

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِيْمِ

GROWTH in children

Dr Ali Rabbani

Pediatric endocrinologist

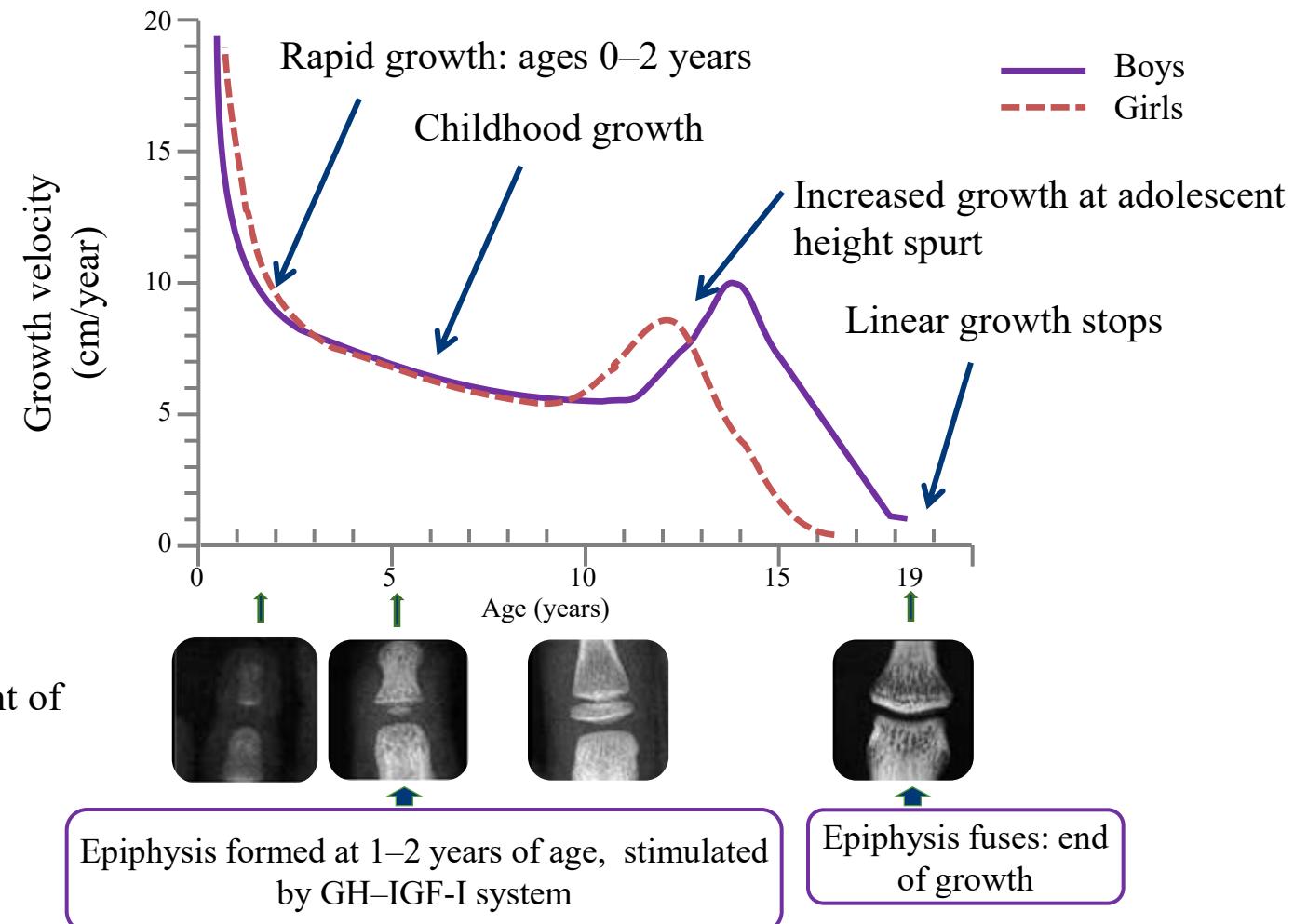
Iranian society of pediatric

1404/04/20

- **Normal growth**
- **Abnormal growth**
- **Approach to Abnormal growth**

- **Fetal growth**
- **Infancy**
- **Child hood**
- **Pubertal growth**

Normal growth pattern

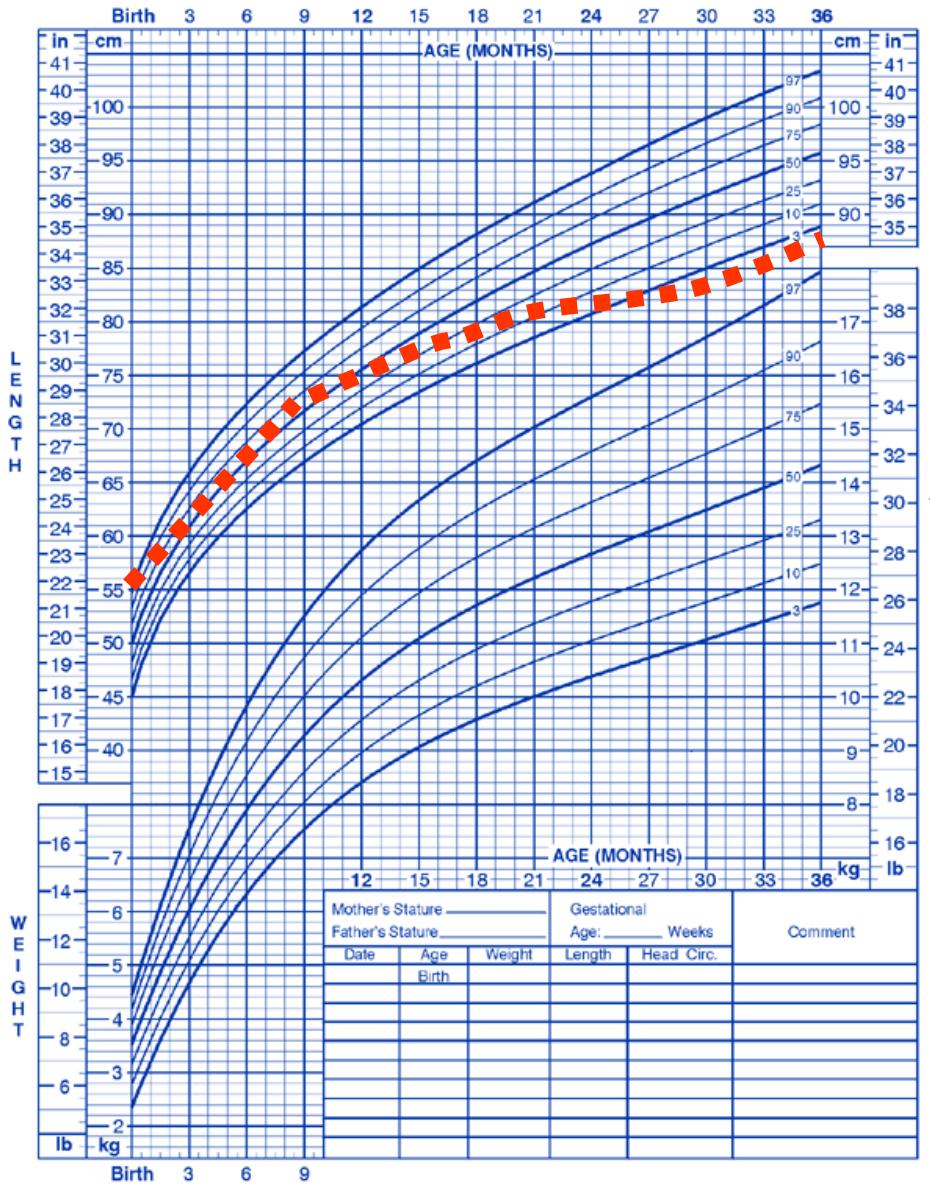


GH–IGF, growth hormone–insulin-like growth factor

Tanner *et al.* *Arch Dis Child* 1966;41:454–71; Tanner *et al.* *Arch Dis Child* 1966;41:613–35.

