Clinician guidelines for diagnosing malnutrition: undernutrition & obesity

Purpose: Develop uniform criteria and terminology to diagnose and document malnutrition (undernutrition and obesity).

How to use the diagnostic criteria:

- If a patient meets multiple indicators for malnutrition, the most severe diagnosis should be used.
- The tables below should not be used in isolation to diagnose malnutrition or obesity. Physical assessment, genetic height potential, and growth channeling should be considered. Assignment of a malnutrition diagnosis may not be appropriate if full patient assessment does not support the diagnosis.
- Specialty growth charts should not be used when classifying for malnutrition or obesity.
- **Clinical judgment should always be used when assigning a malnutrition or obesity diagnosis.**

PEDIATRIC CRITERIA:

- Only one of the following indicators is required to diagnose a patient with malnutrition.
- Premature infants/ Neonates: American Society for Parenteral and Enteral Nutrition (ASPEN) / Academy of Nutrition and Dietetics (AND) published malnutrition criteria for premature infants/neonates in 2018 (1). The evidence supporting the criteria is weak and therefore these criteria are not included in the guidelines below. Please see Appendix A for assessing nutritional status in premature infants and neonates.

Growth references

- Fenton growth reference: Premature infants (born <37 weeks gestational age) up to post-menstrual age (PMA) of 50 weeks
- WHO growth standard: Full term infants (born >37 weeks gestational age) and preterm infants > 40 weeks PMA to 2 years of age
- CDC growth reference: Children between 2 and 20 years of age.

Undernutrition Criteria

- These indicators are for 1 month (1 month corrected for preterm infants) to 18 years of age.

***Table 1. SINGLE* DATA POINT AVAILABLE:**			
Primary Indicator	**Mild protein calorie malnutrition** **Consider ICD-10 code: E44.1**	**Moderate protein calorie malnutrition** **Consider ICD-10 code: E44.0**	**Severe protein calorie malnutrition** **Consider ICD-10 code: E43**
Weight-for-height/length *z* score (<2 years old)	-1 to -1.9	-2 to -2.9	≤-3
BMI *z* score (>2 years old)	-1 to -1.9	-2 to -2.9	≤-3
Height/Length-for-age *z* score	n/a	-2 to -2.9	≤-3
Mid Upper Arm Circumference (MUAC) *z* score* (3 months to 18 years)	-1 to -1.9	-2 to -2.9	≤-3
MUAC measurement (6 months to 5 years)	n/a	11.5-12.5 cm	<11.5 cm

This table was created based on the AND/ASPEN[1] malnutrition consensus statement criteria and WHO criteria [2 3]. Presence of edema from the WHO criteria was excluded since edema is often not nutritionally related in the hospitalized patient.
*See Appendix C for MUAC growth references. WHO z-scores for 3 months to 5 years and Mramba z-scores for 5 to 18 years.

Table 2. MULTIPLE DATA POINTS AVAILABLE Acute: <3 months Chronic: ≥3 months			
Primary indicator	**Mild protein calorie malnutrition** **Consider ICD-10 code: E44.1**	**Moderate protein calorie malnutrition** **Consider ICD-10 code: E44.0**	**Severe protein calorie malnutrition** **Consider ICD-10 code: E43**
Weight Gain Velocity (1 month -2 years)	<75% of the norm for expected weight gain	<50% of the norm for expected weight gain	<25% of the norm for expected weight gain
Unplanned Weight Loss (2-18 years)	5% of usual BW	7.5% of usual BW	10% of usual BW
Unplanned Deceleration in WHZ/BMI	Decline of 1 z-score	Decline of 2 z-scores	Decline of 3 z-scores
Energy intake should be used as a secondary indicator to diagnose malnutrition. If anthropometrics are unavailable or unreliable, one can use intake in the context of other physical findings.			
Inadequate nutrient intake	51-75% estimated energy/protein need	26-50% estimated energy/protein need	≤25% estimated energy/protein need
	1-12 months = 3 days	1-10 years = 5 days	> 10 years = 7 days
This table was created based on the AND/ASPEN [1] malnutrition consensus statement criteria.			

