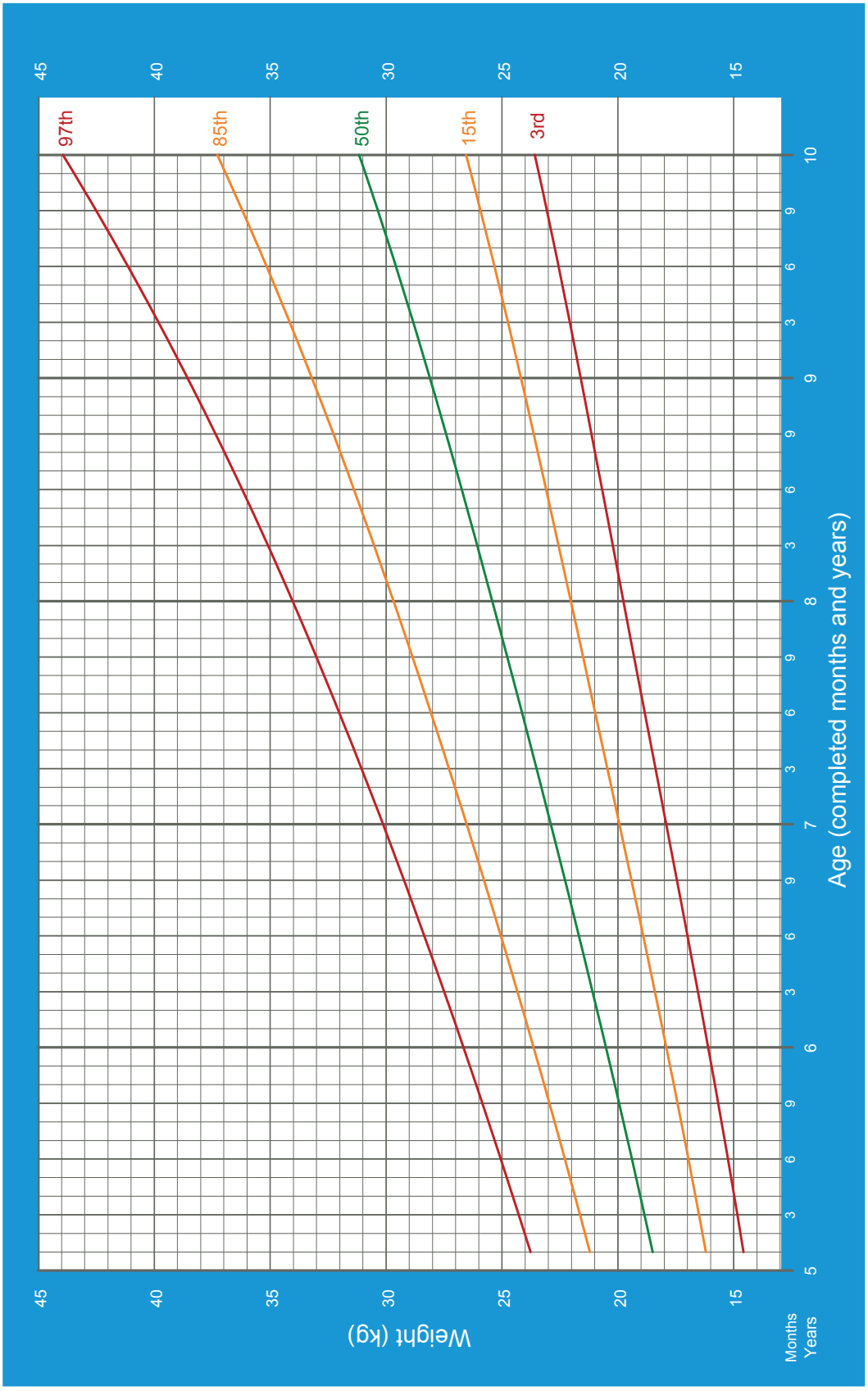
WEIGHT-FOR-AGE - BOYS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

WHO CURVES, 2007

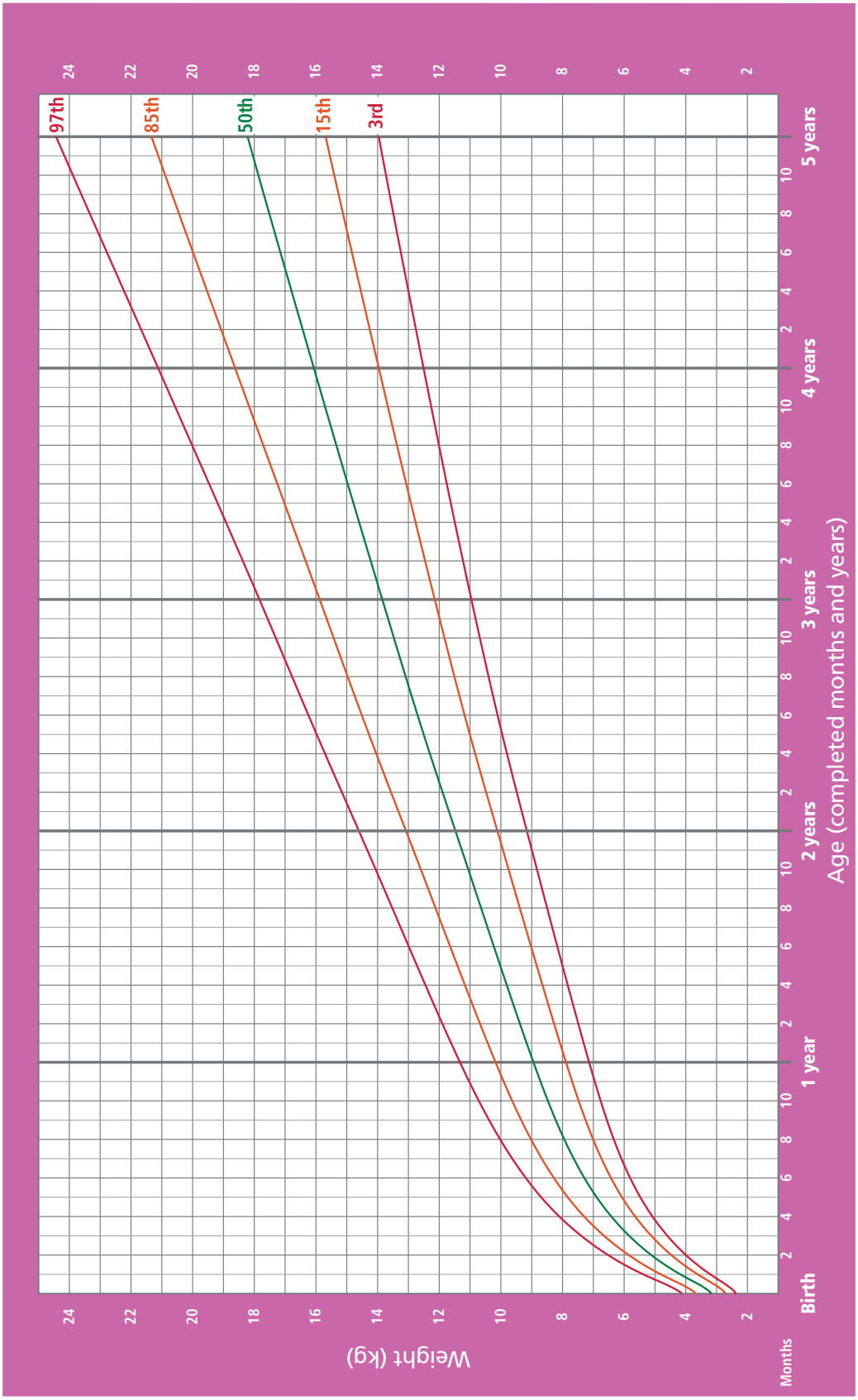
WEIGHT-FOR-AGE - BOYS FROM 5 TO 10 YEARS OLD