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

NAME _____
RECORD # _____



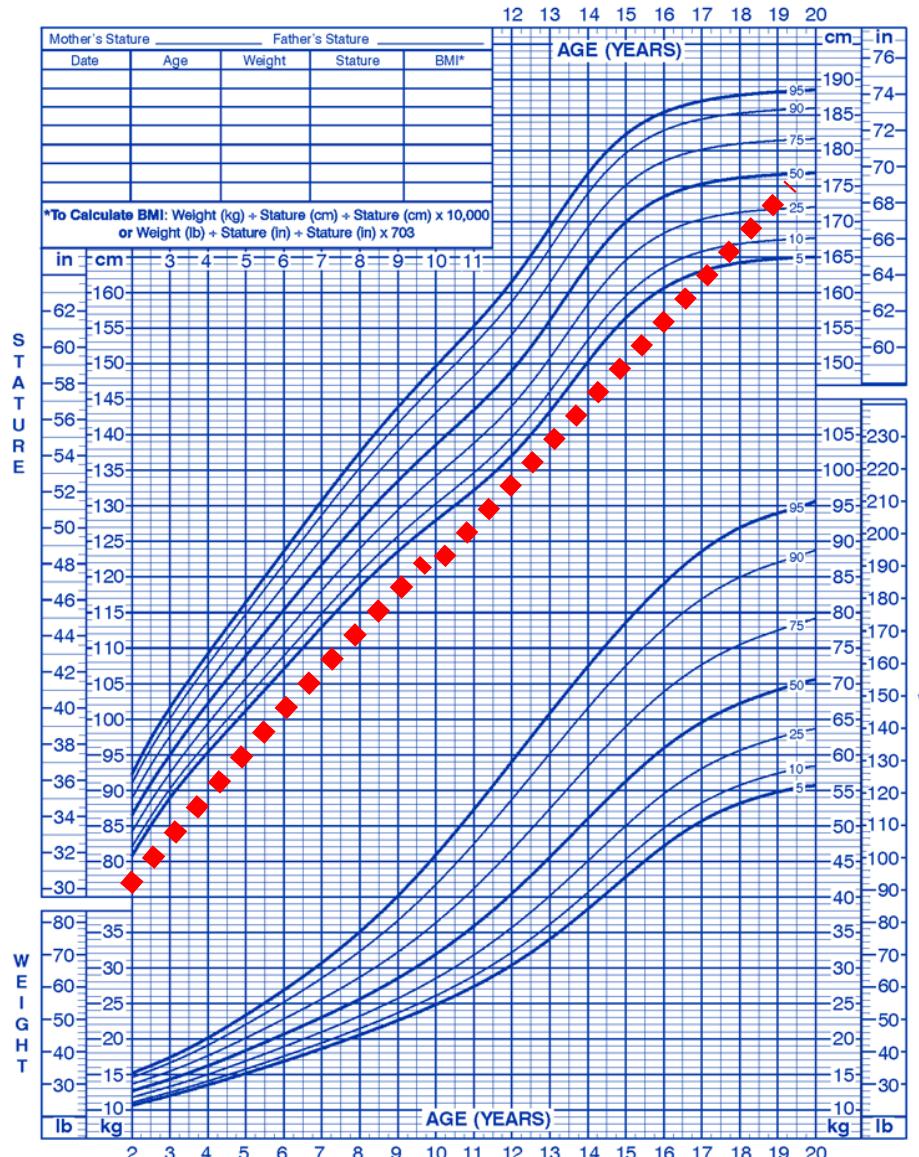
Published May 30, 2000 (modified 4/20/01).
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



SAFER • HEALTHIER • PEOPLE™

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

NAME _____
RECORD # _____



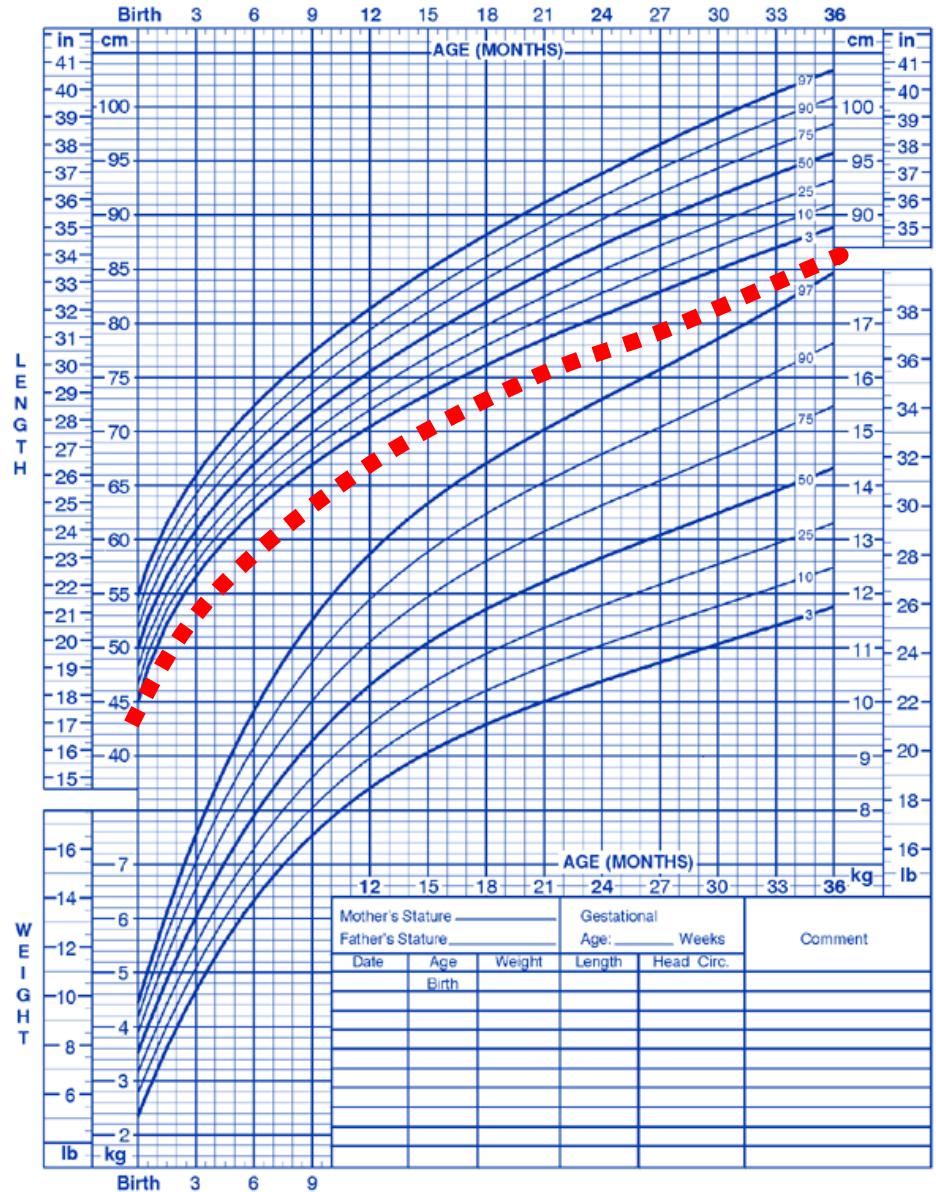
Published May 30, 2000 (modified 11/21/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