Overweight/Obesity Criteria

- These classifications are for patients 2 to <18 years old

Classification	**BMI**	**Relevant ICD 10 codes.** ***Please choose the most specific code on your review***
Overweight	≥85th to ≤95th percentile	E66.3 Overweight
Obesity	≥95th percentile	E66.9 Obesity, unspecified
Severe Obesity	≥120% of the 95th percentile, or a BMI ≥35 (whichever is lower)	E66.01 Morbid (Severe) Obesity
This table was created based on expert committee recommendations (American Medical Association, the Health Resources and Service Administration, and the CDC) [4], and the scientific statement from the AHA on severe obesity in children and adolescents [5].		

ADULT MALNUTRITION CRITERIA:

- For patients ≥ 18 years old

Underweight Criteria

- 2 of the 6 clinical characteristics must be met for a malnutrition (undernutrition) diagnosis
- Mild protein calorie malnutrition was not defined in the Adult AND/ASPEN malnutrition consensus statement

Clinical Characteristics	Moderate protein calorie malnutrition Consider ICD-10 code: E44.0		Severe protein calorie malnutrition Consider ICD-10 code: E43	
Weight Loss, % (weight loss over defined time period)	Acute illness	1-2%, 1 week 5%, 1 month 7.5%, 3 months	Acute illness	>2%, 1 week >5%, 1 month >7.5%, 3 months
	Chronic illness / Environmental	5%, 1 month 7.5%, 3 month 10%, 6 months 20%, 1 year	Chronic illness / Environmental	>5%, 1 month >7.5%, 3 month >10%, 6 months >20%, 1 year
Energy Intake	< 75% of estimated energy requirements Acute illness: for > 7 days Chronic illness: for ≥ 1 month Environmental: for ≥ 3 month		≤ 50% of estimated energy requirements Acute illness: for ≥ 5 days Chronic illness: for ≥ 1 month Environmental: for ≥ 1 month	
Loss of Body Fat Loss of subcutaneous fat (eg. Orbital, triceps, fat overlying the ribs)	Mild		Severe	
Loss of Muscle Mass Muscle loss (eg. Muscle loss of the temples, clavicles, shoulders, interosseous muscles, scapula, thigh, and calf)	Mild		Severe	
Fluid Accumulation Generalized or localized fluid accumulation evident on exam (extremities, vulvar/scrotal edema, or ascites)	Mild		Severe Acute illness: Moderate to Severe	
Reduced Hand Grip Strength Use normative standards provided by the manufacturer of the measurement device	n/a		Measurable reduced	
Chart was developed based on the AND/ASPEN malnutrition consensus statement on adult malnutrition[6].				

Overweight/Obesity Criteria

Classification	BMI	Relevant ICD 10 codes. *Please choose the most specific code on your review*
Overweight	25 to <30 kg/m^2	E66.3 Overweight
Class 1 Obesity	30 to <35 kg/m^2	E66.9 Obesity, unspecified
Class 2 Obesity	35 to <40 kg/m^2	E66.9 Obesity, unspecified
Class 3 (Severe) Obesity	>40 kg/m^2	E66.01 Morbid (Severe) Obesity
This table was created based on NIH criteria [8] which was endorsed by the CDC[9].		