2007 WHO Reference

WHO CURVES, 2006

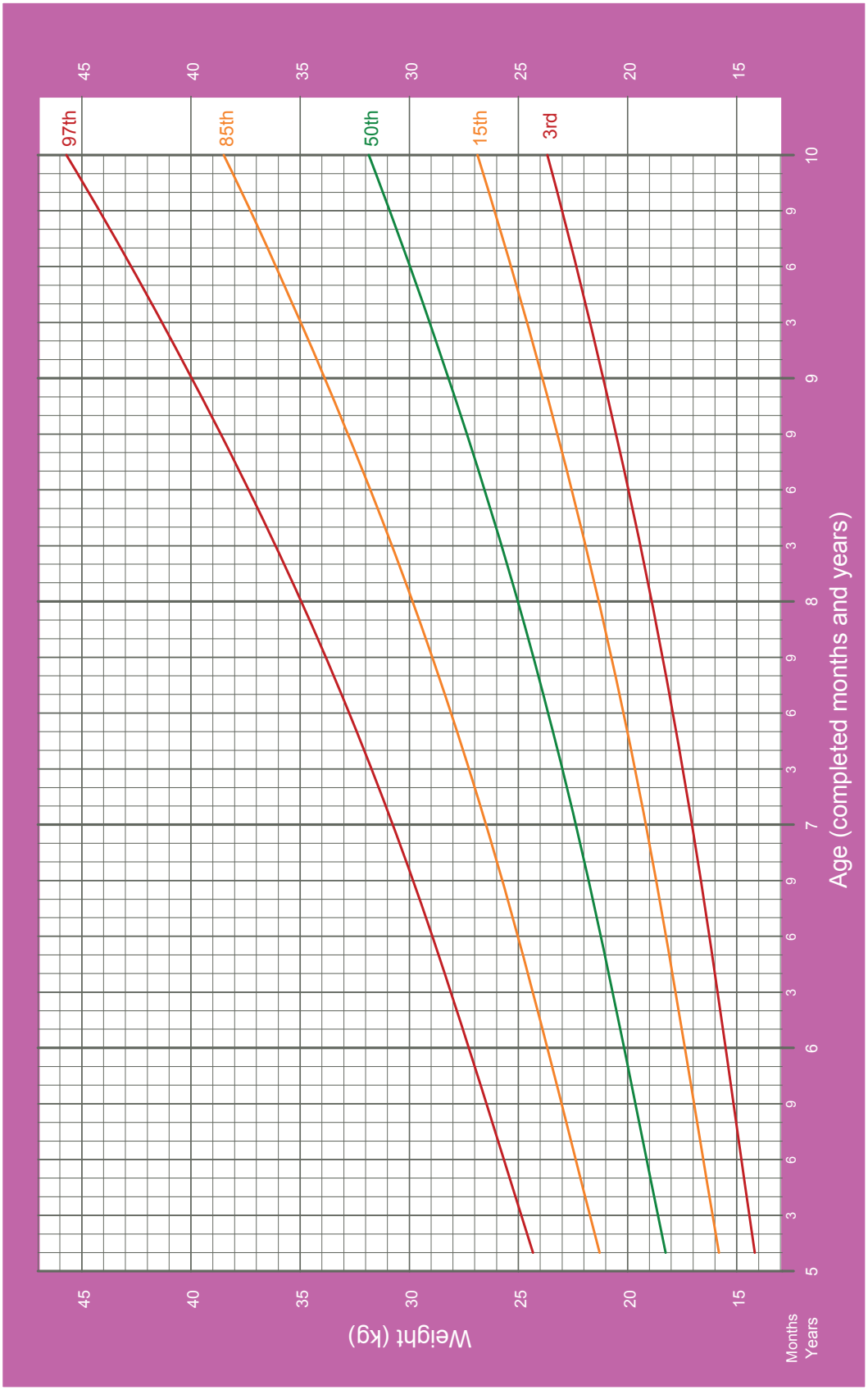
WEIGHT-FOR-AGE - GIRLS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

WHO CURVES, 2007

WEIGHT-FOR-AGE - GIRLS FROM 5 TO 10 YEARS OLD



2007 WHO Reference

Length/Height

Length/height is an essential indicator of a child's body size and linear growth. Changes in height occur over a more extended period, making it a reflection of long-term nutritional issues. Length/height deficits may indicate impairment in protein compartments (Duarte and Castellani, 2002) and, like weight, length/height is utilized to calculate various nutritional status assessment indexes.

When measured with a baby lying down, usually under 24 months, in a supine and horizontal position, with minimal clothing and bare feet, it is referred to as **length.** Instruments such as infantometers are commonly used for that purpose.

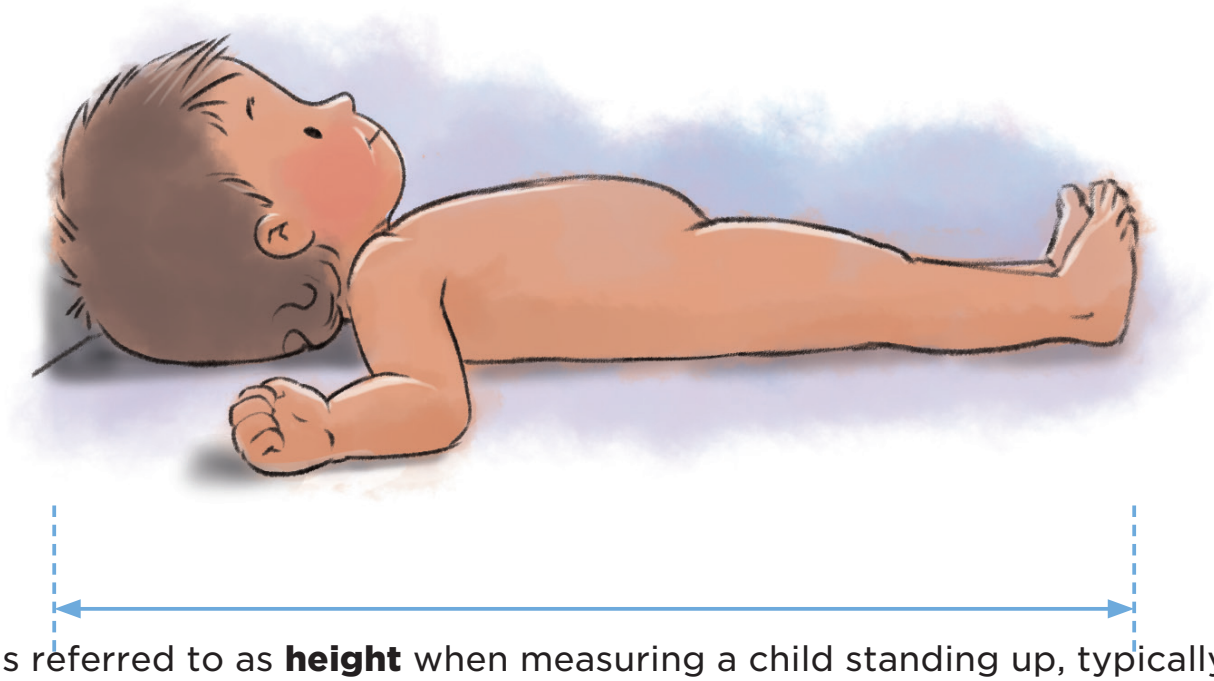
Types of Infantometers

To measure length: Place the baby lying down on a flat, hard surface with minimal clothing and bare feet, facing upwards, and legs straight. Ensure the head is held firmly by the caregiver, and the arms are extended at the sides or secured over the belly.

Position the child's head against the fixed cursor of the infantometer, keeping the neck straight, chin away from the chest, and the head resting comfortably. Gently press over the knees to keep the legs extended.

Record the measured length at the nearest 0.1 centimeter (cm).

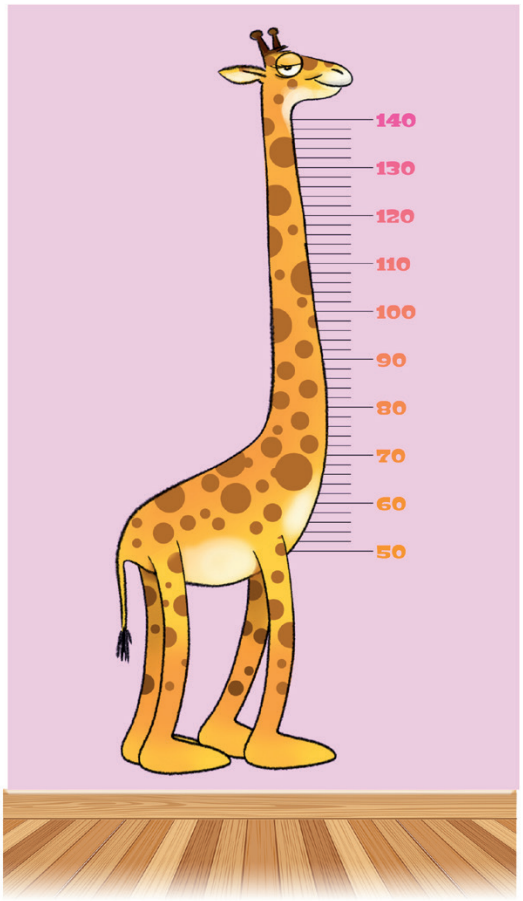
If an infantometer is not available, it is important to note that using a measuring tape may not provide an accurate measurement of length.



It is referred to as **height** when measuring a child standing up, typically for those aged 2 years old and older. The measurement is taken using a stadiometer, which should be mounted on a fixed base and placed parallel to a wall. Some scales come equipped with a stadiometer.

To measure height: have the child stand barefoot, straight, with feet together. The heels, buttocks, and back should be touching the vertical backboard of the stadiometer. The head should be positioned so that the sight line is parallel to the ground. The movable headboard of the stadiometer should be brought down gently on top of the child's head. Read the measurement out loud, and record at the nearest 0.1 cm.