OK135S057

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

NAME _____
RECORD # _____



Published May 30, 2000 (modified 4/20/01).

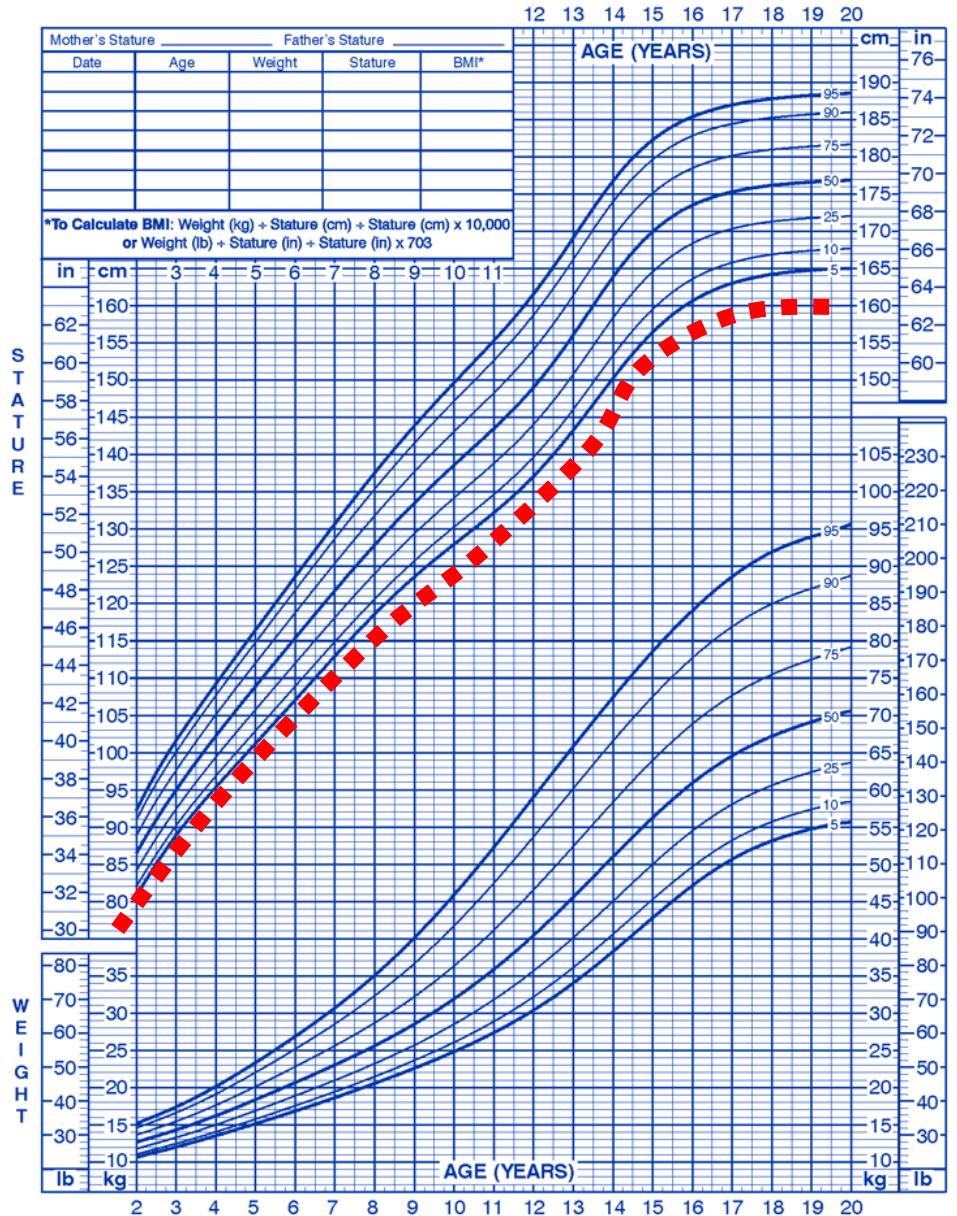
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



SAFER • HEALTHIER • PEOPLE™

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

NAME _____
 RECORD # _____



Published May 30, 2000 (modified 11/21/00).

