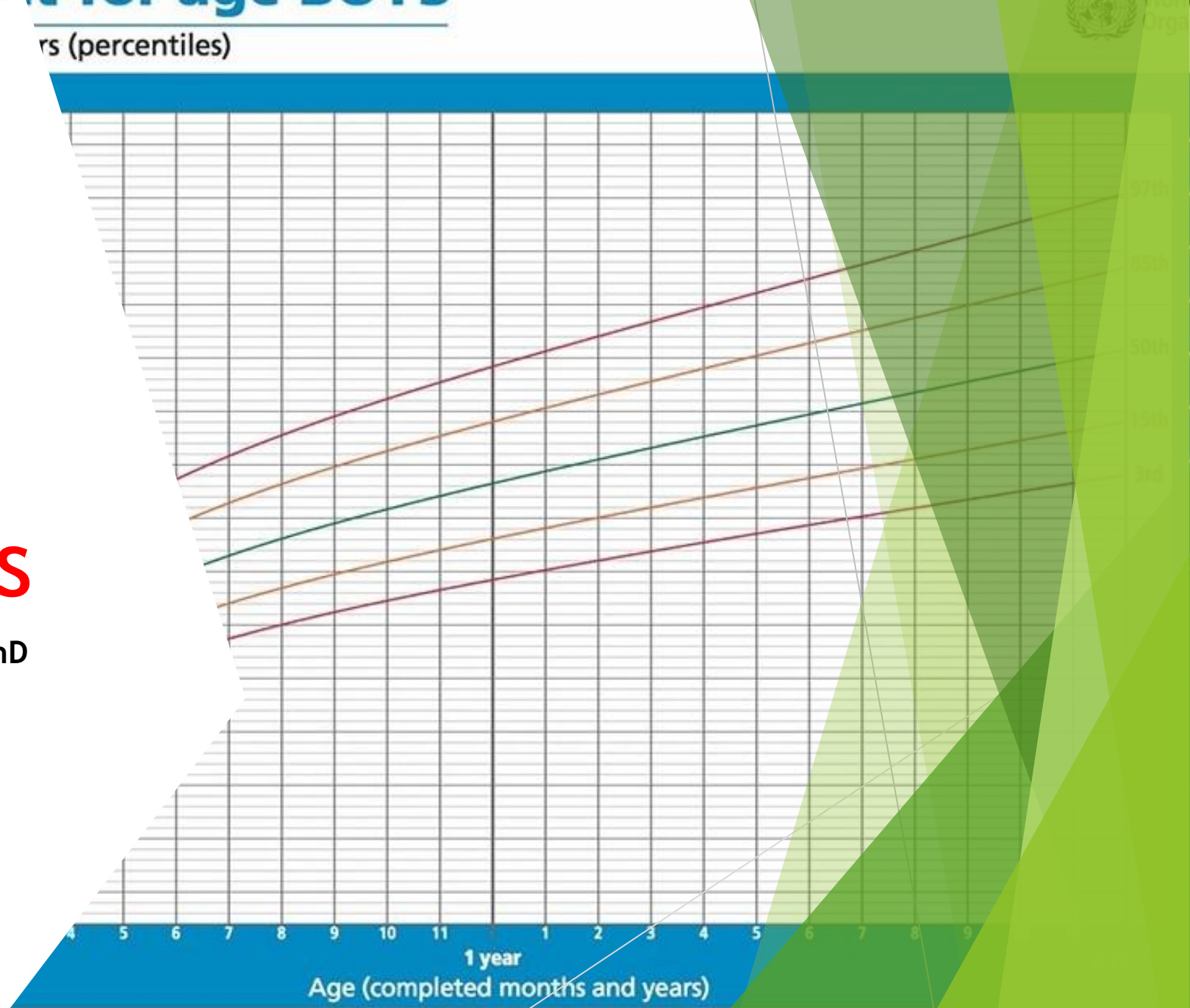


Growth Charts

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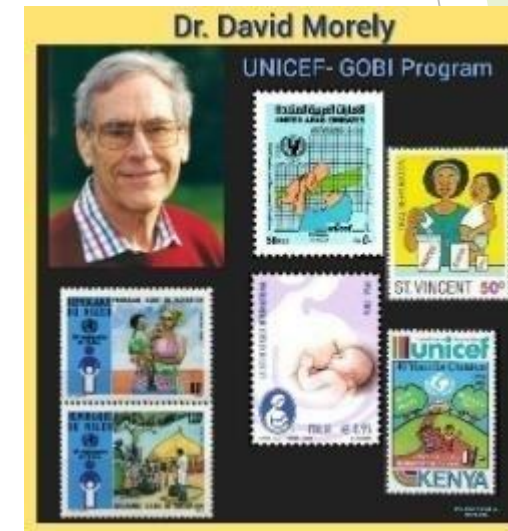
Summary

Introduction

- ▶ *“A 2-year-old boy weighs 8 kg and is 78 cm tall. His mother says he eats well. Is this child normal?”*
- ▶ “Clinical examination alone cannot answer this. We need an objective tool to judge growth – that tool is the growth chart.”