Document Attributes

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Appendix

Appendix A: Assessing nutritional status in premature infant (< 37 weeks gestational age) and neonates (0 to 30 days)

Growth References

- Fenton growth reference: Premature infants (born <37 weeks gestational age) up to post-menstrual age (PMA) of 50 weeks
    - Typically premature infants are transitioned from the Fenton to the WHO growth reference between 40 and 44 weeks PMA.
- WHO growth standard: Full term infants (born >37 weeks gestational age) and preterm infants > 40 weeks PMA to 2 years of age

Size for Gestational Age

Size for gestational age is based on measurements at birth, and not measurements in utero.[10] **Each measurement type (weight, length, head circumference) should be separately classified as SGA, AGA, or LGA.** *SGA carries an elevated risk of developing metabolic disease in later life. [11]

Classifications [10]

- Small for gestational age (SGA): <10% at birth for weight, length, or head circumference
- Appropriate for gestational age (AGA): 10-90th%ile at birth for weight, length, or head circumference
- Large for gestational age (LGA): >90th%ile at birth for weight, length, or head circumference

Intrauterine growth restriction (IUGR): IUGR is a fetal diagnosis, when the fetus does not achieve the expected in utero growth potential due to genetic or environmental factors. [12] Traditionally, it is defined as <10th percentile weight for gestational age on a singleton growth curve [13] or diagnosed by at least two ultrasound measurements [14].

- IUGR does not always result in SGA; the fetus could be IUGR and the infant can be born AGA.

Growth goals

Weight: Controversy exists over the definition of optimal growth rates in preterm infants (g/kg/day vs g/day).

A commonly used growth goal is 18-22 g/kg/day for infants <2 kg [15].

How to calculate g/kg/day = $[(W_2\ (g) - W_1(g))\ /days] \div [(W_1(kg) + W_2(kg)/\ 2]$

**Note weight is expressed in grams for the first part of the equation and kg for the second part*

Below are goals for g/day based off the 50%ile of the Fenton growth chart. Please refer to Appendix B for more in depth growth velocity tables (g/day) based on the Fenton and WHO growth references.

	Boys	Girls
Gestational age (weeks)	Mean weight gain (g/day)	
23-28	11-18	10-17
28-32	20-30	19-28
32-38	30-35	30-34
38-44	30-35	25-30

Weight loss After birth: Expected initial postnatal weight loss ranges between 8 to 15%, with greater loss in extremely preterm infants. Birth weight is typically regained by 2-3 weeks of life. [10]

Length: 1 cm/week [16]

Head Circumference: 0.5–1 cm/week[16]

Appendix B: Growth Velocities

The following growth velocity charts were created based on infants and children growing at the 50th%ile. For infants and children growing at higher or lower percentages, they may have different growth than this standard. Use http://www.peditools.org/ to determine the appropriate growth velocity for their pecentile.

Mean Increments in Weight and Length Gain for Boys and Girls using Fenton Growth Charts

	Boys			Girls		
Gestational age (weeks)	Weight g/day	Weight g/week	Length cm/week	Weight g/day	Weight g/month	Length cm/week
23-24 weeks	11	80	1.4	10	69	1.3
24-25 weeks	13	90	1.4	13	88	1.3
25-26 weeks	14	100	1.4	14	98	1.4
26-27 weeks	16	111	1.4	15	107	1.4
27-28 weeks	18	126	1.4	17	119	1.4
28-29 weeks	21	144	1.4	19	135	1.4
29-30 weeks	24	165	1.4	22	154	1.4
30-31 weeks	27	189	1.4	25	177	1.4
31-32 weeks	30	212	1.4	28	199	1.4
32-33 weeks	33	228	1.4	31	216	1.4
33-34 weeks	34	236	1.3	33	229	1.3
34-35 weeks	34	238	1.3	34	237	1.3
35-36 weeks	33	233	1.2	34	239	1.2
36-37 weeks	32	221	1.1	33	234	1.1
37-38 weeks	30	209	1.0	31	215	1.0
38-39 weeks	29	205	1.0	27	190	1.0
39-40 weeks	30	207	0.9	25	176	0.9
40-41 weeks	31	217	0.9	26	181	0.9
41-42 weeks	33	229	0.9	27	192	0.8
42-43 weeks	34	237	0.9	29	200	0.8
43-44 weeks	34	240	0.9	29	205	0.8

Based on Data Table for Boys and Girls growing at the 50th%ile of the Fenton Growth Charts. Values calculated based on www.peditools.org by taking weekly weight and length gain to maintain 50th percentile using the Fenton Growth Chart.