If you don't have a stadiometer, a measuring tape attached to the wall will not provide an accurate measurement of the height.



Classification according to the WHO (2006 AND 2007) by percentile and Z-score

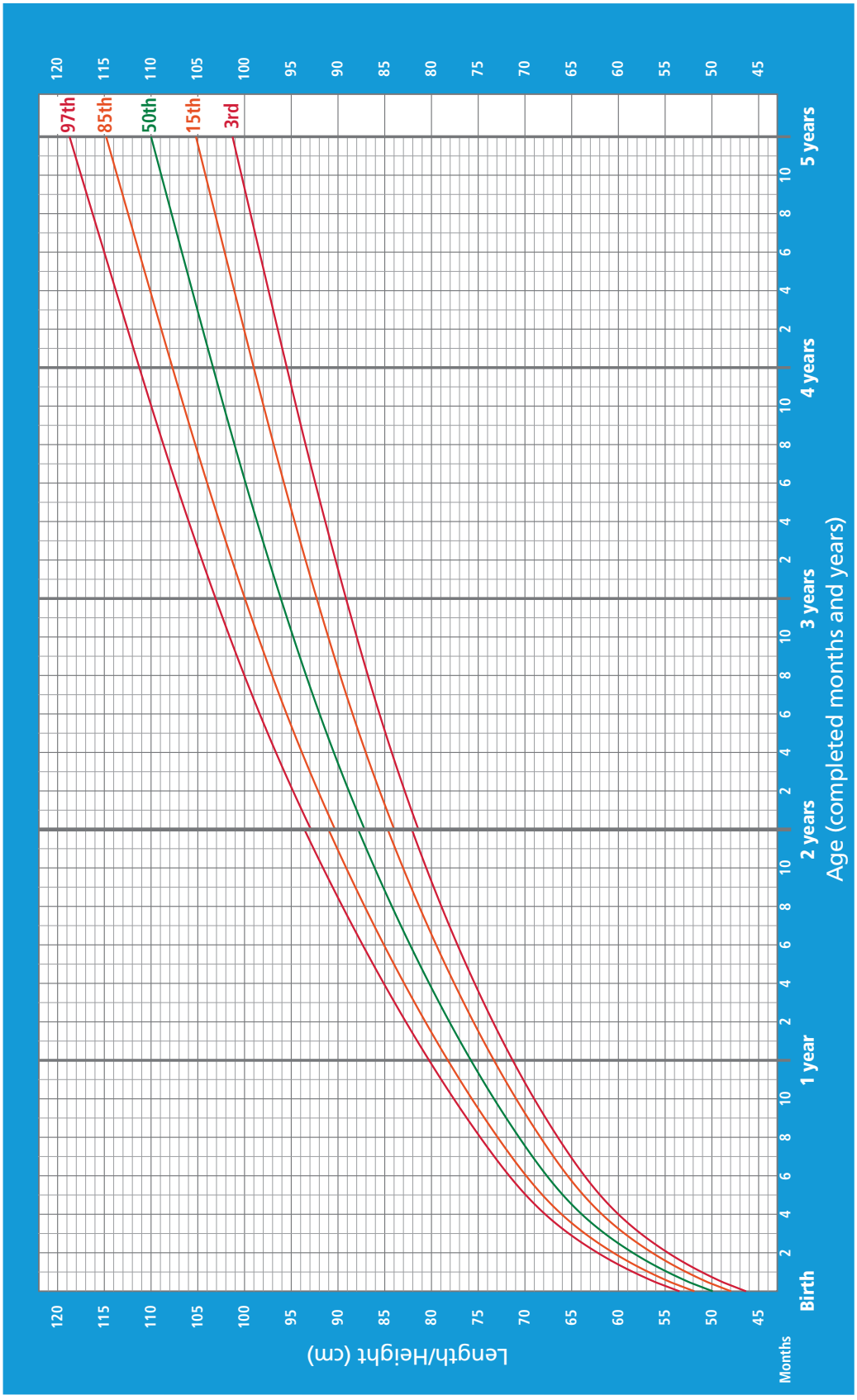
Height-for-age

CRITICAL VALUES		NUTRITIONAL DIAGNOSIS
percentile < 0.1	Z-score < -3	Severe stunting
percentile ≥ 0.1 and < 3rd	Z-score ≥ -3 and < -2	Moderate stunting
percentile ≥ 3rd and ≤ 97th	Z-score ≥ -2 and ≤ +2	Height appropriate for age

Source: *BRASIL*, 2004; *SOCIEDADE BRASILEIRA DE PEDIATRIA*, 2006; *WHO*, 2006.

WHO CURVES, 2006

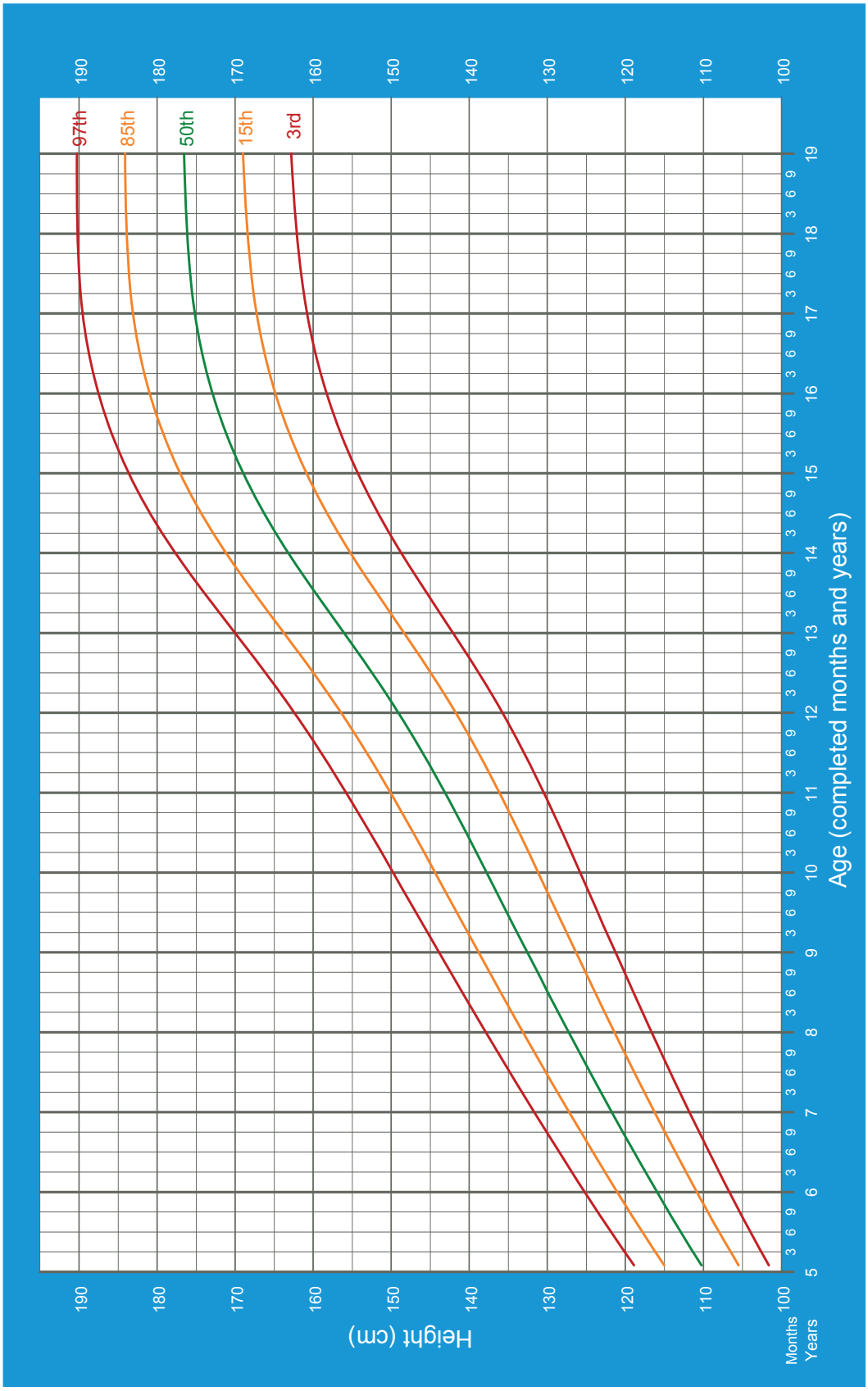
HEIGHT-FOR-AGE - BOYS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