Introduction

- ▶ The **Growth chart or Road to Health chart** is a visible display of child's physical growth and development
- ▶ It was first designed by **David Morley** and later modified by **WHO**
- ▶ It is designed for **longitudinal follow** up of a child, so that changes over time can be interpreted.

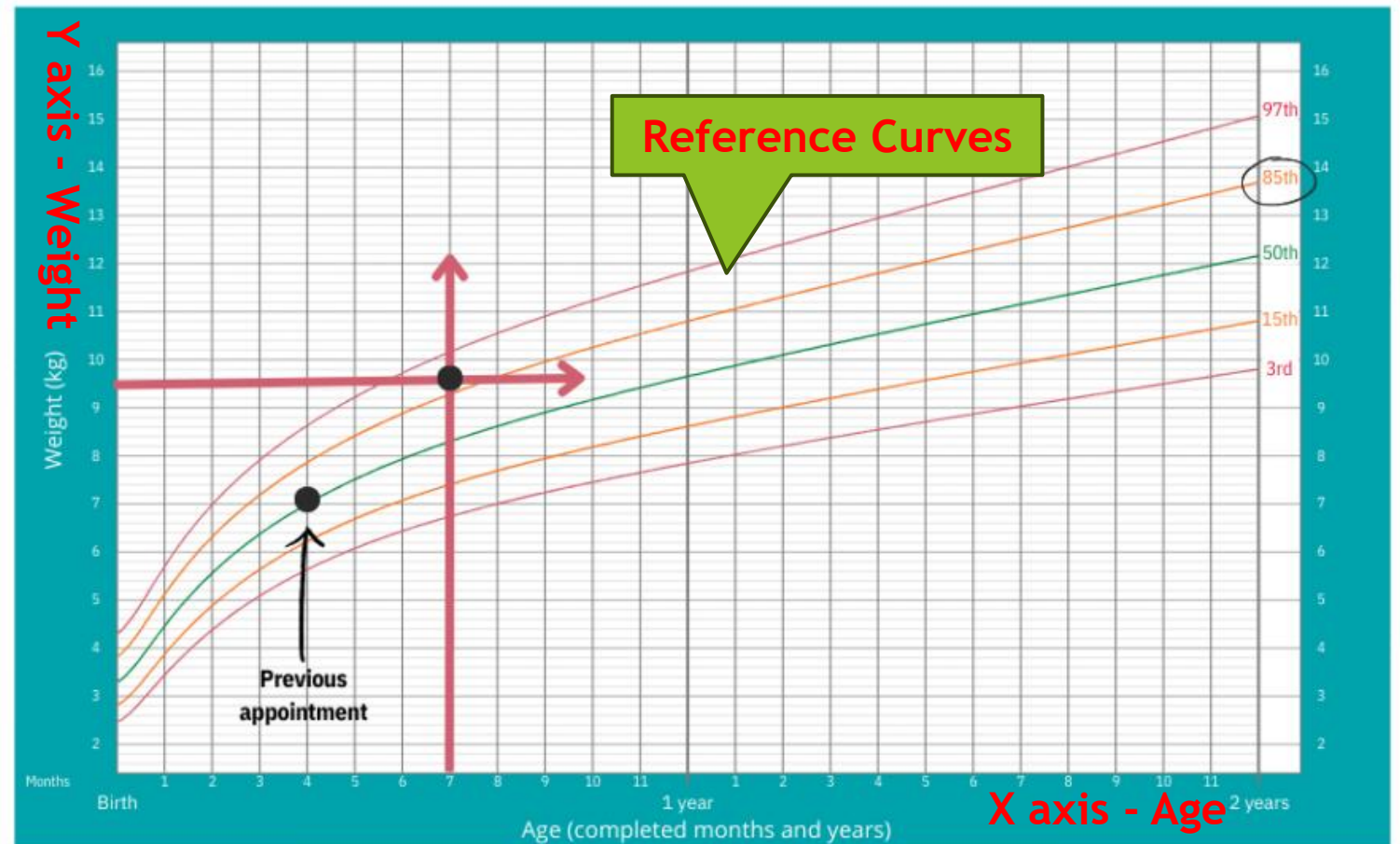


Components of Growth charts

- ▶ A growth chart consists of
identification details,
age axis (X axis),
measurement axis (Y axis),
reference curves,
color coding,
growth trend.