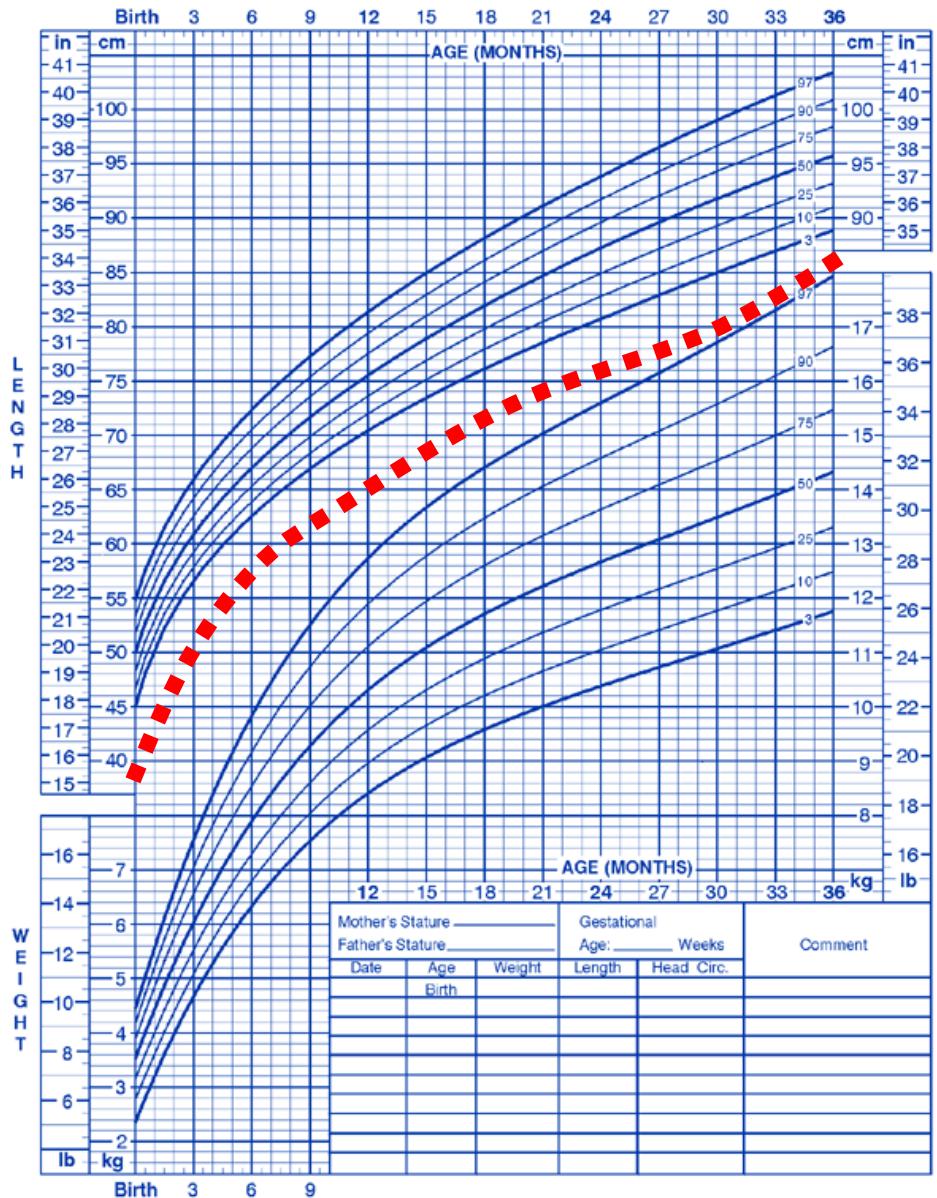
SOURCE: Developed by the National Center for Health Statistics in collaboration with
 the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



SAFER • HEALTHIER • PEOPLE™

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

NAME _____
RECORD # _____



Published May 30, 2000 (modified 4/20/01).

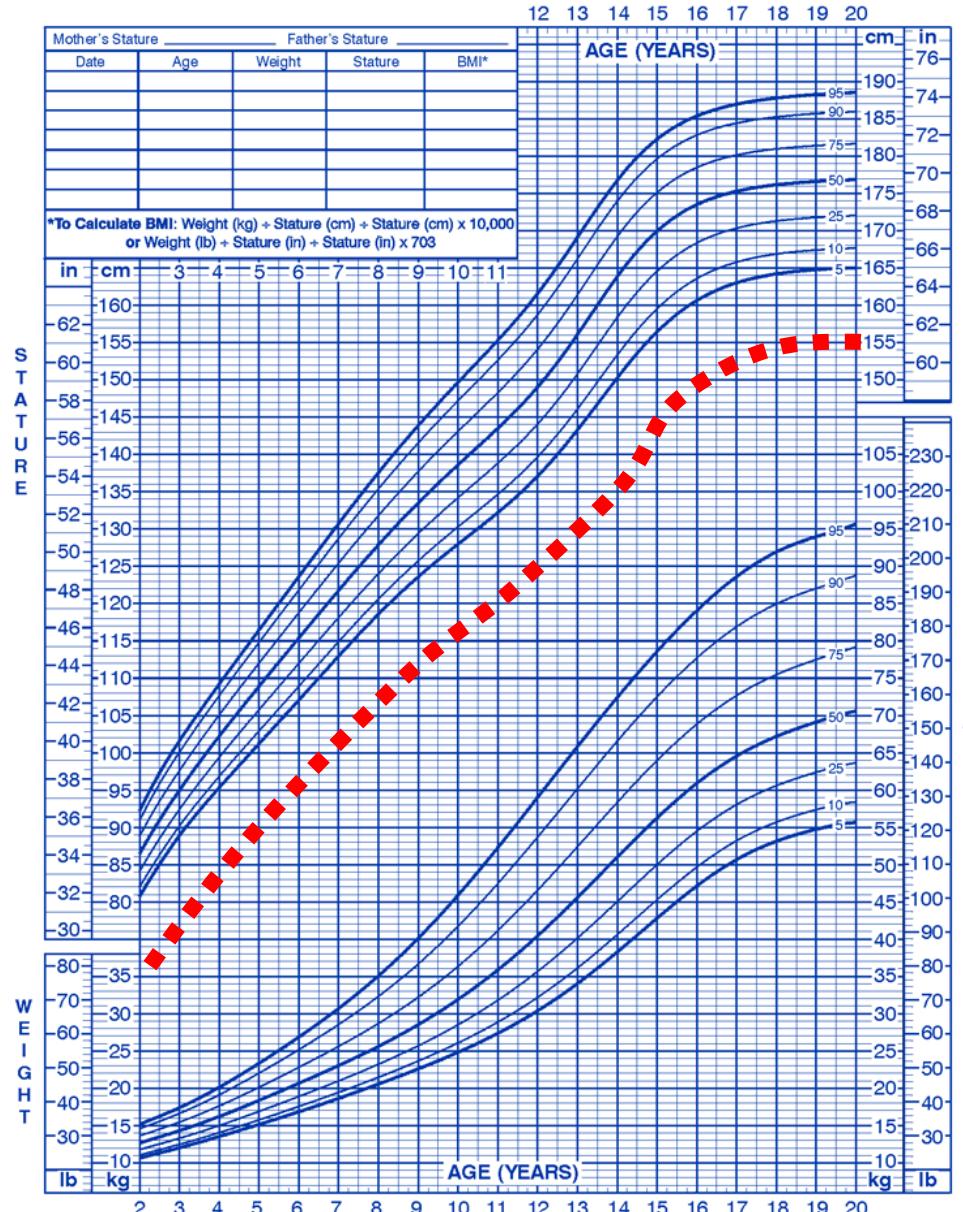
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



SAFER • HEALTHIER • PEOPLE™

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

NAME _____
RECORD # _____



Published May 30, 2000 (modified 11/21/00).

