

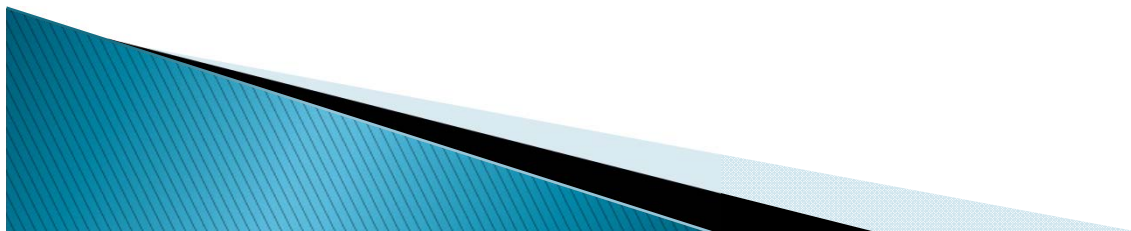


Growth Charts

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What are Growth Charts?

- ▶ Growth charts consist of a series of percentile curves that illustrate the distribution of selected body measurements in children.



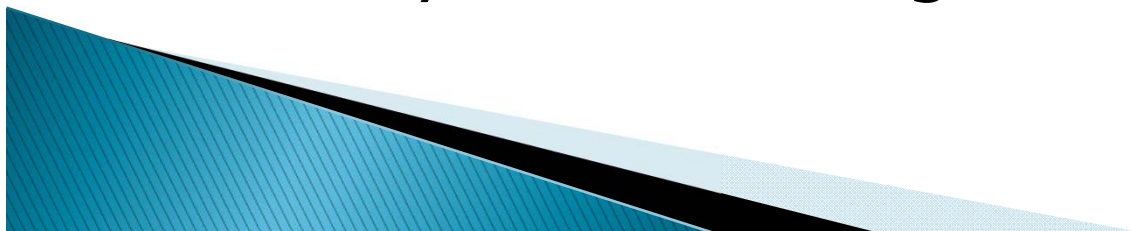
Which all Growth Charts are available?

- ▶ National Center for Health Statistics (NCHS/1977)
- ▶ Centers for Disease Control and Prevention (CDC/2000)
- ▶ WHO MGRS 2006.

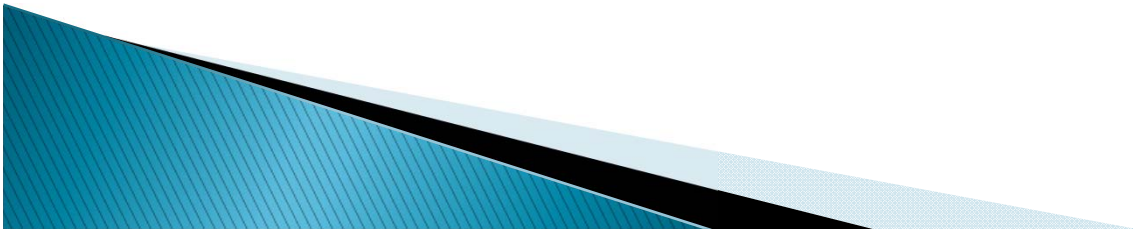


Multicentre Growth Reference Study (MGRS)

- ▶ Between 1997 and 2003
- ▶ The MGRS combined a longitudinal follow-up from birth to 24 months and a cross-sectional survey of children aged 18 to 71 months.
- ▶ The mothers of the children selected for the construction of the standards engaged in fundamental health-promoting practices, namely breastfeeding and not smoking.



Reference vs Standard



Reference vs Standard

- ▶ *Whereas the WHO charts are growth standards, describing the growth of healthy children in optimal conditions, the CDC charts are a growth reference, describing how certain children grew in a particular place and time.*




Selection of communities

- ▶ High socioeconomic status.
- ▶ Low altitude (<1500 m).
- ▶ Low population mobility, allowing for a 2-year follow-up.
- ▶ A minimum of 20% of mothers in the community were already following the international feeding recommendations.



Selection of communities cont...

