PREVENTIVE MEDICINE IN OBSTETRICS,PAEDIATRICS AND GERIATICS

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GROWTH AND DEVELOPMENT

“Growth refers to increase in physical size of body whereas development refers to increase in skills and functions”.

Growth and development are considered together, because the child grows and develops as a whole.

DETERMINANTS OF GROWTH AND DEVELOPMENT

1. Genetic inheritance
2. Nutrition
3. Age
4. Sex
5. Physical surroundings
6. Psychological factors
7. Infections
8. Economic factors
9. Other factors

9. **Other factors:**

- Birth order of child
- Birth spacing
- Birth weight in single or multiple pregnancies
- Education of the parents

NORMAL GROWTH

- Concept of Normality: A “normal child” may be defined as one whose characteristics fall within the range of measurements accepted as normal for the majority of children in the same (or reference) age groups.
- The limits of normal variation: Includes two standard deviations above and below the mean (between the 3rd centile and 97 centile).

- For physical development: measurement techniques like kilogram and centimeters.
- Some observations are based on observations: “Mile stones of development”

Methods of Assessments

- **Parameters for Growth:** Weight, Height (length in Infants) and head and chest circumferences.
- These characteristics are measured and compared with the reference standards.
- **Methods of comparison:**

1. Mean (median) values
2. Percentiles or centiles
3. Age-independent indices:

- Weight for length
- Weight for height

1.Mean or Median Values:

The median rather than mean is used where possible because of the skewed distribution of most anthropometric measurements.

A variation of 2 standard deviations from either side of the mean or median is considered as within normal limits.

2. Percentiles or centiles:

- Percentiles are easier to understand than standard deviation.
- Percentiles refer to the percentage of individuals falling below a particular level.
- By definition 3 percentage of children are below the **3rd percentile,** and a further 3 percent are above the **97 th percentile.**

- Remaining 94 percent of individuals who fall between these two lines (btw 3rd and 97 th percentile) should be regarded s being within the range of **“normal”.**
- However the 6 percent of children outside this range may not be **“abnormal”** particularly if their growth is parallel with their centile lines.

3.Age -independent Indices:

It is possible to assess growth of a child by the following methods

- Weight for length
- Weight for height

Assessment Of Growth

1.Longitudinal: Measuring the same child at regular intervals.

This provides data of child progress.

2.Cross sectional: Compare the child's growth with that of peers.

- This involves the comparison of large number of children of the same age group.
- The range of their measurements(weight, height) is plotted, usually on percentile charts.

Reference or Standard values

For national and international comparisons and for monitoring , reference or **“standard values”** of growth are essential:

Reference Standards:

- Harvard or Boston Standards
- WHO Reference values
- Indian Standards (for developing countries)

1.Harvard (or Bostan) Standards:

They have been compiled longitudinally on a large series of children mostly from North Europeon Origin, from 1930 to 1956 and became widely used world wide

2.WHO Reference Values:

These values replaced Harvard values for weight and height. These were based on cross sectional data assembled by US (NCHS).These are used for children upto 5 years of age

3.Indian Standards:

Indian council during 1956 and 1965 conducted national cross sectional study to establish the much needed reference standards for Indian children.

As Indian data are based on lower socio economic groups they cannot be representing standards values

Reference versus Standard Values

- If the values are derived from a population racially different from the population under study, such values should be considered as **referenced values** only and not standard values.
- **Example:** It will be absurd to apply the Harvard standards of growth to Eskimos who are racially different

SURVEILLANCE OF GROWTH AND DEVELOPMENT

Growth Surveillance Purpose:

To identify those children who are not growing normally.

Reflects the effectiveness of other components of child care such as nutrition, sanitation and control of infection.

It covers the following components:

- Physical growth
- Behavioral development

- *Physical growth*

1. Weight for age
2. Height for age
3. Weight for height
4. Head and chest circumference

- *Behavioral development*

1. Motor development
2. Personal social development
3. Adaptive development
4. Language development

1.Weight- for- Age

- Measurement of weight and rate of gain of weight are the best single parameters of assessing physical growth.
- Careful repeated measurements are important at intervals:
  - ideally monthly, from birth to 01 year
  - every 02 months during the second year
  - every 03 months thereafter up to 05 years of age since this age group is at greatest risk from growth faltering.
- **“Growth chart”** is the tool for comparison with reference standards.