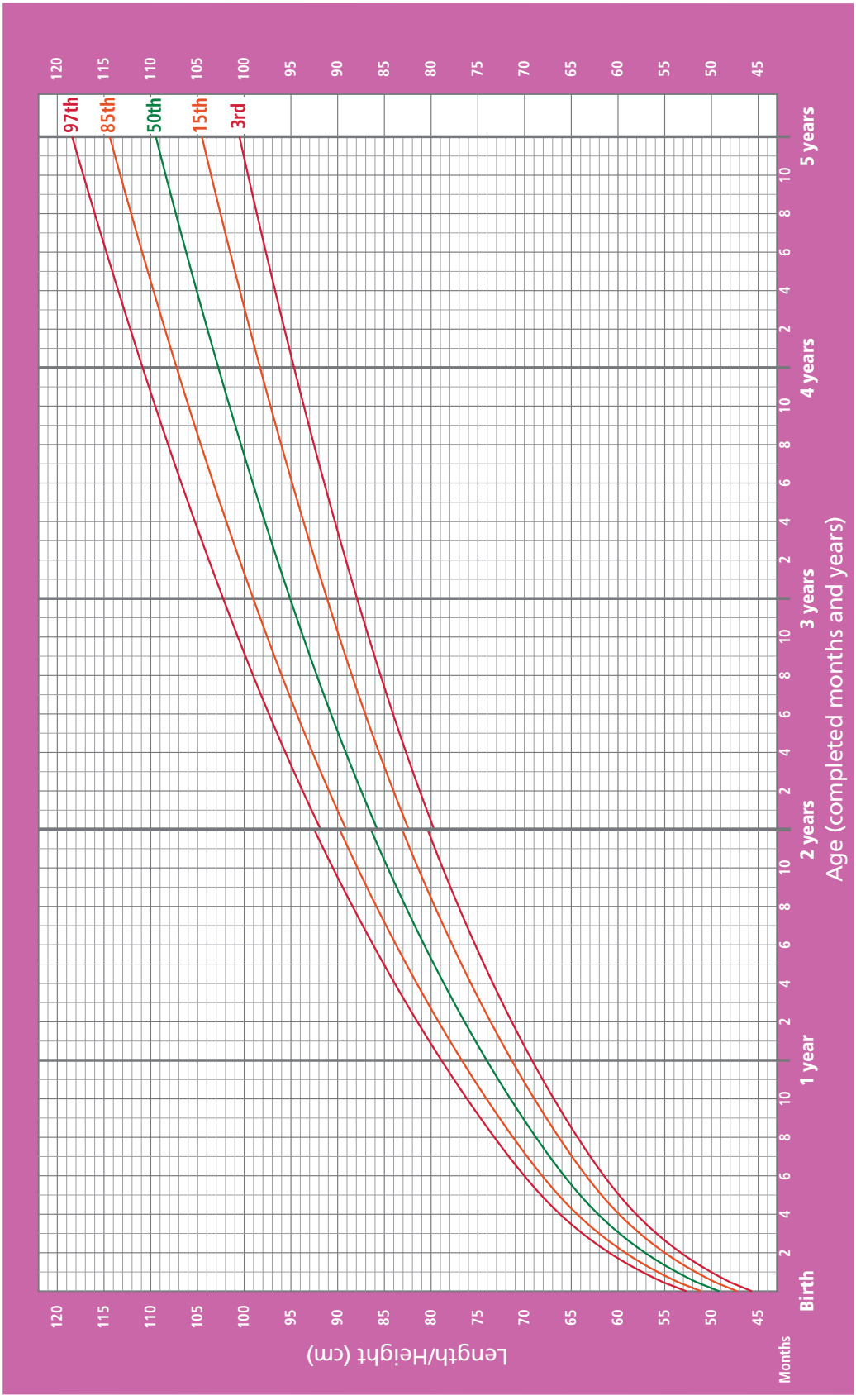
WHO CURVES, 2007

HEIGHT-FOR-AGE - BOYS FROM 5 TO 10 YEARS OLD



WHO CURVES, 2006

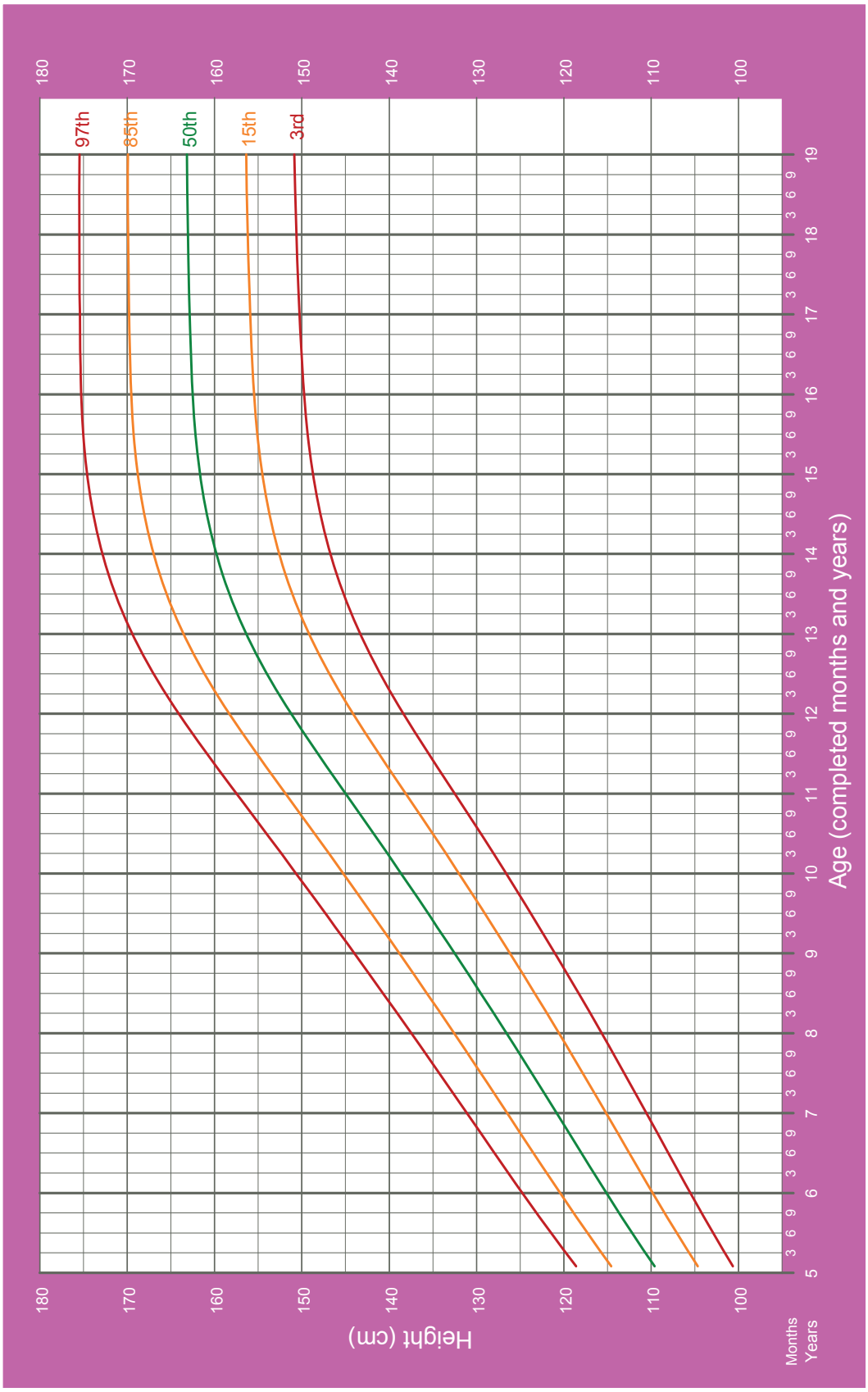
HEIGHT-FOR-AGE - GIRLS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

WHO CURVES, 2007

HEIGHT-FOR-AGE - GIRLS FROM 5 TO 19 YEARS OLD



2007 WHO Reference

Weight For Length/ Height

Weight-for-length/height expresses the harmony between body mass and height, without considering age.