- ▶ Study sites had to have a research institution capable of conducting the study.
 - ▶ Feeding criteria specified that infants had to follow international infant feeding recommendations, including predominantly breastfeeding for at least 4 months.
 - ▶ Introducing complementary foods by at least 6 months but not before 4 months.
 - ▶ Continued breastfeeding for at least 12 months (no upper limit on breastfeeding duration).
 - ▶ Study sites had to have a breastfeeding support system.
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Exclusion Criteria

- ▶ Maternal smoking during pregnancy or lactation.
- ▶ Prematurity (<37 weeks gestation).
- ▶ High gestational age (≥ 42 weeks).
- ▶ Multiple births.
- ▶ Substantial morbidity.
- ▶ Low socioeconomic status.
- ▶ Unwillingness of the mother to follow feeding criteria.



MGRS Data: Salient Features

- ▶ Based on healthy children living under conditions likely to favor achievement of their full genetic growth potential.
- ▶ It included children from a diverse set of countries: Brazil, Ghana, India, Norway, Oman and the USA.
- ▶ By selecting privileged, healthy populations, the study reduced the impact of environmental variation.
- ▶ Identify breastfeeding as the biological norm and establish the breastfed child as the normative model for growth and development.



- ▶ Include windows of achievement for six gross motor–developmental milestones:

Sitting without support

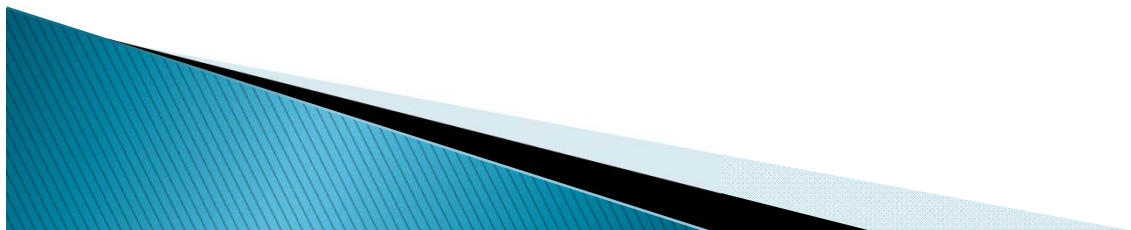
Hands–and–knees crawling

Standing with assistance

Walking with assistance

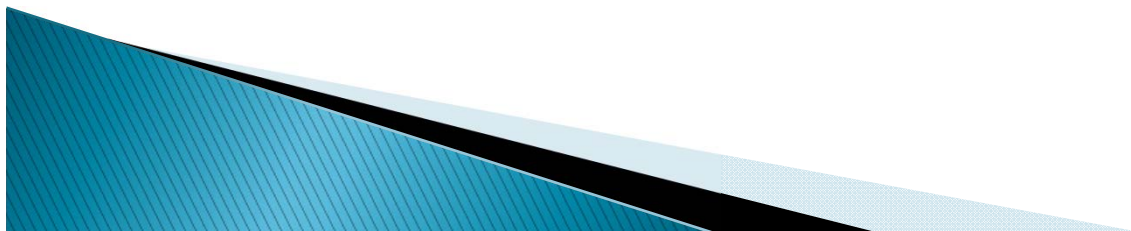
Standing alone

Walking alone



Child growth assessment

- ▶ Measure weight, length or height.
- ▶ Calculate body mass index (BMI).
- ▶ Plot these measurements on growth charts.
- ▶ Interpret growth indicators.