Weight gain

- A baby should gain at least 500 gram weight per month in first three months of life. This is the minimum. Children who gain less weight are malnourished.
- First 03 Months of life: 01 kg per month
- First 05 months: doubles the weight
- End of first year: trebles
- Age of 02 years :quadruples
- During the first year: 07 kg
- During second year: 2.5 kg
- Until puberty: 02 Kg Per year

2.Height (length)- for- Age

- Height should be taken in the standing position without foot wear.
- Errors in the measurements of young children may lead to significant errors in the classification of the nutritional status.
- Length of baby at birth :50 cm.
- During first year: length increases by 25 cm
- During second year: Another 12 cm
- During growth spurt Boys: add 20 cm
- During growth spurt Girls: add 16 cm

- **Pakistani girls:** reach 98 % of their height by 16.5 years
- **Pakistani Boys:** reach the same stage by 17.75 years.
- Height is a stable measurement of growth as opposed to body weight. **Weight** reflects present health status of the child, **height** indicates the events in the past also.

- The use of growth (height) centile chart is valuable to study the height curve.

➢ **Low Height for age :**

This is also called Nutritional **"stunting"** or **"dwarfing".**

- It reflects past or chronic malnutrition.
- **The cut off point** taken for diagnosis stunting is 90 percent of the united states NCHS height for age values.
- **Waterlow** recorded the use of 2SD below median reference as the cut off point.

3. Weight- for- Height

- Height and weight are interrelated. Weight for height helps to determine whether the child is within the range of **"normal"** weight for his age.

➢ **Low weight for height :**

This is also known as **"nutritional wasting"** or **"emaciation"** (acute malnutrition). It is associated with high risk of mortality and morbidity. Child less than 70 percent of the expected weight for height is classed as **"severely wasted".**

- **Weight Records :** Weight chart is an important tool in the prevention of malnutrition.

4. Head and Chest Circumference

- At birth the head circumference is 34 cm.
- It is about 02 cm more than the chest circumference.
- By 06 To 09 months: the two measurements become equal.
- After that: chest circumference overtakes the head circumference.
- In severely malnourished children this over taking may be delayed by 03-04 years due to poor development of thoracic cage

- Besides increase in height and weight, the term **Growth** also includes various physiological events which occur at predictable periods such as:

✓ *dentition*

✓ *ossification of bones*

✓ *secondary sexual characteristics.*

Average weight and height increase during the first 5 years

Age	Increments
	Weight increments per week
0 – 3 months	200 g
4 – 6 months	150 g
7 – 9 months	100 g
10 – 12 months	50 – 75 g
	Weight increments per year
1 – 2 years	2.5 kg
3 – 5 years	2.0 kg
	Length increments per year
1st year	25 cm
2nd year	12 cm
3rd year	9 cm
4th year	7 cm
5th year	6 cm

GROWTH CHART

- Designed by David Morley and later modified by WHO
- It is a visible display of the child's physical growth and development.
- Meant for longitudinal follow-up (growth monitoring)
- Compare with reference curves
- Inexpensive way of monitoring weight gain and child's health

WHO Child growth Standards

- The new WHO 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

WHO Child growth Standards

Reference curves

- **The upper reference curve**: represents the median (50 percentile) for boys (slightly higher than for girls)
- **Lower reference curve:** the 3rd percentile for girls (slightly lower than that of boys).

Chart can be used for both genders.

Road- to- Health: The space between the two growth curves (weight channel).

This will include the zone of normality for most populations i.e the weights of 95 percent of normal healthy children used as a reference fall within this area.

WHO Growth Chart

- It is the **direction of growth** that is more important than the position of dots on the line.
- Flattening or falling of the child's weight curve signals growth failure, which is the earliest sign of **"Protein-energy malnutrition"** and may precede clinical signs by weeks or even months.
- The **objective** in child care is to keep the child above 3rd percentile.

Reference curves:

For purpose of comparison, reference curves are provided in growth chart. These show the limits of normal growth.

- Normally 50 th percentile corresponds to the reference median.
- It gives the value of 50 th child of a group of 100 when they are arranged in ascending or descending order.
- Here equal number of children will have measurements smaller or larger than the 50 th value.

- The growth chart shows normal zone of weight for age, under nutrition (below 2- SD) and severely underweight zone (below 3- SD) .