Mean Increments in Weight and Length Gain for Boys and Girls using WHO Growth Charts

	Boys			Girls		
Age (months)	Weight g/day	Weight g/month	Length cm/month	Weight g/day	Weight g/month	Length cm/month
0-1	37.4	1124	4.8	31.3	955	4.5
1-2	36.5	1096	3.7	33.7	940	3.3
2-3	27.1	808	3	23.9	717	2.7
3-4	20.5	626	2.5	19.2	577	2.2
4-5	16.9	508	2	15.8	474	1.9
5-6	14	423	1.7	13.3	398	1.7
6-7	11.9	363	1.5	11.5	345	1.5
7-8	10.5	318	1.4	10.3	306	1.4
8-9	9.5	286	1.3	9.1	276	1.3
9-10	8.6	263	1.3	8.4	254	1.3
10-11	8.1	247	1.2	7.8	239	1.2
11-12	7.8	235	1.2	7.7	228	1.2
12-24	6-7	208	1.1	6-7	210	1.0

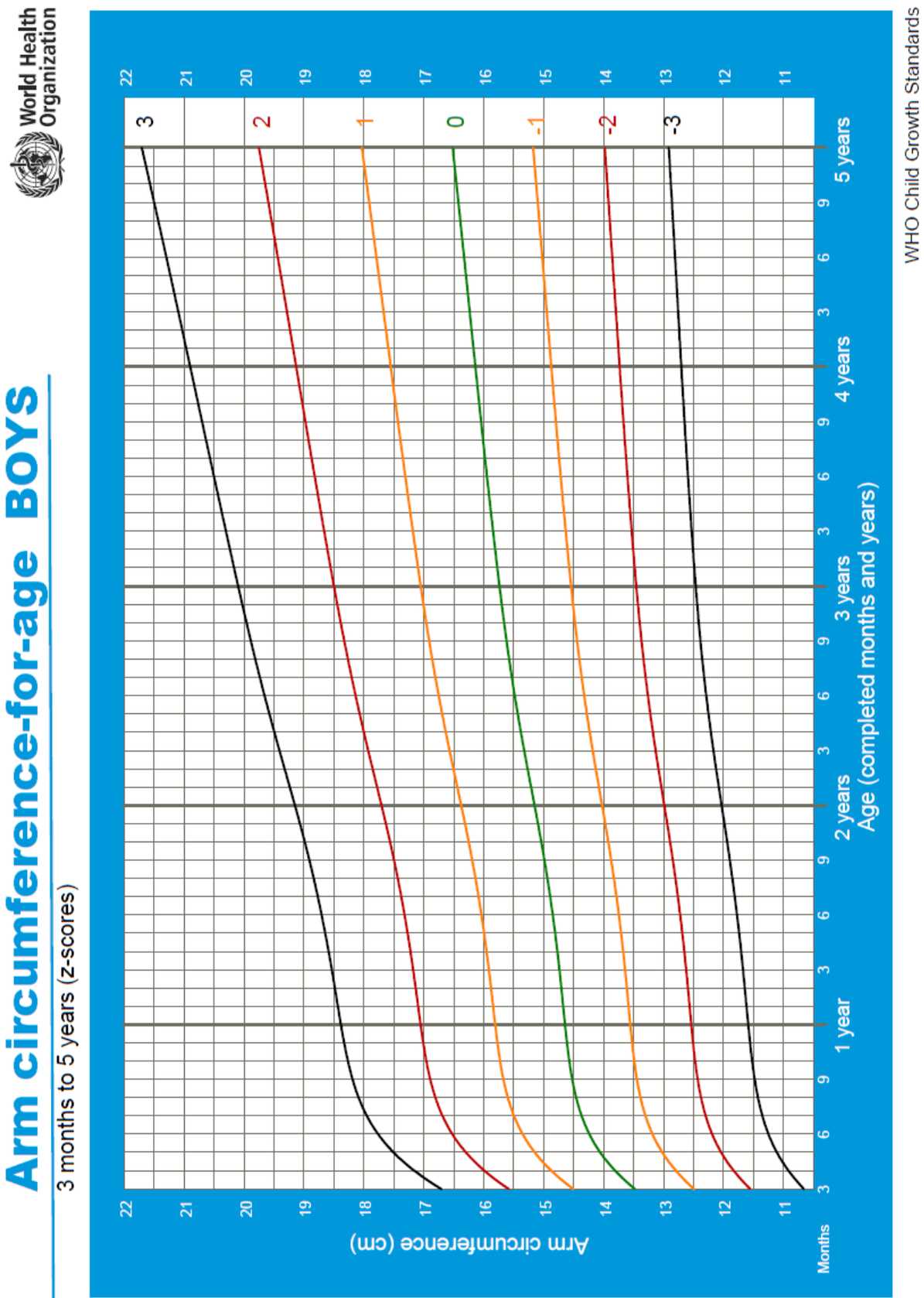
Based on Data Table for Boys and Girls growing at the 50th%ile of the WHO Growth Charts. Values were listed by month and for weight and length, and then extrapolated by 30 to obtain the per day values.
http://www.cdc.gov/growthcharts/who_charts.htm