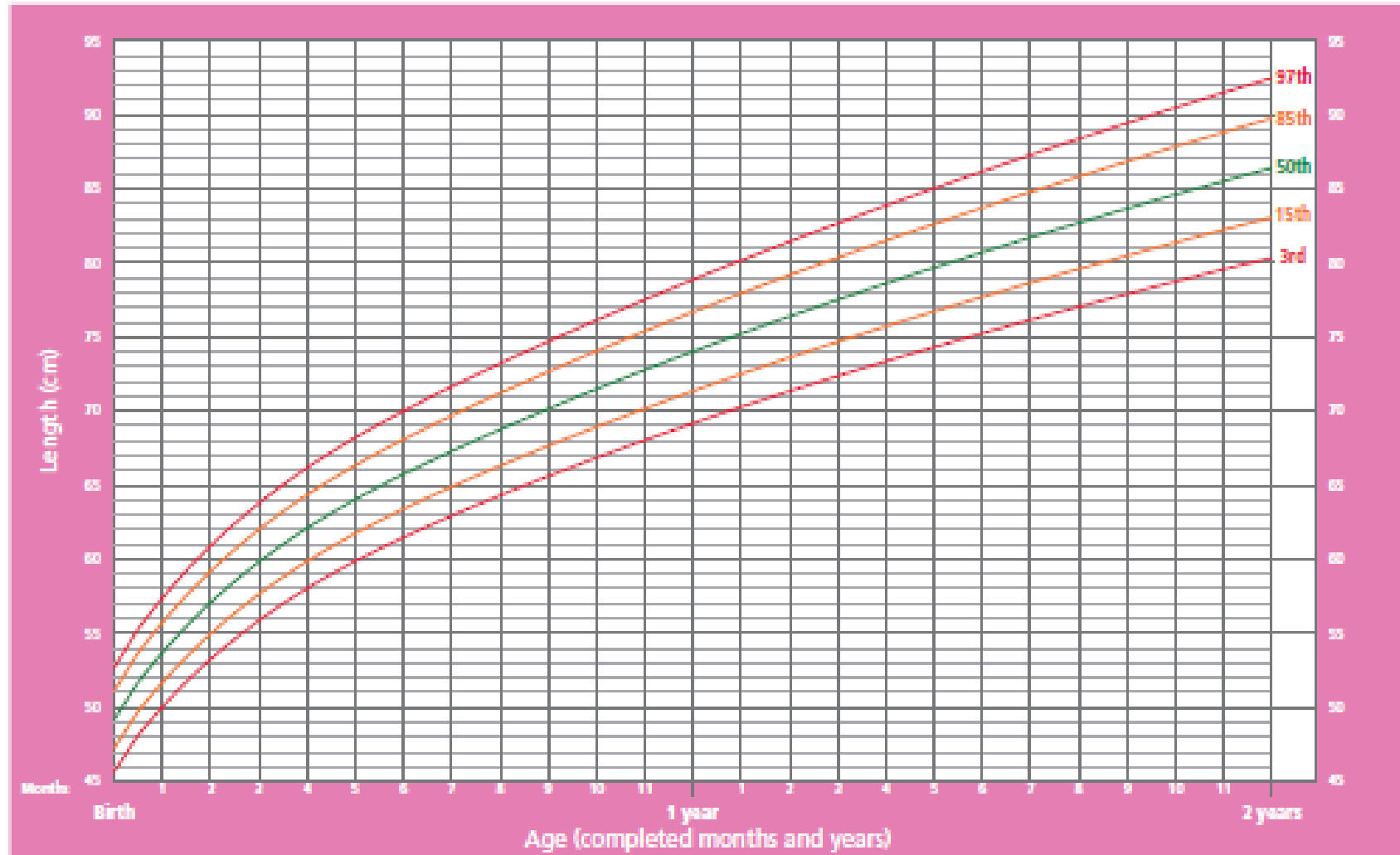
MGRS Growth Charts

- ▶ Length/height-for-age
- ▶ Weight-for-age
- ▶ Weight-for-length
- ▶ Weight-for-height
- ▶ Body mass index-for-age (BMI-for-age)
- ▶ Head circumference-for-age
- ▶ Arm circumference-for-age
- ▶ Subscapular skinfold-for-age
- ▶ Triceps skinfold-for-age
- ▶ Motor development milestones
- ▶ Weight velocity
- ▶ Length velocity
- ▶ Head circumference velocity