Growth Chart in developing countries

- **It has four reference curves.**
- The top most curve corresponds to 80 percent of the median (50th percentile) of the WHO reference standard
- Lower lines represents 70 percent, 60 percent and 50 percent of that standard.
- 80 percent median weight is approximately equal to 2 standard deviation below the median (or mean) which is the conventional limit of the “normal range”.
- **The purpose of these lines is to show the degree of malnutrition.**

Degrees Of Malnutrition :

- **First degree malnutrition:** Mild
  (Between 70 to 80%)
- **Second Degree malnutrition:** Moderate
  (Between 60-70 %)
- **Third Degree malnutrition:** Severe
  (Below 60 %)
- **Fourth Degree malnutrition** Below 50 %

USES OF GROWTH CHART

1. FOR GROWTH MONITORING
2. DIAGNOSTIC TOOL: IDENTIFY HIGH RISK CHILDREN
3. PLANNING AND POLICY MAKING
4. EDUCATIONAL TOOL
5. TOOL FOR ACTION
6. EVALUATION

“PASSPORT TO CHILD HEALTH CARE”

Information on Growth Chart

1. Identification and registration
2. Birth date and weight
3. Chronological age
4. History of sibling health
5. Immunization procedure
6. Introduction of supplementary food
7. Episodes of sickness
8. Child spacing
9. Reasons for special care

Alternative methods of Growth Monitoring

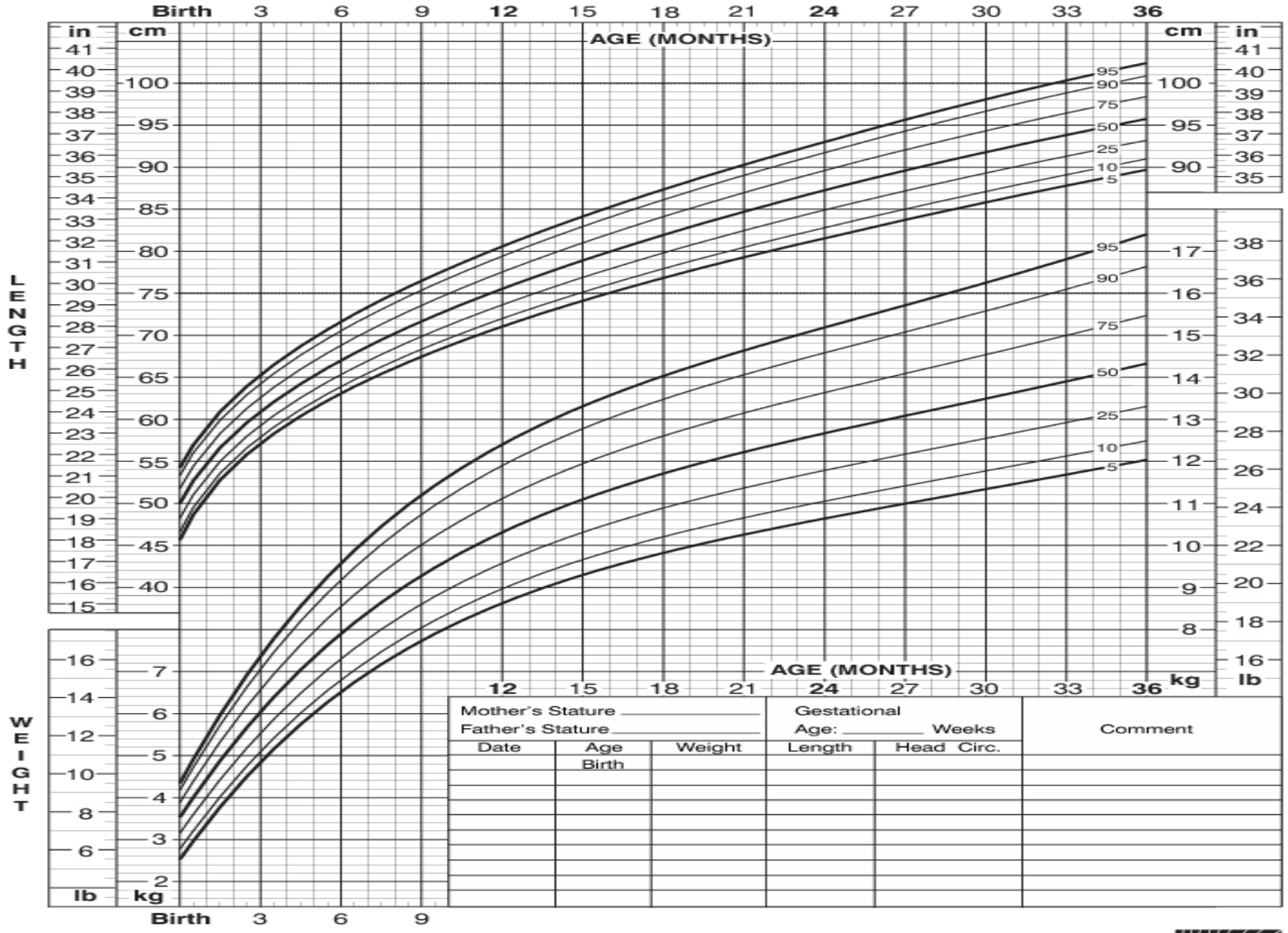
- Height for age
- Weight for height
- Arm Circumference