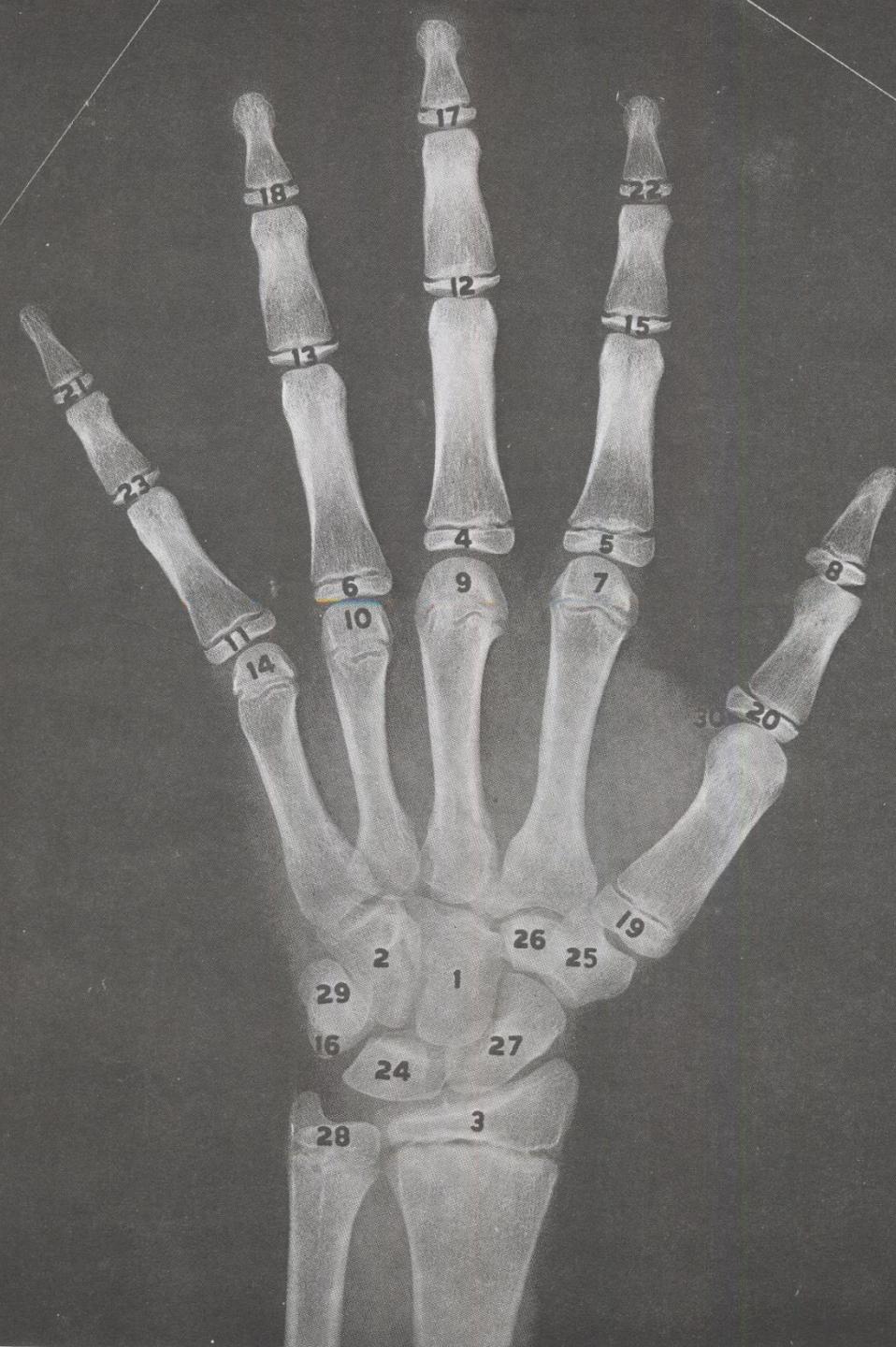
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>



SAFER • HEALTHIER • PEOPLE™







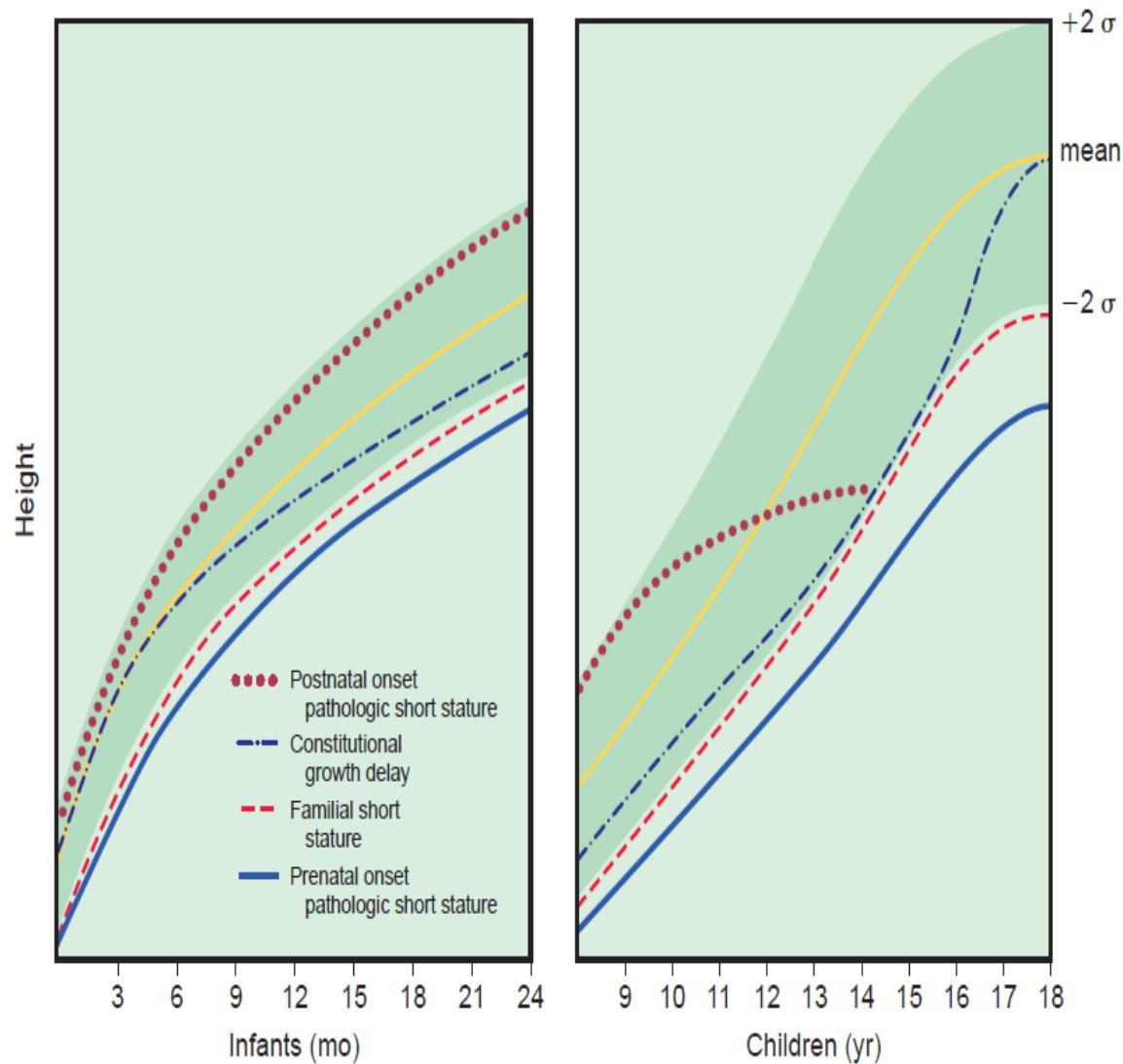
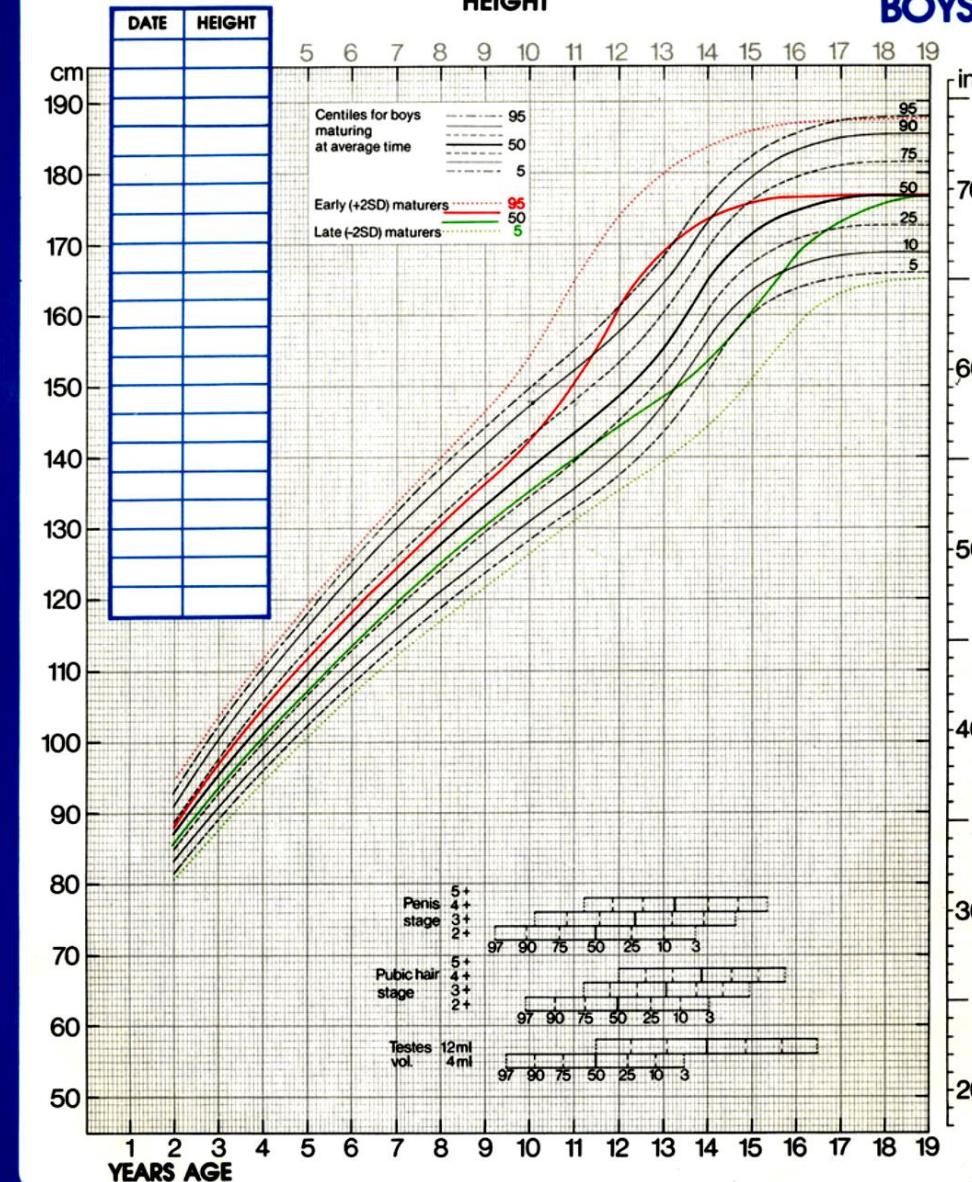