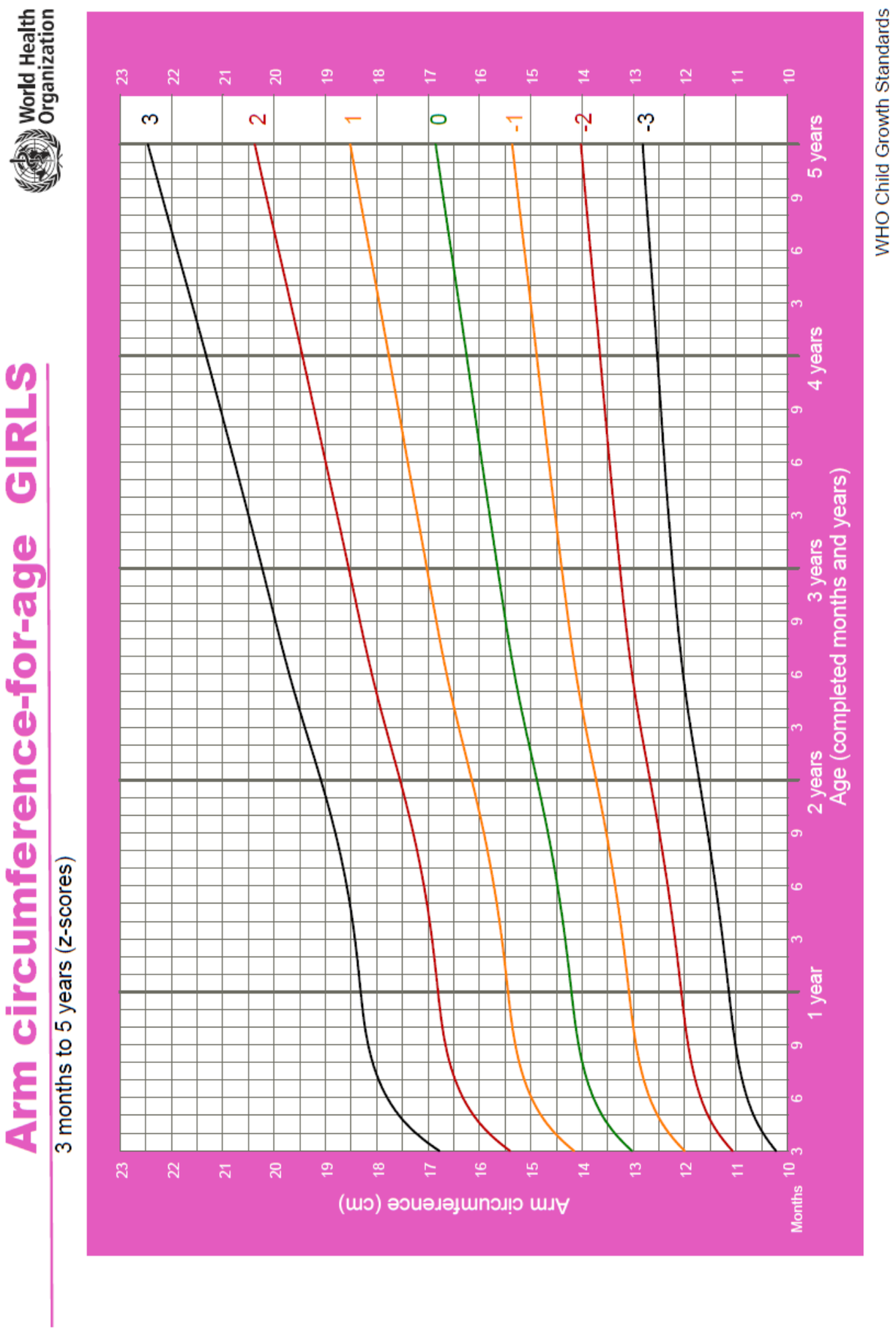
Mean Increments In Weight and Height for Boys and Girls Using CDC Growth Charts								
	Boys				Girls			
Age (months)	Weight g/month	Weight kg/year	Height cm/month	Height cm/year	Weight g/month	Weight kg/year	Height cm/month	Height cm/year
2-3 y	132	1.6	0.7	9	148	1.8	0.8	9
3-4 y	156	1.9	0.6	7	156	1.9	0.5	6
4-5 y	181	2.2	0.5	6	173	2.1	0.6	7
5-6 y	189	2.3	0.6	7	189	2.3	0.6	7
6-7 y	197	2.4	0.5	6	214	2.6	0.6	7
7-8 y	205	2.5	0.5	6	230	2.8	0.5	6
8-9 y	247	3.0	0.5	6	279	3.4	0.4	5
9-10 y	271	3.3	0.4	5	321	3.9	0.4	5
10-11y	329	4.0	0.4	5	353	4.3	0.5	6
11-12y	378	4.6	0.5	6	362	4.4	0.7	8
12-13y	419	5.1	0.6	7	345	4.2	0.5	6
13-14y	444	5.4	0.6	7	296	3.6	0.25	3
14-15y	436	5.3	0.5	6	214	2.6	0.08	1
15-16y	378	4.6	0.3	4	156	1.9	0.08	1
16-17y	304	3.7	0.2	2	99	1.2	0.08	1
17-18y	214	2.6			90	1.1		
18-19y	156	1.9			90	1.1		
19-20y	123	1.5			74	0.9		