The last two are independent of age and are useful when age is not known.

Birth to 36 months: Boys
Length-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____



Mother's Stature _____

Father's Stature _____

Gestational Age: _____ Weeks

Date	Age	Weight	Length	Head Circ.	Comment
	Birth				

Published May 30, 2000 (modified 4/20/01).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

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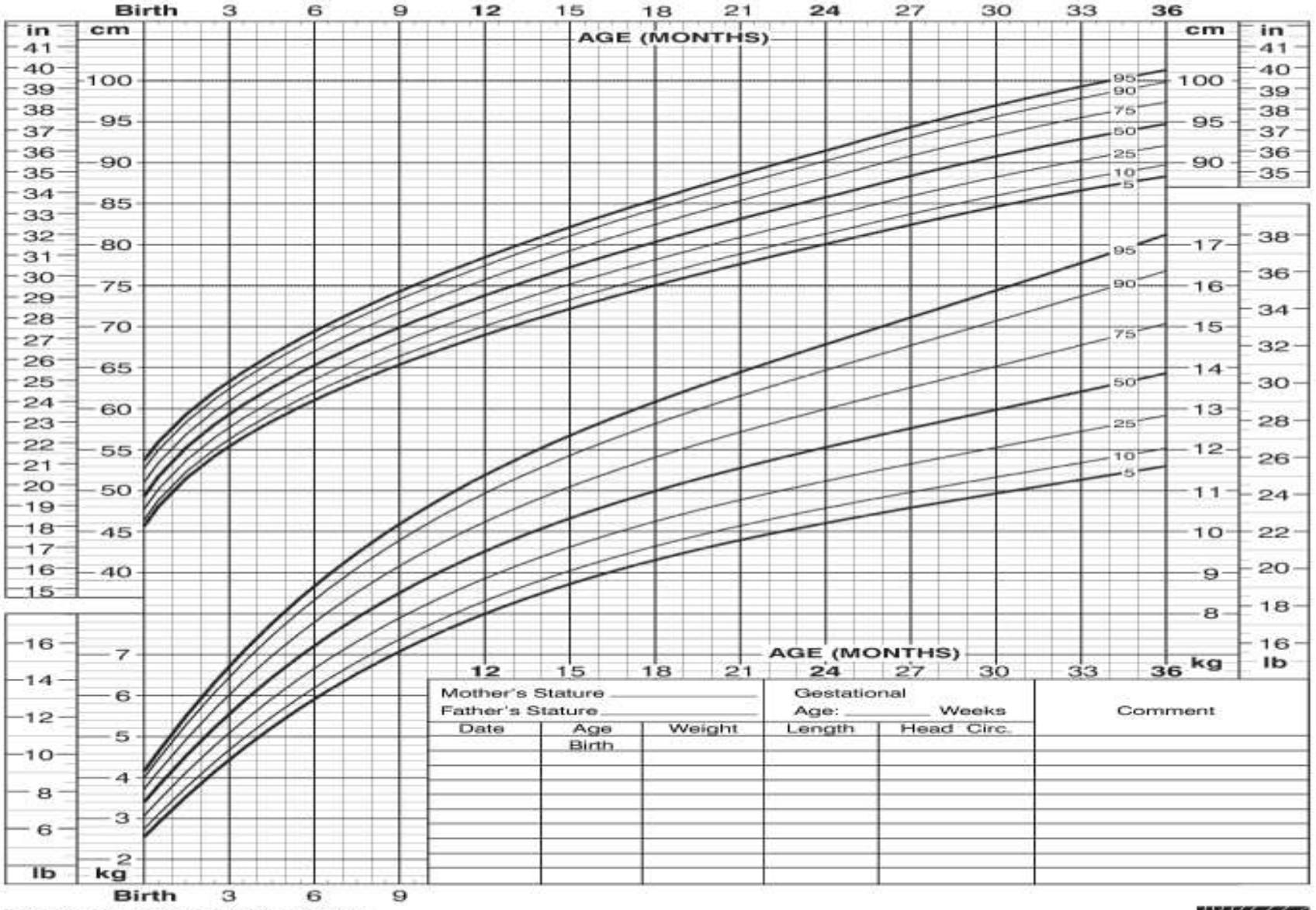