Weight-for-age BOYS

Birth to 2 years (percentiles)



Reference Curves

- ▶ Reference curves are **standard lines drawn on a growth chart** that represent the expected growth pattern of healthy children of the same **age and sex**, based on a reference population.
- ▶ Lines usually marked as: **0 SD (Median), -2 SD, -3 SD, +2 SD, +3 SD**

Weight in between **-2 and +2 SD** → Normal growth

Weight **< -2 SD** → Undernutrition

Weight **< -3 SD** → Severe malnutrition

Weight **> +2 SD** → Overweight / obesity

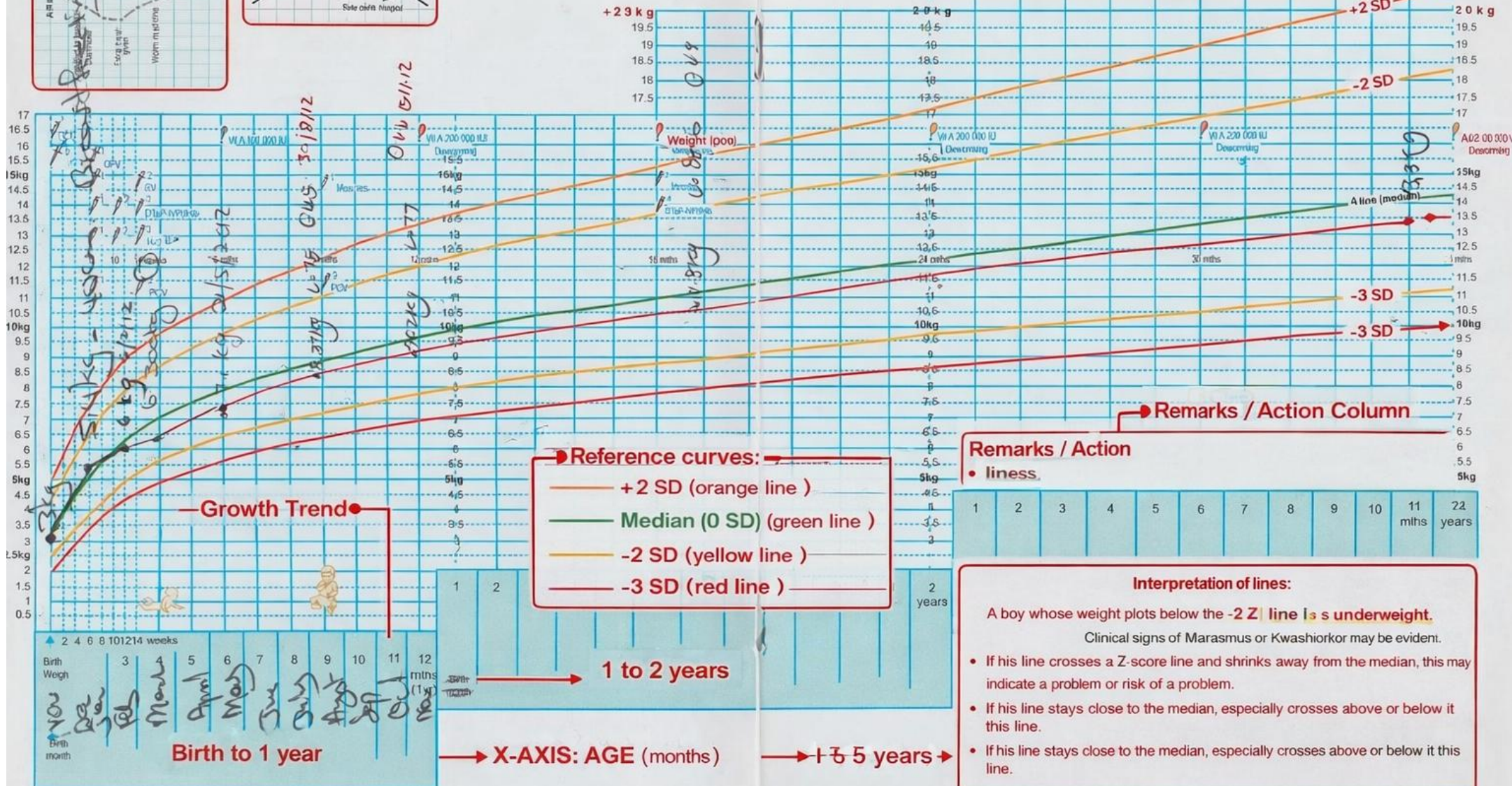
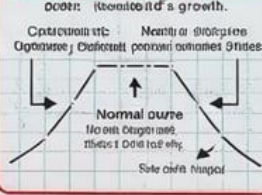
*** “The direction of the growth curve is more important than the actual weight.”**