Length-for-age GIRLS

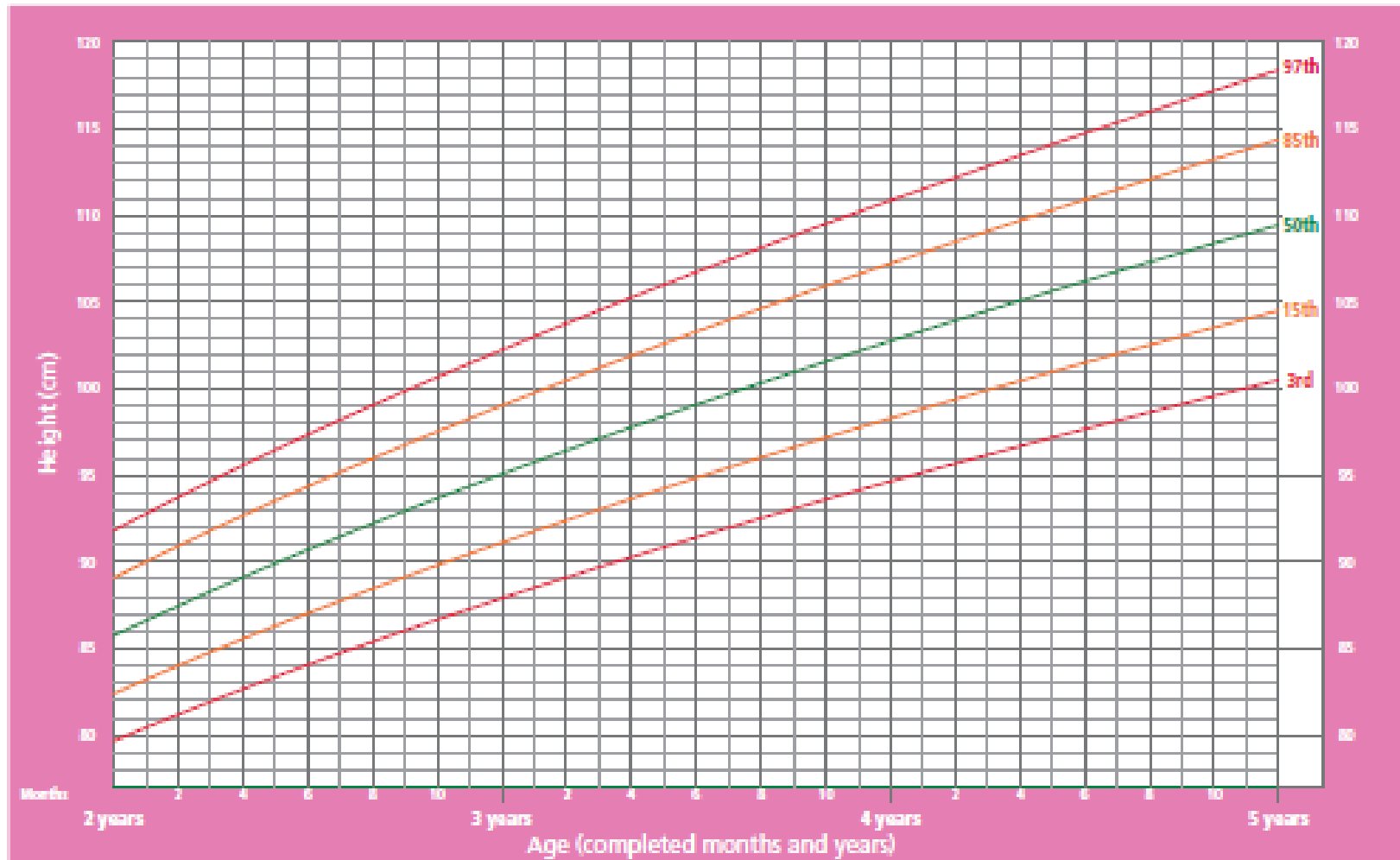
Birth to 2 years (percentiles)