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2 to 20 years: Boys
Stature-for-age and Weight-for-age percentiles

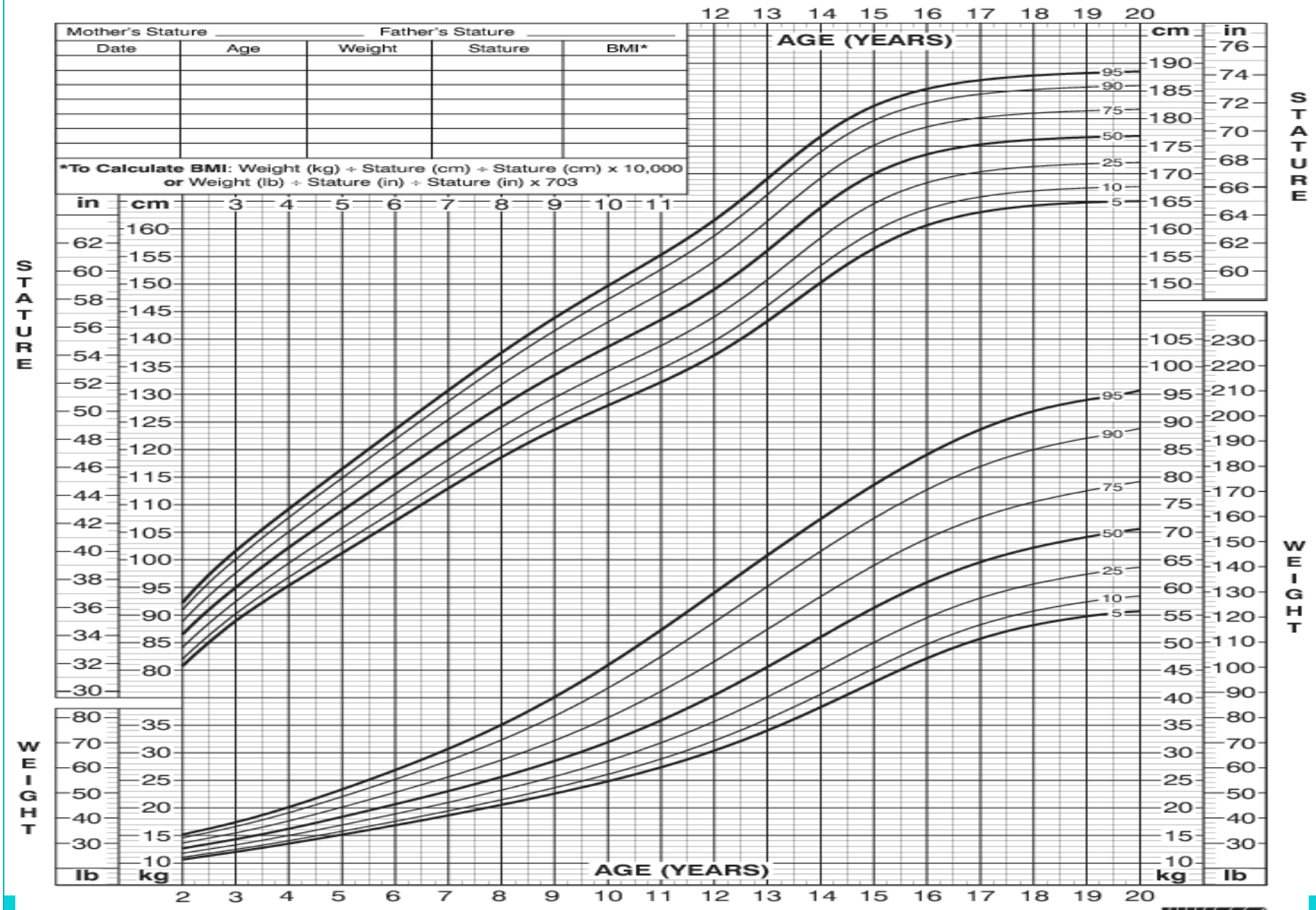
NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