Boy's Weight-for-Age Chart

Write on the chart:

- Child's Name:
- Date of birth:
- Sex: M

Watch the direction of the curve



Reference curves:

- + 2 SD (orange line)
- Median (0 SD) (green line)
- 2 SD (yellow line)
- 3 SD (red line)

Remarks / Action

1	2	3	4	5	6	7	8	9	10	11	12
										mths	years

Interpretation of lines:

A boy whose weight plots below the -2 Z line is **underweight**.
Clinical signs of Marasmus or Kwashiorkor may be evident.

- If his line crosses a Z-score line and shrinks away from the median, this may indicate a problem or risk of a problem.
- If his line stays close to the median, especially crosses above or below it this line.
- If his line stays close to the median, especially crosses above or below it this line.

Birth to 1 year

X-AXIS: AGE (months)

1 to 2 years

1 to 5 years

Types of Growth charts

Type of Growth Chart	Growth Indicator Used
Weight-for-Age (WFA)	Weight compared with age
Height-for-Age (HFA)	Height compared with age
Weight-for-Height (WFH)	Weight compared with height
BMI-for-Age	BMI adjusted for age

* Among these Weight for Age Charts are more sensitive. As Weight will change immediately.

WHO Child growth standards, 2006

- ▶ A Multicentre Growth Reference Study was undertaken between 1997 to 2003 in Brazil, Ghana, India, Norway, Oman and USA.
- ▶ Data of 9440 healthy breast fed infants and young children (0-60 months boys and girls) from different ethnic and cultural backgrounds was collected.
- ▶ Mothers followed healthy practices, not smoked during and after pregnancy
- ▶ The new standards were generated for boys and girls aged 0-60 months
- ▶ Percentiles and Z scores curves for **length/ height for age, weight for age, weight for length, weight for height and BMI for age**

WHO Child growth standards, 2006

- ▶ The new standards depict normal early childhood growth under optimal environmental conditions and can be used to assess children everywhere, regardless of ethnicity, socio-economic status and type of feeding.
- ▶ **The standards are different for both boys and girls.**

Simplified field tables

Weight-for-Height 2 to 5 Years (z-scores)



World Health Organization

Boys				Height cm	Girls			
-3 SD	-2 SD	-1 SD	Median		Median	-1 SD	-2 SD	-3 SD
9.6	10.4	11.2	12.2	87.0	11.9	10.9	10.0	9.3
9.7	10.5	11.3	12.3	87.5	12.0	11.0	10.1	9.3
9.8	10.6	11.5	12.4	88.0	12.1	11.1	10.2	9.4
9.9	10.7	11.6	12.5	88.5	12.3	11.2	10.3	9.5
10.0	10.8	11.7	12.6	89.0	12.4	11.4	10.4	9.6
10.1	10.9	11.8	12.8	89.5	12.5	11.5	10.5	9.7
10.2	11.0	11.9	12.9	90.0	12.6	11.6	10.6	9.8
10.3	11.1	12.0	13.0	90.5	12.8	11.7	10.7	9.9
10.4	11.2	12.1	13.1	91.0	12.9	11.8	10.9	10.0
10.5	11.3	12.2	13.2	91.5	13.0	11.9	11.0	10.1
10.6	11.4	12.3	13.4	92.0	13.1	12.0	11.1	10.2
10.7	11.5	12.4	13.5	92.5	13.3	12.1	11.2	10.3
10.8	11.6	12.6	13.6	93.0	13.4	12.3	11.3	10.4
10.9	11.7	12.7	13.7	93.5	13.5	12.4	11.4	10.5
11.0	11.8	12.8	13.8	94.0	13.6	12.5	11.5	10.6
11.1	11.9	12.9	13.9	94.5	13.8	12.6	11.6	10.7
11.1	12.0	13.0	14.1	95.0	13.9	12.7	11.7	10.8
11.2	12.1	13.1	14.2	95.5	14.0	12.8	11.8	10.8
11.3	12.2	13.2	14.3	96.0	14.1	12.9	11.9	10.9
11.4	12.3	13.3	14.4	96.5	14.3	13.1	12.0	11.0
11.5	12.4	13.4	14.6	97.0	14.4	13.2	12.1	11.1