WHO Child Growth Standards

Height-for-age GIRLS

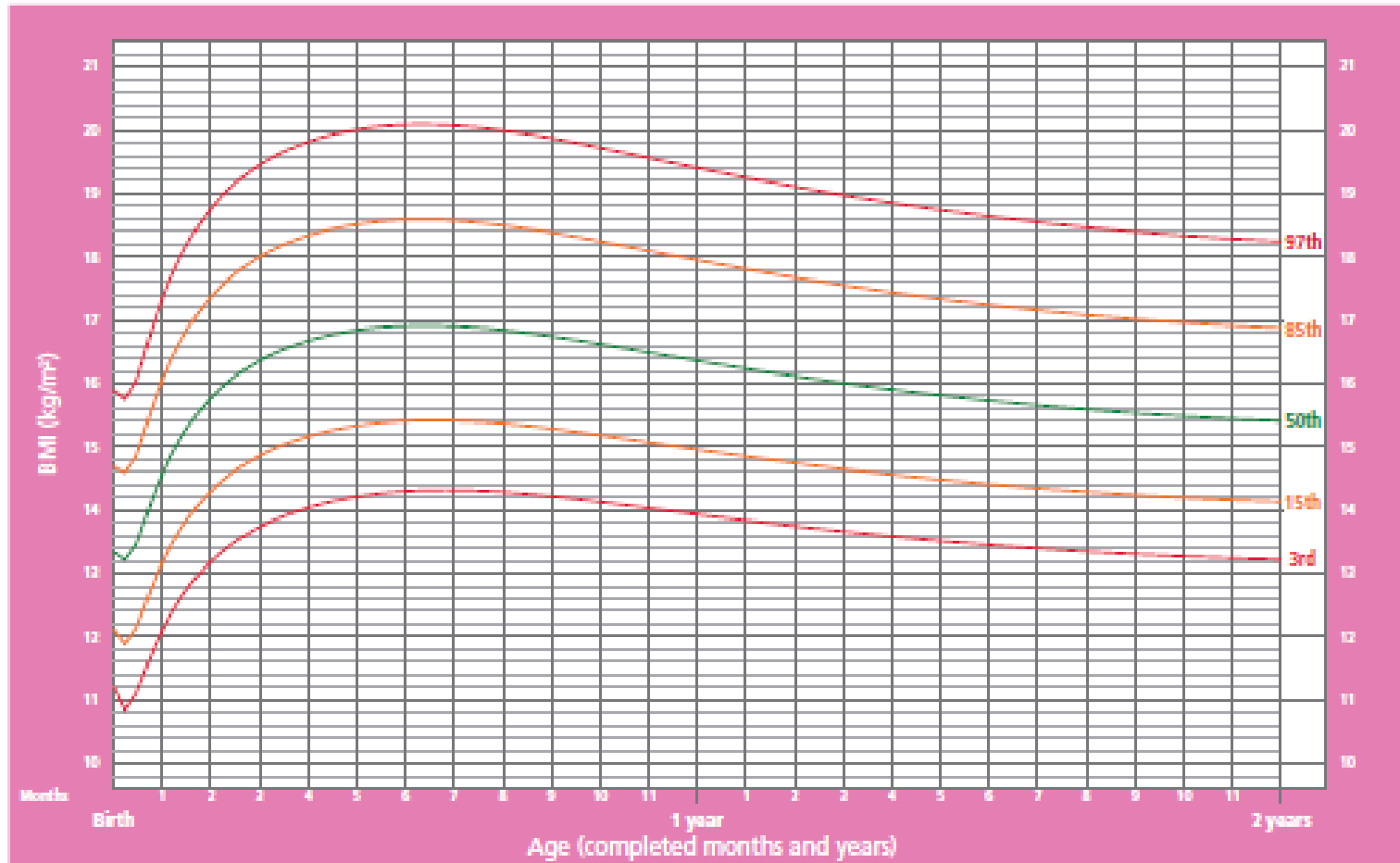
2 to 5 years (percentiles)