(SISVAN, Ministry of Health, Brazil, 2004)

Classification according to WHO (2006 and 2007), by percentile and Z score

Weight-for-age

CRITICAL VALUES		NUTRITIONAL DIAGNOSIS
percentile < 0.1	Z-score < -3	Severe wasting
percentile ≥ 0.1 and < 3rd	Z-score ≥ -3 and < -2	Moderate wasting
percentile ≥ 3rd and ≤ 85th	Z-score ≥ -2 and ≤ +1	Eutrophy
percentile > 85th and ≤ 97th	Z-score > +1 and ≤ +2	Risk of overweight
percentile > 97th and ≤ 99.9th	Z-score > +2 and ≤ +3	Overweight
percentile > 99.9th	Z-score > +3	Obesity

Body Mass Index

The Body Mass Index (BMI) is performed through a simple calculation that allows checking whether or not someone is at the ideal weight with the square of the current height (WHO, 2006, 2007)

Calculation

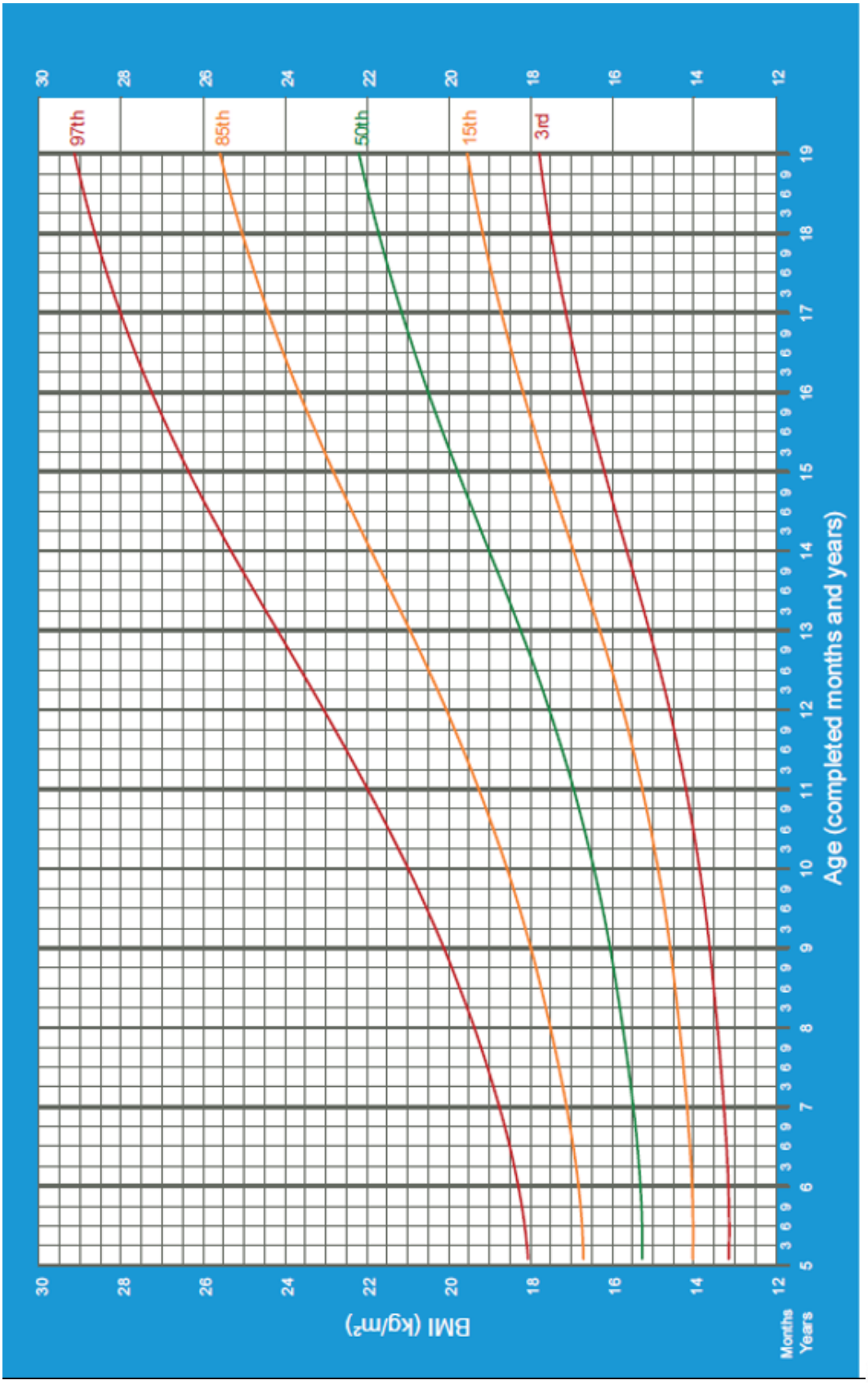
$$BMI = \frac{WEIGHT}{HEIGHT^2}$$

Classification according to WHO (2006 and 2007) by percentile and Z score.

BMI-for-age

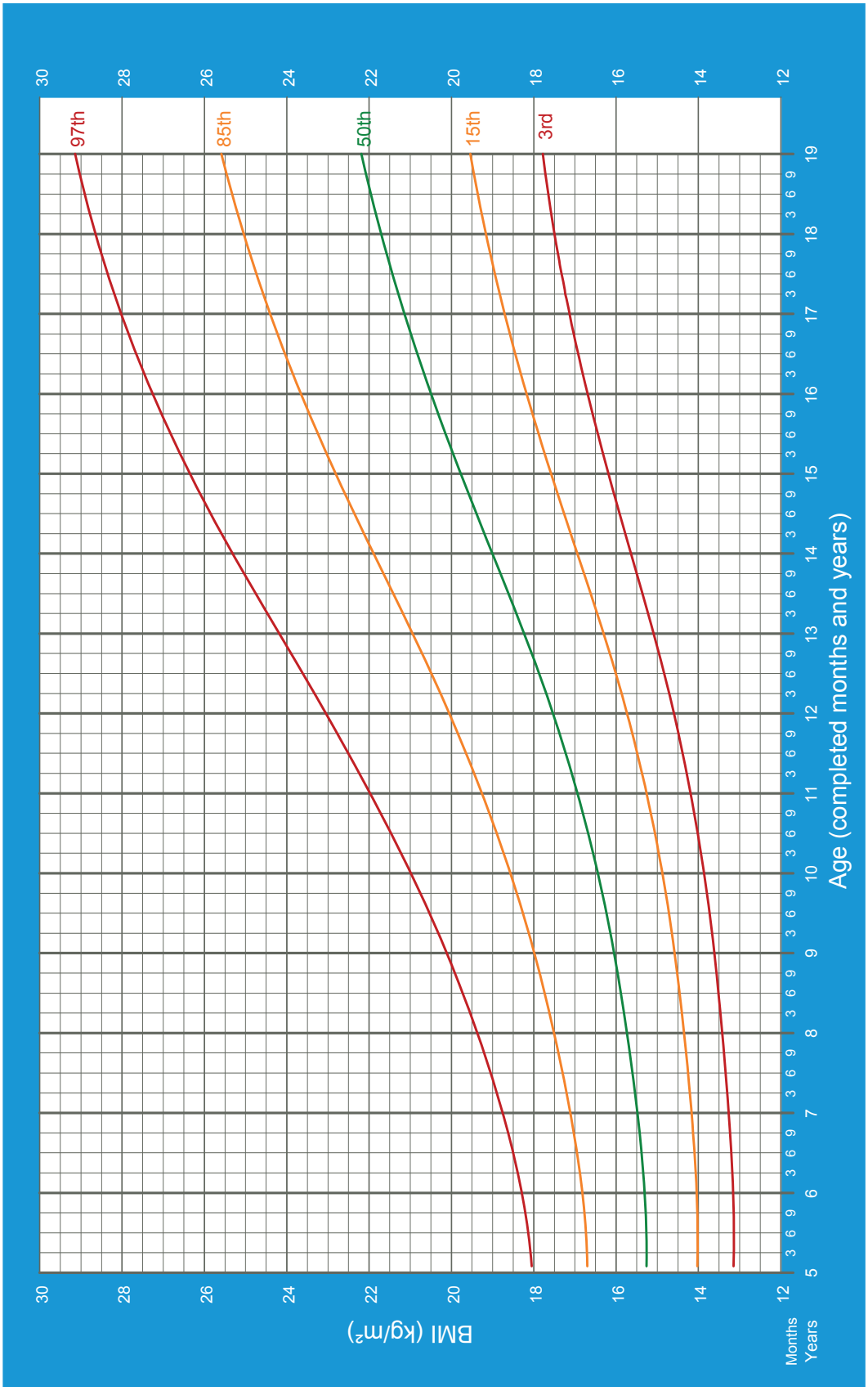
CRITICAL VALUES		NUTRITIONAL DIAGNOSIS
percentile < 0.1	Z-score < -3	Severe wasting
percentile ≥ 0.1 and < 3rd	Z-score ≥ -3 and < -2	Moderate wasting
percentile ≥ 3rd and ≤ 85th	Z-score ≥ -2 and ≤ +1	Eutrophy
percentile > 85th and ≤ 97th	Z-score > +1 and ≤ +2	Risk of overweight
percentile > 97th and ≤ 99.9th	Z-score > +2 and ≤ +3	Overweight
percentile > 99.9th	Z-score > +3	Obesity