Adapted from ADA Pocketguide to Pediatric nutrition assessment. Based on increases in weight and stature at the 50th%ile of the CDC growth charts. Data source: Centers for Disease Control and Prevention. Percentile Data Files with LMS Values. Available at: http://www.cdc.gov/nchs/about/major/nhances/growthcharts/datafiles.htm

Appendix C: MUAC growth references

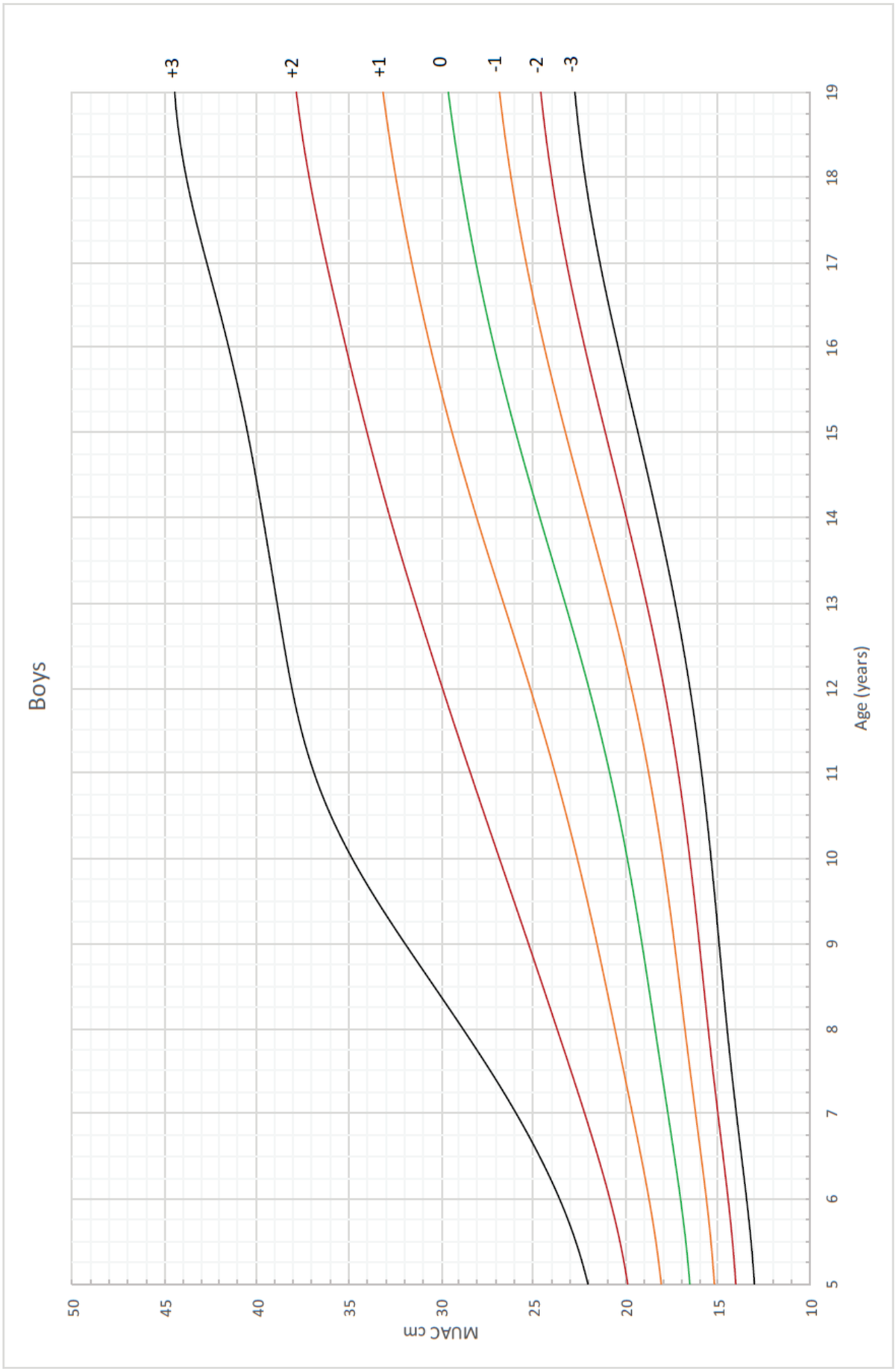
3 months to 5 years MUAC reference [17]