WHO Child Growth Standards

BMI-for-age GIRLS

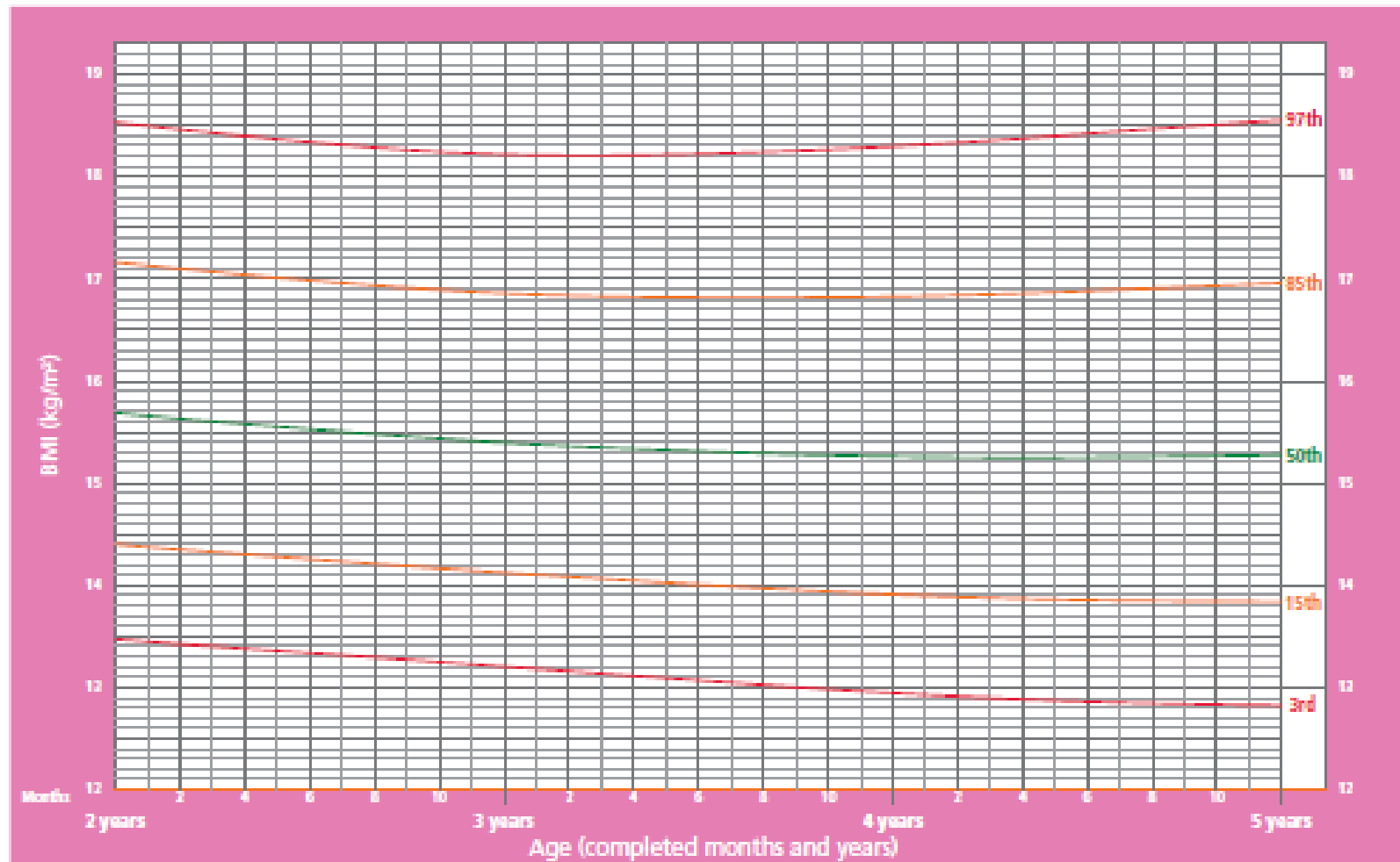
Birth to 2 years (percentiles)



WHO Child Growth Standards

BMI-for-age GIRLS

2 to 5 years (percentiles)