BMI – BOYS FROM 0 TO 5 YEARS



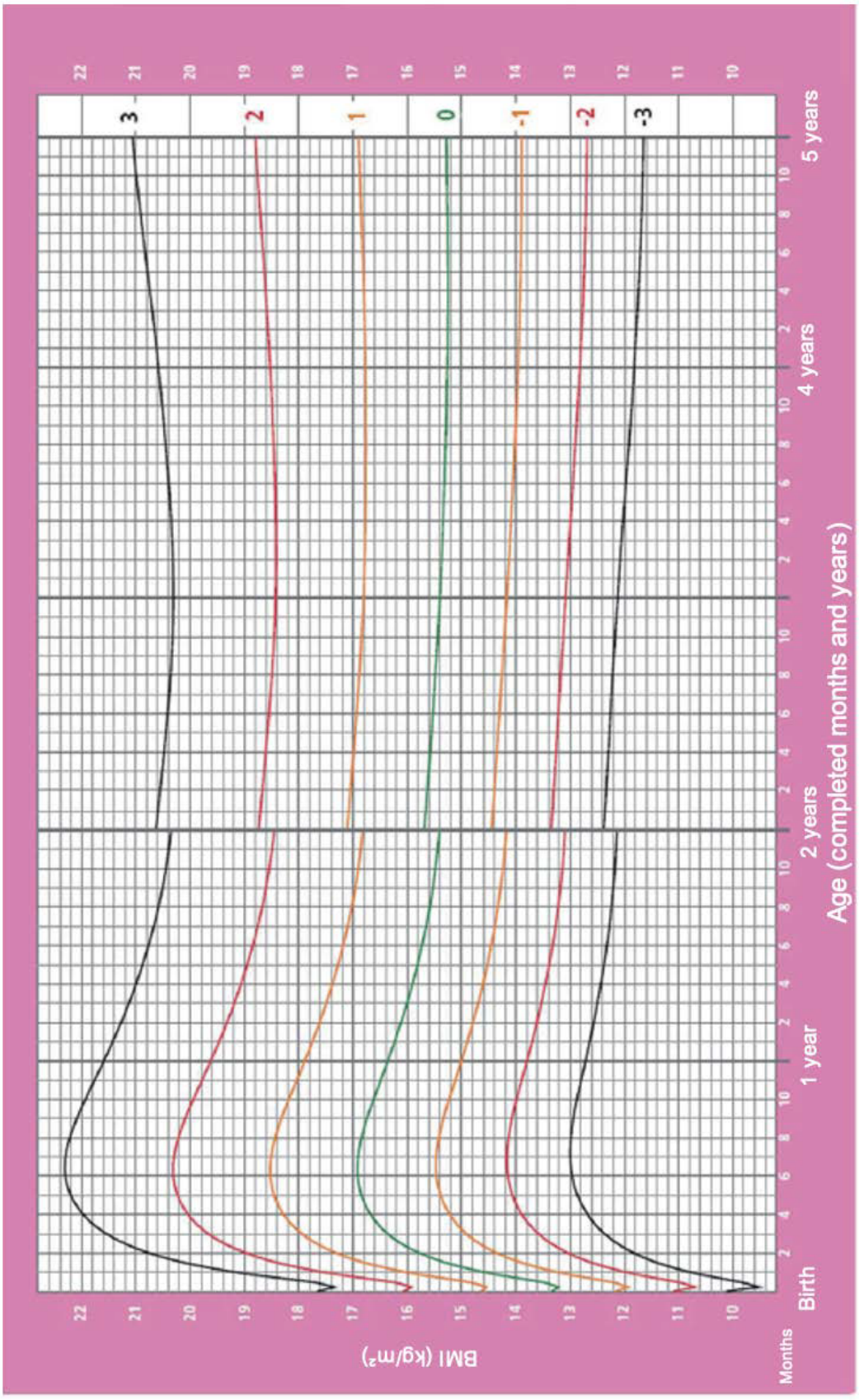
Source: WHO Child Growth Standards 2006 (https://www.who.int/childgrowth/en/)

BMI – BOYS FROM 5 TO 19 YEARS



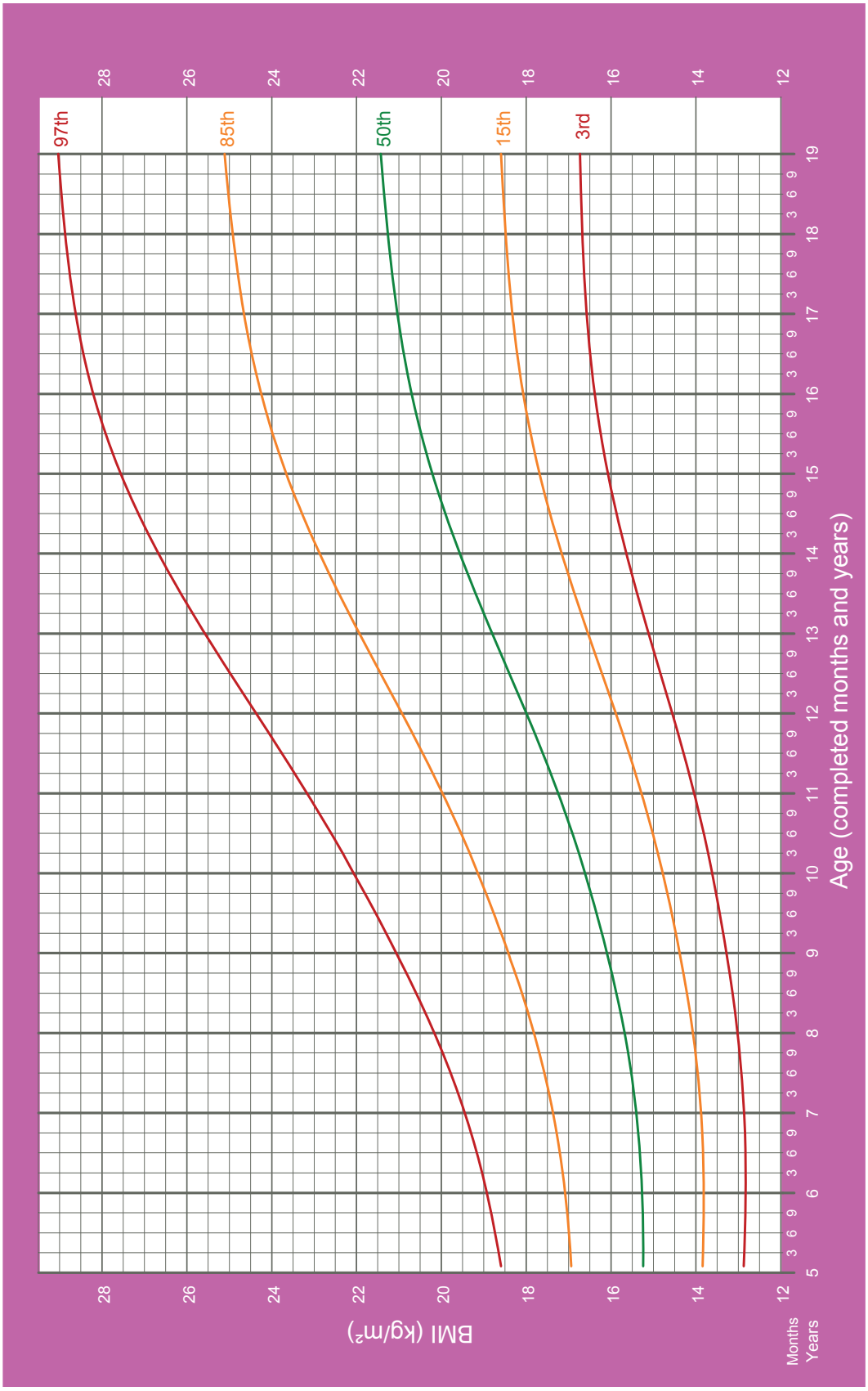
2007 WHO Reference

BMI – GIRLS FROM 0 TO 5 YEARS



Source: WHO Child Growth Standards 2006 (https://www.who.int/childgrowth/en/)

BMI - GIRLS FROM 5 TO 19 YEARS



2007 WHO Reference

Head Circumference

This measurement is related to the size of the head, with its normal growth reflecting appropriate brain growth and development. It is recommended to measure head circumference up to 2 years of age, corresponding to a period of rapid brain growth (Barros, 2008).

To measure head circumference: Use a non-extensible measuring tape graduated in centimeters. Place the tape around the most prominent region of the frontal area (above the eyebrows). Extend the tape to the protuberance of the occipital region at the back of the head. Take the measurement in cm (BARROS et al., 2008; BARROS et al., 2021)
.

How to interpret the Head circumference?