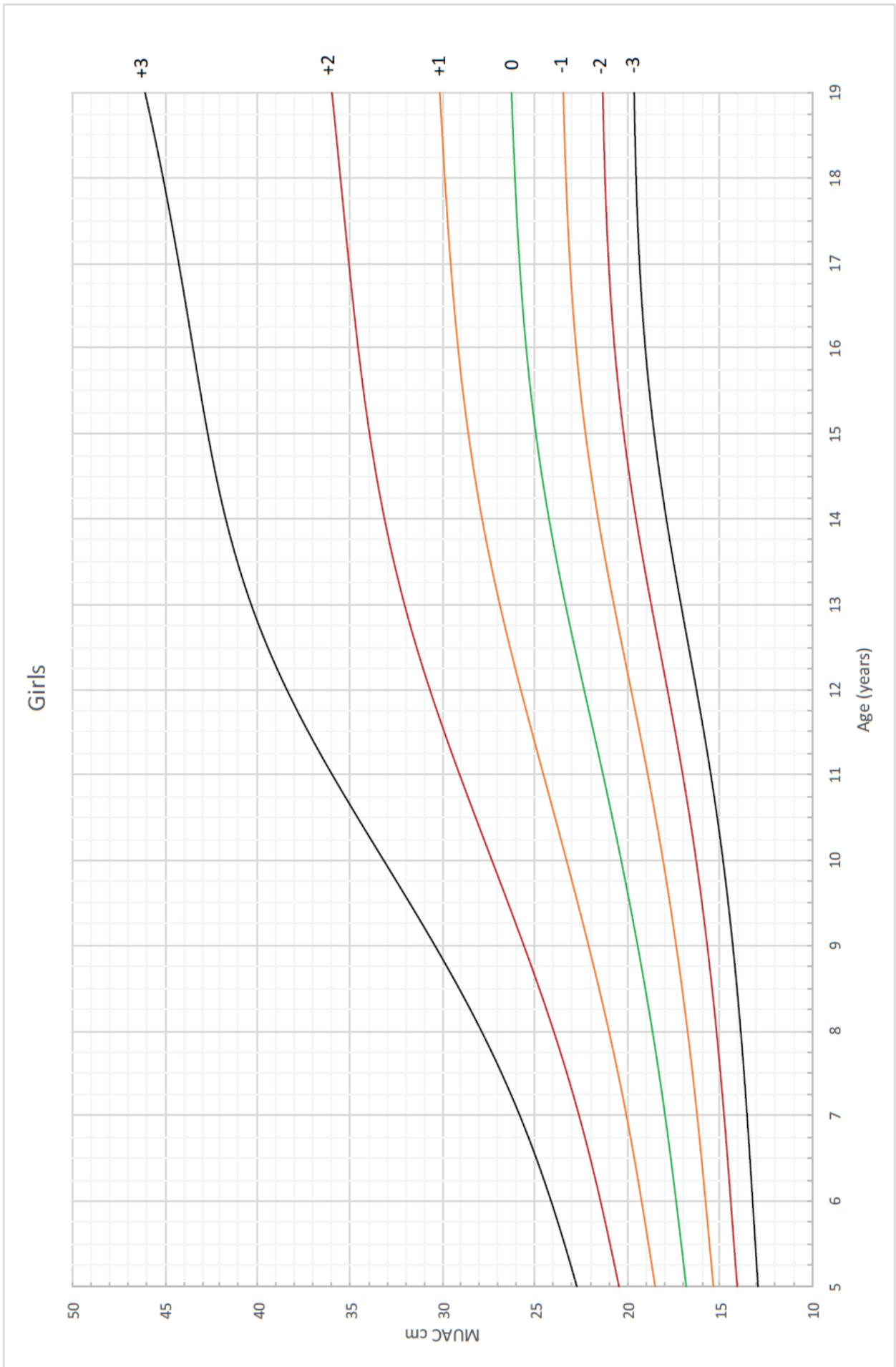



World Health Organization
Arm circumference-for-age GIRLS
3 months to 5 years (z-scores)
Arm circumference (cm)
Months
1 year
2 years
3 years
4 years
5 years
Age (completed months and years)
3
2
1
0
-1
-2
-3
WHO Child Growth Standards

5-18 years MUAC reference [18]

While this reference has z-score values for children up to 19 years, the malnutrition classification criteria are for children up to 18 years old.




+3
+2
+1
0
-1
-2
-3
Girls
MUAC cm
Age (years)
50
45
40
35
30
25
20
15
10
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19