Z
Score
tables



- Child growth standards
 - Standards
 - Weight-for-age**
 - Length/height-for-age
 - Weight-for-length/height
 - Body mass index-for-age (BMI-for-age)
 - Head circumference for age

Weight-for-age

Charts

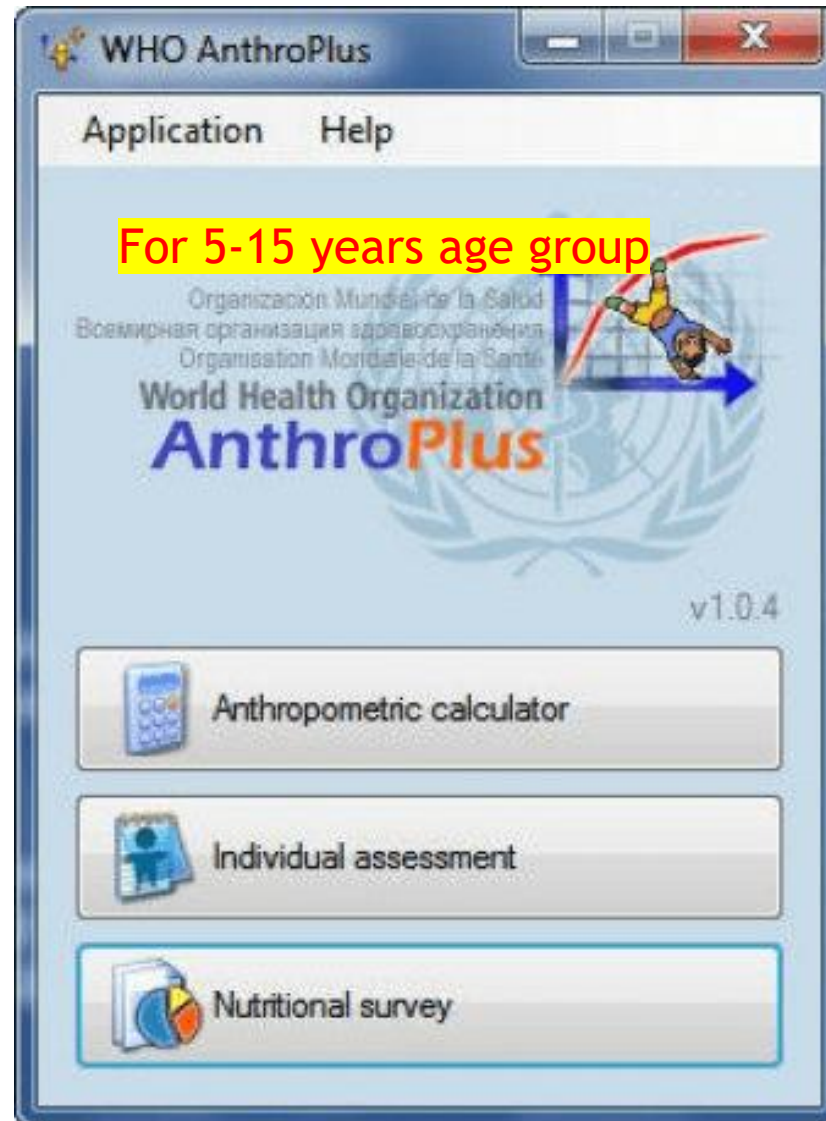
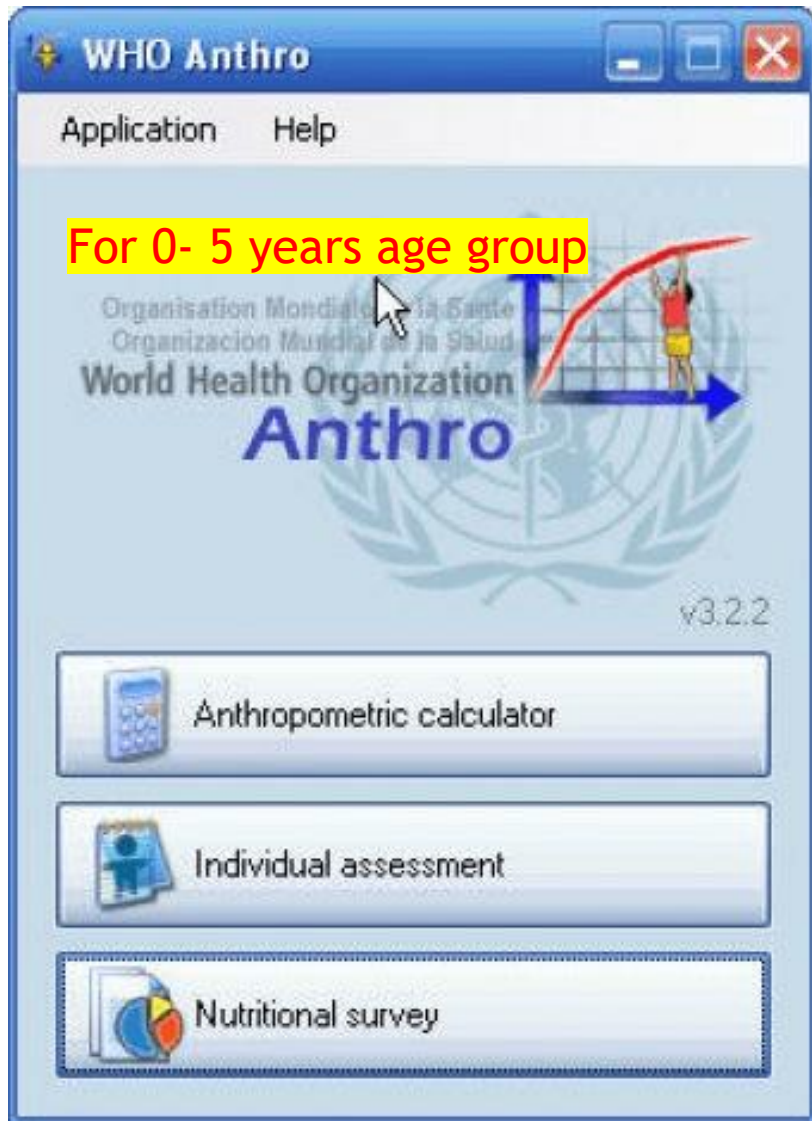
z-scores: girls