MICROCEPHALY:
Smaller than average: Percentile < 3rd or Z-score < -2

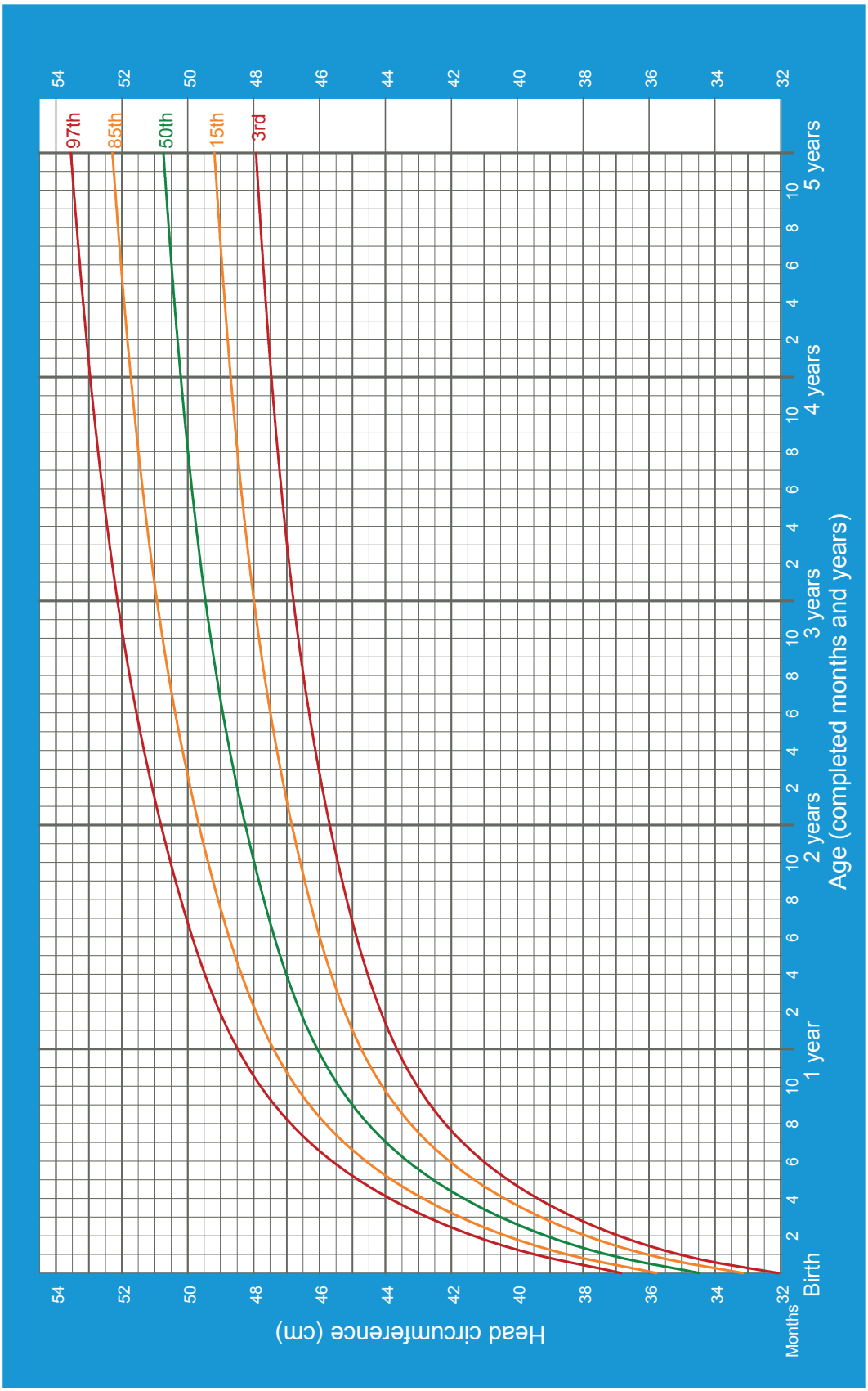
MACROCEPHALY:
Larger than average: Percentile < 97th or Z-score < -2

It is important to note that even small differences in percentiles at the extremes (percentiles < 3rd or >97th) represent clinically important differences such that close attention should be paid to measurements falling outside the normal range.

NORMAL LIMITS: Percentile ≥ 3rd and ≤97th OR Z-score ≥ -2 and ≤ +2.

HEAD CIRCUMFERENCE

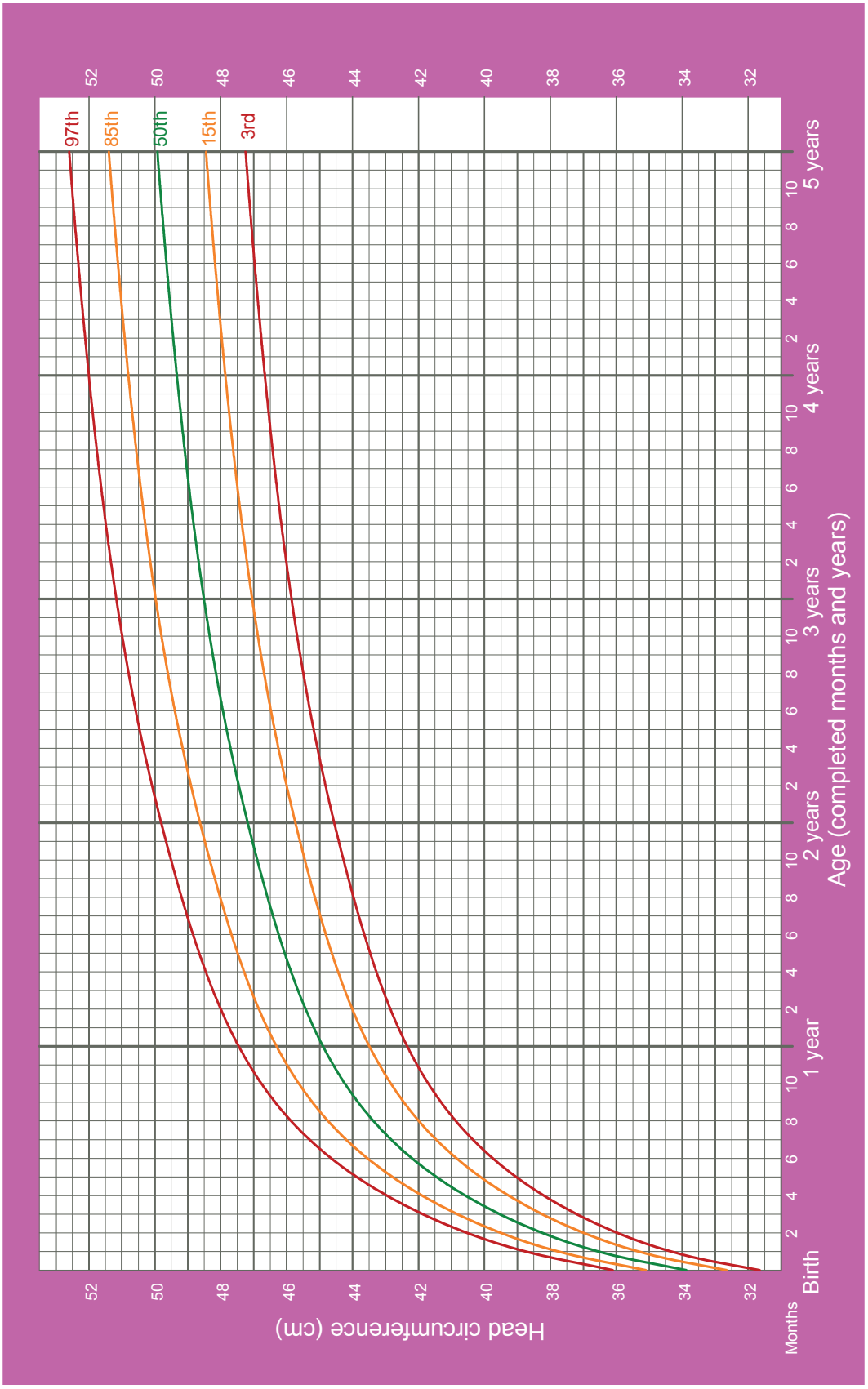
BOYS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

HEAD CIRCUMFERENCE

GIRLS FROM 0 TO 5 YEARS OLD



WHO Child Growth Standards

Brachial Circumference

Brachial circumference or mid-upper arm circumference (MUAC) serves as an indicator of muscle growth and reflects the adequacy of protein intake. It provides an estimation of protein and adipose tissue levels (Duarte and Castellani, 2002).

To measure MUAC: Measure at the central point of the left arm (by convention), between the bone segments of the acromion in the scapula and the olecranon in the ulna. Use a millimeter cellulose tape that is inextensible and inelastic (such as a tape measure), with a precision of 0.1 cm. Have the patient stand (for children) or sit on the lap (for infants). Ensure the arm is positioned vertically, keeping it relaxed and extended, with the palm of the hand facing the thigh. Place the measuring tape around the midpoint of the arm, without compressing the tissues. Take the measurements without stretching the tape and record the result at the nearest 0.1 cm (Duarte and Castellani, 2002).

Classification according to the WHO (2006 and 2007) by percentiles

Brachial circumference (MUAC)-for-age

ARM CIRCUMFERENCE	
Critical Values	Nutritional Diagnosis
percentile < 5^{th}	Risk of wasting
percentile ≥ 5^{th} and ≤ 95^{th}	Eutrophy
percentile > 95^{th}	Risk of excess weight

Source: *BRASIL*, 2004; *SOCIEDADE BRASILEIRA DE PEDIATRIA*, 2006; *OMS*, 2006.