Figure 15-3 Height-for-age curves of the 4 general causes of proportional short stature: postnatal onset pathologic short stature, constitutional growth delay, familial short stature, and prenatal onset short stature. (From Mahoney CP: Evaluating the child with short stature, *Pediatr Clin North Am* 34:825, 1987.)

Serono

HEIGHT

BOYS



Distributed exclusively by:

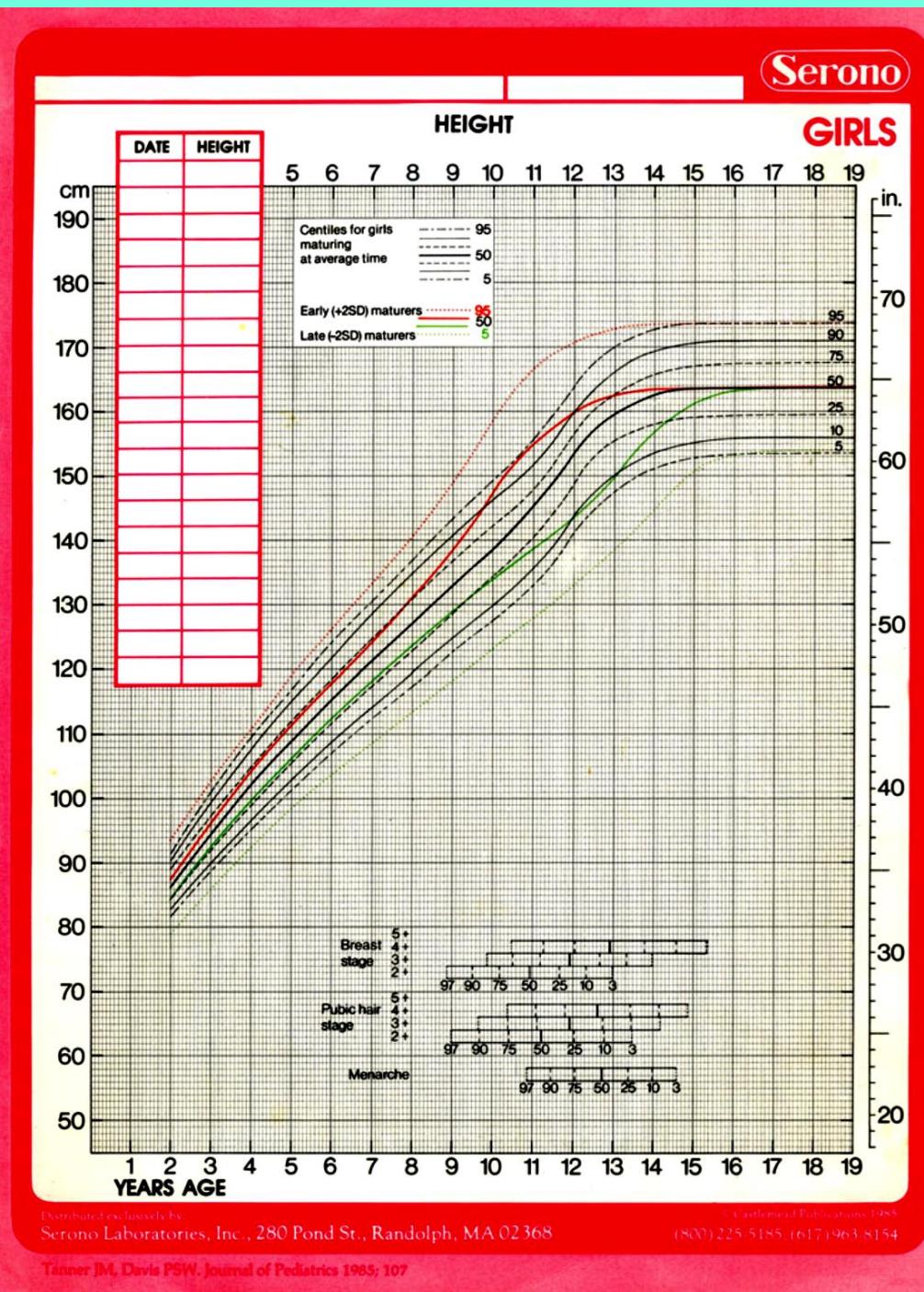
Serono Laboratories, Inc., 280 Pond St., Randolph, MA 02368