- [Girls chart- Weight-for-age: Birth to 6 months \(z-scores\)](#)
- [Girls chart- Weight-for-age: Birth to 2 years \(z-scores\)](#)
- [Girls chart- Weight-for-age: 6 months to 2 years \(z-scores\)](#)
- [Girls chart- Weight-for-age: 2 to 5 years \(z-scores\)](#)
- [Girls chart- Weight-for-age: Birth to 5 years \(z-scores\)](#)

z-scores: boys

- [Boys chart- Weight-for-age: Birth to 6 months \(z-scores\)](#)
- [Boys chart- Weight-for-age: Birth to 2 years \(z-scores\)](#)
- [Boys chart- Weight-for-age: 6 months to 2 years \(z-scores\)](#)
- [Boys chart- Weight-for-age: 2 to 5 years \(z-scores\)](#)
- [Boys chart- Weight-for-age: Birth to 5 years \(z-scores\)](#)

WHO Anthro Software

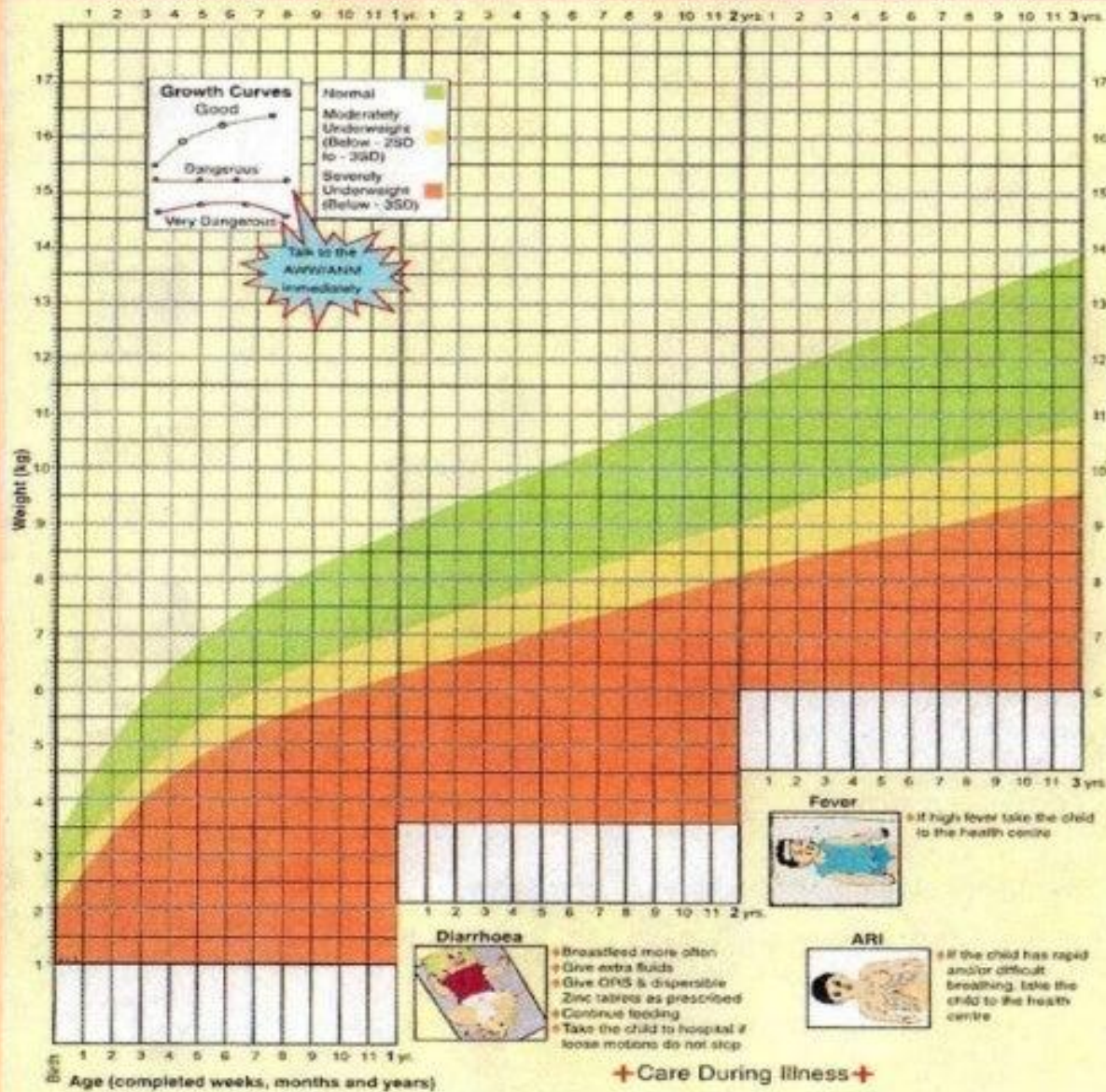


Growth chart used in India

- ▶ India has adopted these new WHO growth standards in the year 2009 for monitoring the young child growth and development in NRHM and ICDS.
- ▶ The same standards will be used for research too.
- ▶ Mother and Child Protection card include these growth charts.
- ▶ It shows the normal zone of weight for age, undernutrition below -2SD and severely under nourished (below -3SD)
- ▶ It is the direction of curve is more important than the position of dots on line.
- ▶ Flattening or falling of weight curve indicates growth failure, which is earliest sign of protein energy malnutrition.