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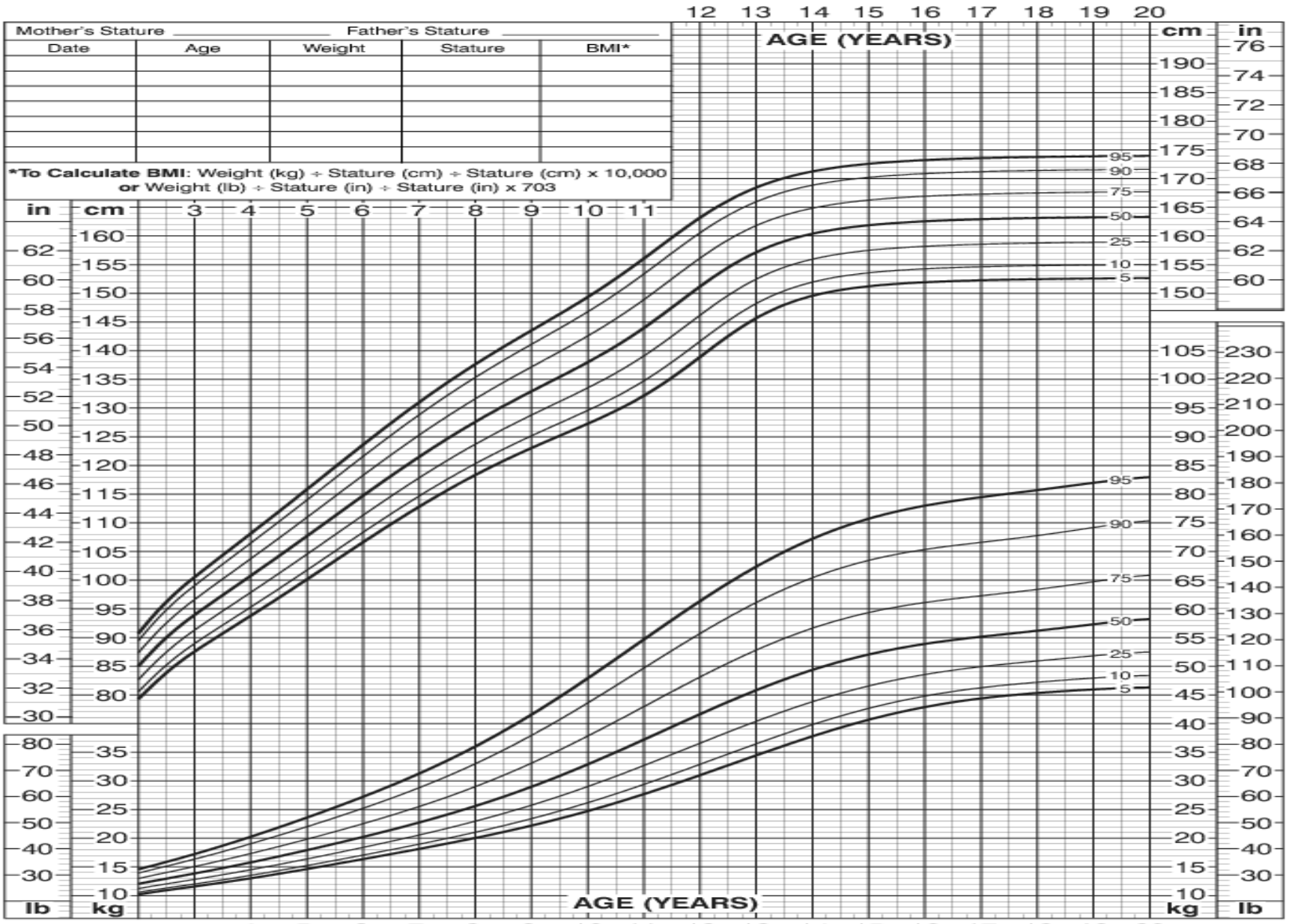

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CHILD HEALTH PROBLEMS

- Low birth weight
- Malnutrition
- Infections
- Accidents and poisoning
- Behavioral problems
- Other factors:
  - Maternal health
  - Family health
  - Socioeconomic circumstances
  - Environment
  - Social support and health care