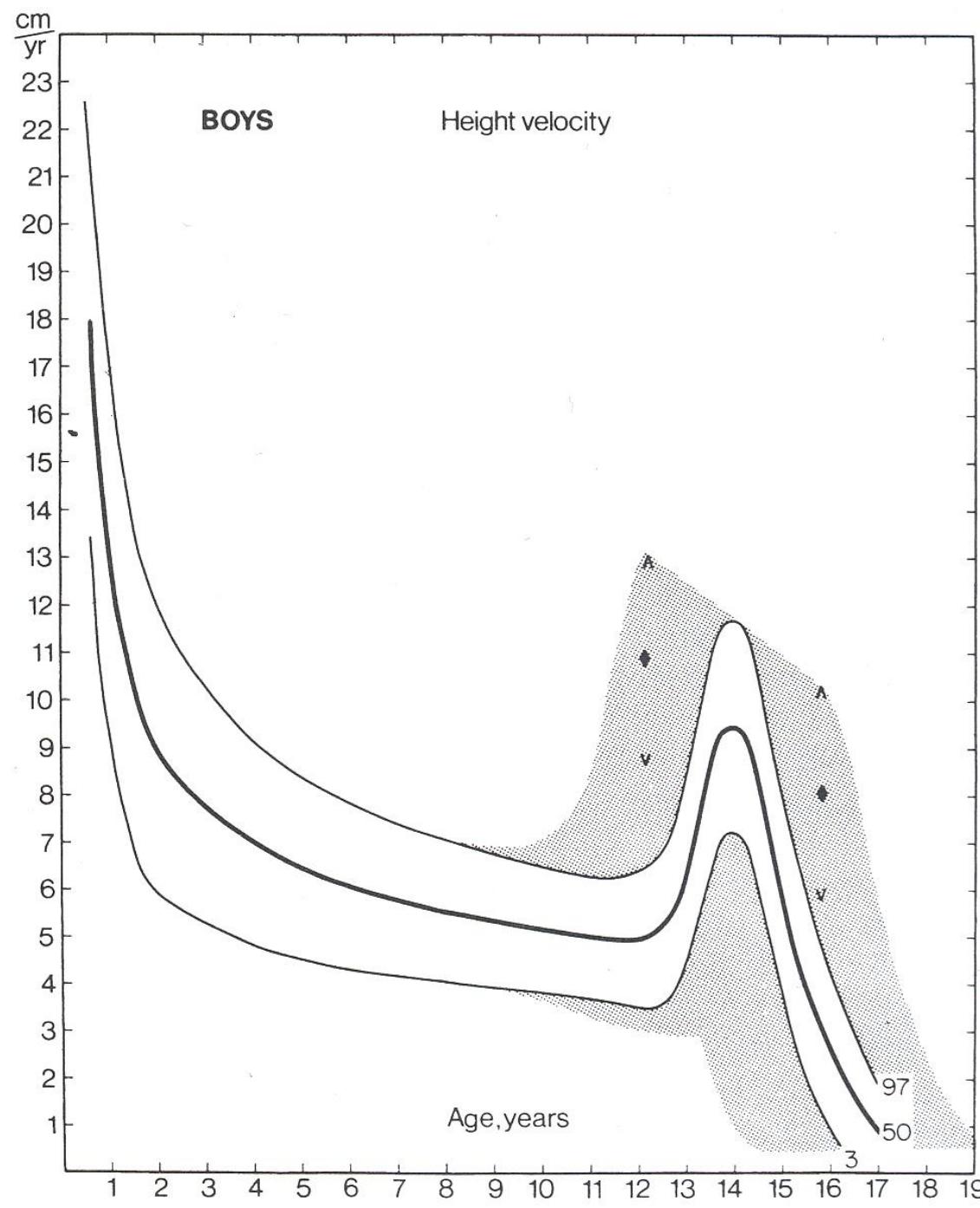
© Castlemead Publications 1985

(800) 225-5185, (617) 963-8154

Tanner JM, Davis PSW. Journal of Pediatrics 1985; 107:

Serono





Causes of short stature

- **Normal Variants of short stature**
- **Constitutional (delayed bone age)**
- **Genetic (short familial heights)**
- **Constitutional and genetic**

Causes of short stature

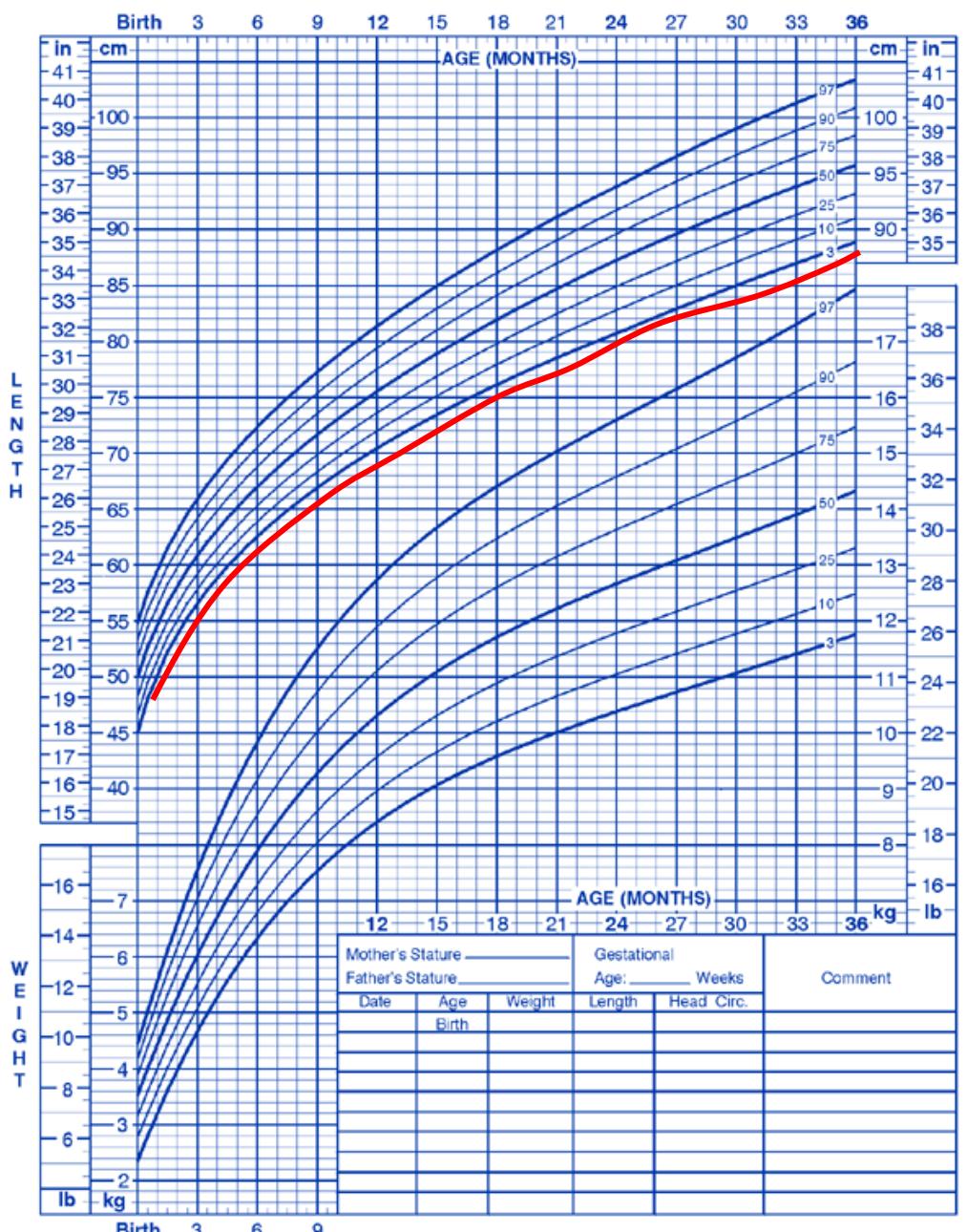
- **80% percent N.V.S.S**
- **20% is pathologic**