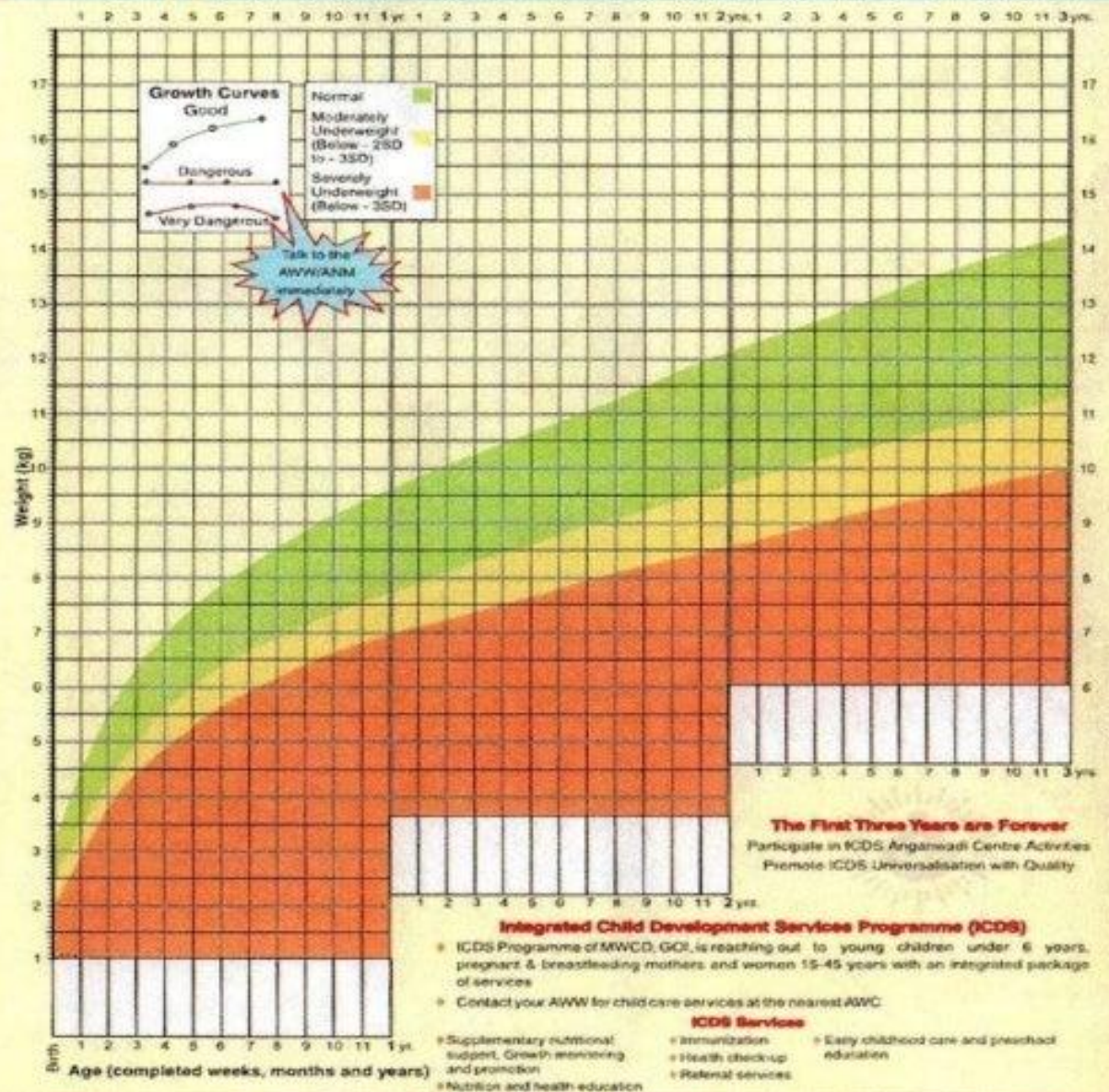
GIRL: Weight-for-age – Birth to 3 years (As per WHO Child Growth Standards)



Ensure equal care for the girl child



BOY: Weight-for-age – Birth to 3 years (As per WHO Child Growth Standards)



Have your child weighed at the AWC every month

Uses of Growth charts

1. For Growth monitoring
2. Screening/ Diagnostic tool - For identifying malnutrition
3. Planning and policy making
4. Educational tool - To educate mothers
5. Tool for action - For Health workers to take immediate action when malnutrition was observed
6. Evaluation of interventions like Nutrition rehabilitation or ICDS programs
7. Tool for teaching - To teach importance of adequate feeding. Deleterious effects of diarrhoea

Limitations of Growth charts

Limitation	Key Point
Etiology	Shows deviation, not cause
Single reading	Insufficient
Measurement errors	Common & impactful
Development delays	Not assessed
Micronutrients	Not detected
Acute illness	Misleading
Genetics	Individual variation ignored

Summary

1. Growth charts are **objective tools for longitudinal assessment**, best interpreted using **serial measurements**, not single readings
2. **Direction of the growth curve** (flattening or downward crossing) is more important than the absolute plotted value
3. **WHO growth standards** represent optimal growth and are applicable across populations, sexes, and settings
4. Growth charts are effective for **screening and monitoring**, but **cannot identify etiology** or detect micronutrient deficiencies
5. Accurate interpretation requires **correct age calculation, precise measurement, and clinical correlation**



Thank you