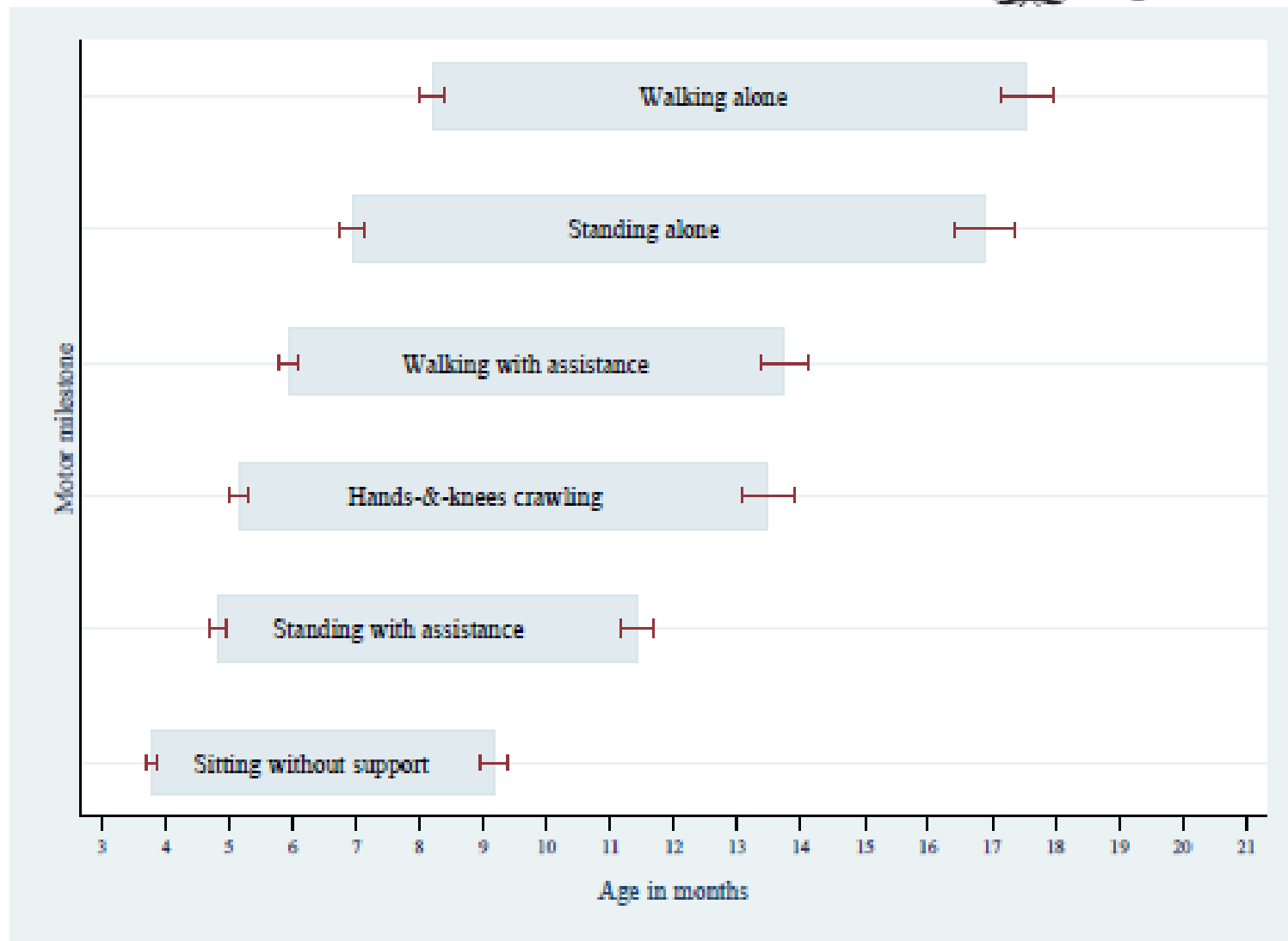


WHO Child Growth Standards





Windows of achievement for six gross motor milestones



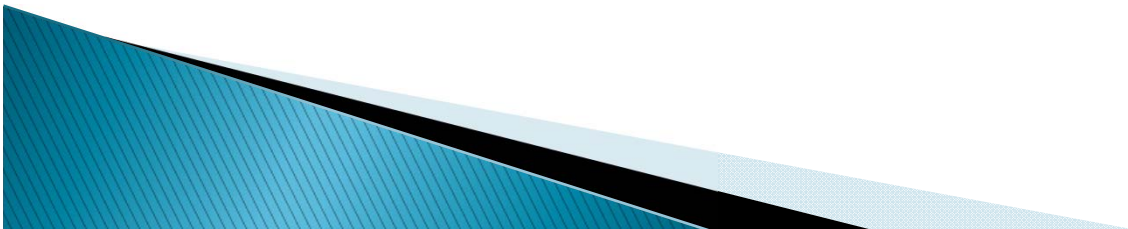
Reference: WHO Multicentre Growth Reference Study Group, WHO Motor Development Study: Windows of achievement

Growth Monitoring-IAP 2006

Age	Ht/Lt	Weight	HC	Other
Birth, 1.5,3.5,6,9,15 mths	✓	✓	✓	
18 mths-3 years	✓ 6 mthly	✓ 6mthly	✓ 6 mthly	
3.5-5.5 years	✓ 6 mthly	✓ 6 mthly		
6-8 years	✓ 6 mthly	✓ 6 mthly		BMI & SMR
9-18 years	✓ yearly	✓ yearly		BMI & SMR yearly

Age Independent Growth Parameters

- ▶ MAC
- ▶ Bangle Test
- ▶ Triceps skinfold Thickness
- ▶ Ratios



Age Independent Growth Parameters cont...

Index Name	Calculation	Normal value
Kanawati & McLaren's index	MAC/HC	0.32–0.33
Rao & Singh's index	$\frac{Wt}{height^2} \times 100$	0.14
Dugdale's index	$\frac{Wt}{height^{1.6}}$	0.88–0.97
Quaker arm circumference	MAC for a given ht	75–85%: malnourished
Jellife's ratio	HC/CC	<1 after 1 year: malnourished

Thanks