MUAC values in percentiles (Frisancho, 1990)

MID-UPPER ARM CIRCUMFERENCE (MUAC)												
Age (years)	N	Average	SD	Percentiles								
				5	10	15	25	50	75	85	90	95
GENDER: MALE												
1-1.9	681	16.1	1.2	14.2	14.7	14.9	15.2	16.0	16.9	17.4	17.7	18.2
2-2.9	672	16.4	1.4	14.3	14.8	15.1	15.5	16.3	17.1	17.6	17.9	18.6
3-3.9	715	16.9	1.4	15.0	15.3	15.5	16.0	16.8	17.6	18.1	18.4	19.0
4-4.9	708	17.2	1.4	15.1	15.5	15.8	16.2	17.1	18.0	18.5	18.7	19.3
5-5.9	676	17.7	1.8	15.5	16.0	16.1	16.6	17.5	18.5	19.1	19.5	20.5
6-6.9	298	18.3	2.1	15.8	16.1	16.5	17.0	18.0	19.1	19.8	20.7	22.8
7-7.9	312	19	2.1	16.1	16.8	17.0	17.6	18.7	20.0	21.0	21.8	22.9
8-8.9	296	19.6	2.3	16.5	17.2	17.5	18.1	19.2	20.5	21.6	22.6	24.0
9-9.9	322	20.7	2.7	17.5	18.0	18.4	19.0	20.1	21.8	23.2	24.5	26.0
10-10.9	333	21.8	3	18.1	18.6	19.1	19.7	21.1	23.1	24.8	26.0	27.9
11-11.9	324	22.8	3.4	18.5	19.3	19.8	20.6	22.1	24.5	26.1	27.6	29.4
12-12.9	349	23.8	3.5	19.3	20.1	20.7	21.5	23.1	25.4	27.1	28.5	30.3
13-13.9	350	24.8	3.3	20.0	20.8	21.6	22.5	24.5	26.6	28.2	29.0	30.8
14-14.9	358	26.2	3.5	21.6	22.5	23.2	23.8	25.7	28.1	29.1	30.0	32.3
15-15.9	359	27.3	3.2	22.5	23.4	24.0	25.1	27.2	29.0	30.3	31.2	32.7
16-16.9	350	28.7	3.2	24.1	25.0	25.7	26.7	28.3	30.6	32.1	32.7	34.7
17-17.9	339	29	3.4	24.3	25.1	25.9	26.8	28.6	30.8	32.2	33.3	34.7
GENDER: FEMALE												
1-1.9	622	15.7	1.3	13.6	14.1	14.4	14.8	15.7	19.4	17.0	17.2	17.8
2-2.9	615	16.2	1.3	14.2	14.6	15.0	15.4	16.1	17.0	17.4	18.0	18.5
3-3.9	651	16.6	1.4	14.4	15.0	15.2	15.7	16.6	17.4	18.0	18.4	19.0
4-4.9	680	17.1	1.5	14.8	15.3	15.7	16.1	17.0	18.0	18.5	19.0	19.5
5-5.9	673	17.7	1.8	15.2	15.7	16.1	16.5	17.5	18.5	19.4	20.0	21.0
6-6.9	296	18.2	2	15.7	16.2	16.5	17.0	17.8	19.0	19.9	20.5	22.0
7-7.9	330	19	2.2	16.4	16.7	17.0	17.5	18.6	20.1	20.9	21.6	23.3
8-8.9	275	20	2.6	16.7	17.2	17.6	18.2	19.5	21.2	22.2	23.2	25.1
9-9.9	321	21.1	2.8	17.6	18.1	18.6	19.1	20.6	22.2	23.8	25.0	26.7
10-10.9	330	21.8	3.1	17.8	18.4	18.9	19.5	21.2	23.4	25.0	26.1	27.3
11-11.9	302	23.2	3.6	18.8	19.6	20.0	20.6	22.2	25.1	26.5	27.9	30.0
12-12.9	324	24	3.4	19.2	20.0	20.5	21.5	23.7	25.8	27.6	28.3	30.2
13-13.9	361	25	3.7	20.1	21.0	21.5	22.5	24.3	26.7	28.3	30.1	32.7
14-14.9	370	25.9	3.6	21.2	21.8	22.5	23.5	25.1	27.4	29.5	30.9	32.9
15-15.9	309	25.9	3.5	21.6	22.2	22.9	23.5	25.2	27.7	28.8	30.0	32.2
16-16.9	343	26.8	3.5	22.3	23.2	23.5	24.4	26.1	28.5	29.9	31.6	33.5
17-17.9	293	27.3	4.1	22.0	23.1	23.6	24.5	26.6	29.0	30.7	32.8	35.4

References

ALEXANDER GR, HIMES JH, KAUFMAN RB, MOR J, KOGAN MA. United State national reference for fetal growth. Obstetrics&Gynecology, v.87, n2, p.163-168, fev. 1996.

BARROS SP, ARENA EP, PEREIRA AC. Guia prático: Avaliação Antropométrica em Pediatria, 2008, São Paulo. ed. Ponto Crítico, 176p.

BARROS SP, TONELLO C, ALONSO N et al.. Guia de medidas antropométricas para crianças com fissura labiopalatina. Smile Train e HRAC. Universidade de São Paulo. 11p., 2021.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Orientações para a coleta e análise de dados antropométricos em serviços de saúde : Norma Técnica do Sistema de Vigilância Alimentar e Nutricional - SISVAN / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – Brasília : Ministério da Saúde, 2011. 76 p. : il. – (Série G. Estatística e Informação em Saúde) ISBN 978-85-334-1813-4.

BOULET SL, ALEXANDER GR, SALIHU HM, KIRBY RS, CARLO WA. Fetal growth risk curves: defining levels of fetal growth restriction by neonatal death risk. Am J Obstet Gynecol. 2006;195(6):1571-7.

DUARTE AC, CASTELLANI FR. Semiologia Nutricional. Axcel Books do Brasil Editora. Rio de Janeiro, 2002. 115p.

FRISANCHO AR. Anthropometric standards for the assessment of growth and nutritional status. Ann Arbor: University of Michigan Press, 1989. 189p.

GARDOSI J, MADURASINGHE V, WILLIAMS M, MALIK A, FRANCIS A. Maternal and fetal risk factors for stillbirth: population based study. BMJ. 2013;346:f108.

GIULIANI F, CHEIKH IL, BERTINO E, BHUTTA ZA, OHURNA EO, ROVELLI I et al. Monitoring postnatal growth of preterm infants: present and future. Am J Clin Nutr 2016, 103(2):635S-47S. doi: 10.3945/ajcn.114.106310

INTERGROWTH-21st International Fetal and Newborn Growth Standards for the 21st Century April 2012 University of Oxford. 59p.

LOPES JMA et al, Monitoramento do crescimento de RN pré-termos, Departamento Científico de Neonatologia • Sociedade Brasileira de Pediatria, nº 1, fev 2017.

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES), 2003-2004. Source: Inter-university Consortium for Political and Social Research (ICPSR).

ONIS M, ONYANGO AW, BORGHI E, SIYAM A, NISHIDA C, SIEKMANN J. Developmente of a WHO growth reference for school-aged children and adolescentes. Bulletin of the World Health Organization, set. 2007, 85(1), p.660-667.

RUGULO LM. Peso de nascimento: motivo de preocxupação em curto e longo prazo. J.Pediatr. Rio de Janeiro, v.81, p.359-360, 2005.

RODRIGUES FP, MARTINELLI S, BITTAR RE, FRANCISCO RPV, ZUGAIB M. Comparação entre duas curvas de crescimento para o diagnóstico de recém-nascidos pequenos para a idade gestacional. Rev. Bras.Ginecol.Obstet., 37(2), fev. 2015, 9p.

SOCIEDADE BRASILEIRA DE PEDIATRIA, SBP. Monitoramento do crescimento de RN pré-termo. Documento Científico do Departamento Científico de Neonatologia, n.1, fevereiro de 2017. 6p.

VILLAR J, GIULIANI F, BHUTTA ZA, BERTINO E, OHUMA EO, ISMAIL LC et al. Postnatal growth standards for preterm infants: the Preterm Postnatal Follow-up Study of the INTERGROWTH-21(st) Project. Lancet Glob Health. 2015;3(11):e681-91.

WHO child growth standards : length/height-for-age, weight-for-age, weight-for-length, weight-forheight and body mass index-for-age : methods and development. Coordinating team: Mercedes de Onis ... [et al.]. ISBN 92 4 154693 X

ISBN: 978-65-981201-4-6

Smile Train is an international charity, a world leader in cleft and lip palate treatment. Your treatment center is a partner of **Smile Train.**

Follow us on our social networks:

@smiletrainbrasil

smiletrainbrasil.com

CHANGING THE WORLD ONE SMILE AT A TIME

Hospital de Reabilitação de Anomalias Craniofaciais
Universidade de São Paulo

SmileTrain