بیمار اول:

پسر ۱۰ ساله ای با قد ۱۲۵ سانتی متر جهت بررسی رشد ارجاع شده است. قد زمان

تولد ۴۷ سانتی متر

بررسی روی چارت رشد همراه بیمار را ملاحظه بفرمایید



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>

SAFER • HEALTHIER • PEOPLE™

OK135S063

Stature-for-age and Weight-for-age percentiles

The figure is a growth chart titled "AGE (YEARS)" at the top center. The vertical axis on the left is labeled "in" and "cm" with numerical scales from 30 to 160. The vertical axis on the right is labeled "lb" and "kg" with numerical scales from 10 to 190. The horizontal axis at the bottom is labeled "AGE (YEARS)" with numerical scales from 2 to 20. There are two sets of blue percentile curves, one for height and one for weight, each consisting of five curves (5th, 10th, 50th, 90th, 95th). A red line is drawn across the chart, starting at approximately (age 2, height 32, weight 10) and ending at approximately (age 10, height 125, weight 50), representing the 50th percentile for both height and weight at age 10.

Published May 30, 2000 (modified 11/21/00)

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>



آزمایشات همراه شامل تست های تیروئید نرمال و پاسخ به تست تحریکی برای هورمون رشد به شرح زیر است:

GH ---- 0.1----- 3 IGF1=140 IGFBP3=Normal

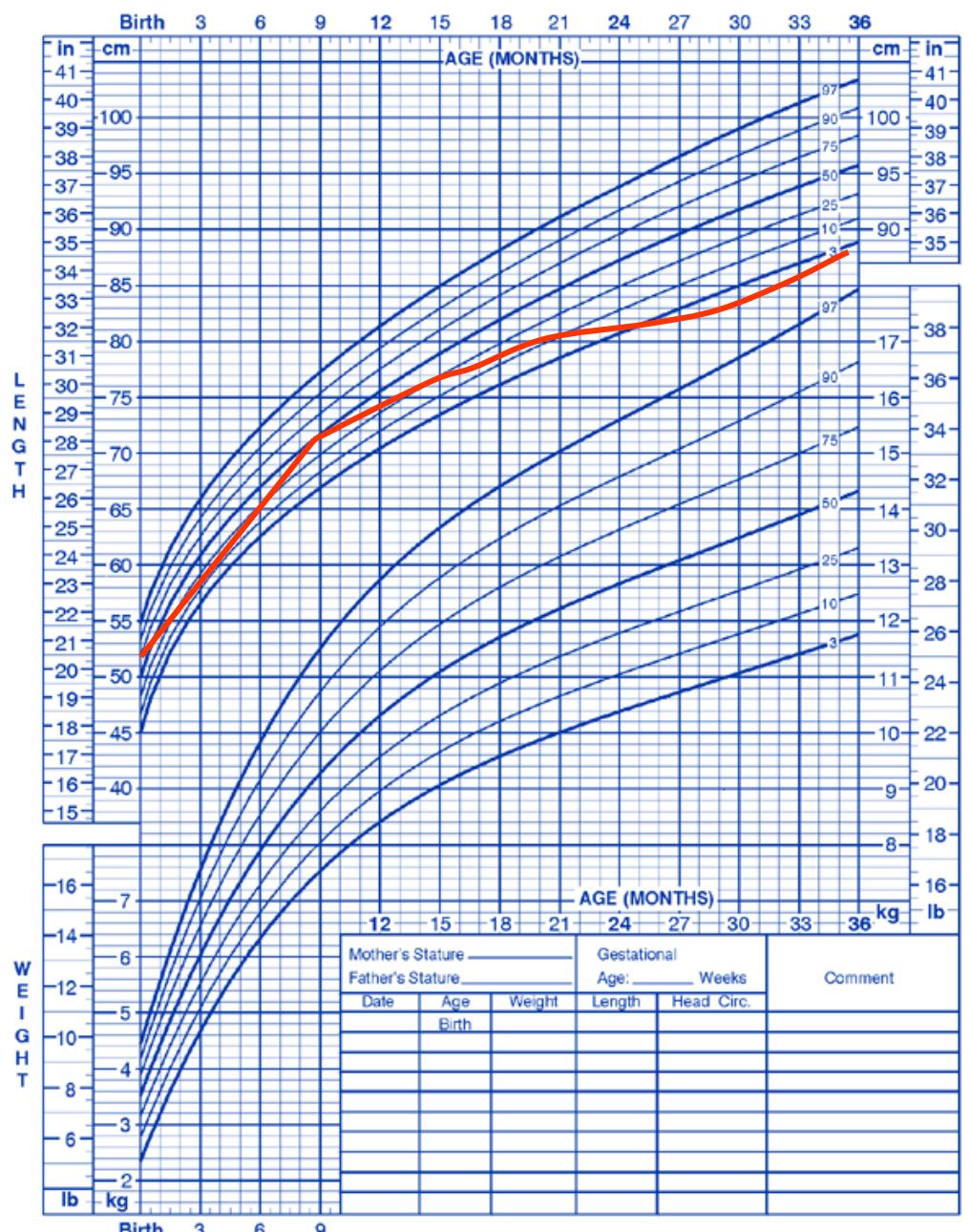
Bone age =10-10.5

تشخیص چیست؟

Familial Short Stature

بیمار دوم:

پسر ۸ ساله قد ۱۱۷ سانتی متر قد موقع تولد ۵۲ سانتی متر جهت بررسی رشد ارجاع شده است منحنی رشد همراه
بیمار را ملاحظه می فرمایید

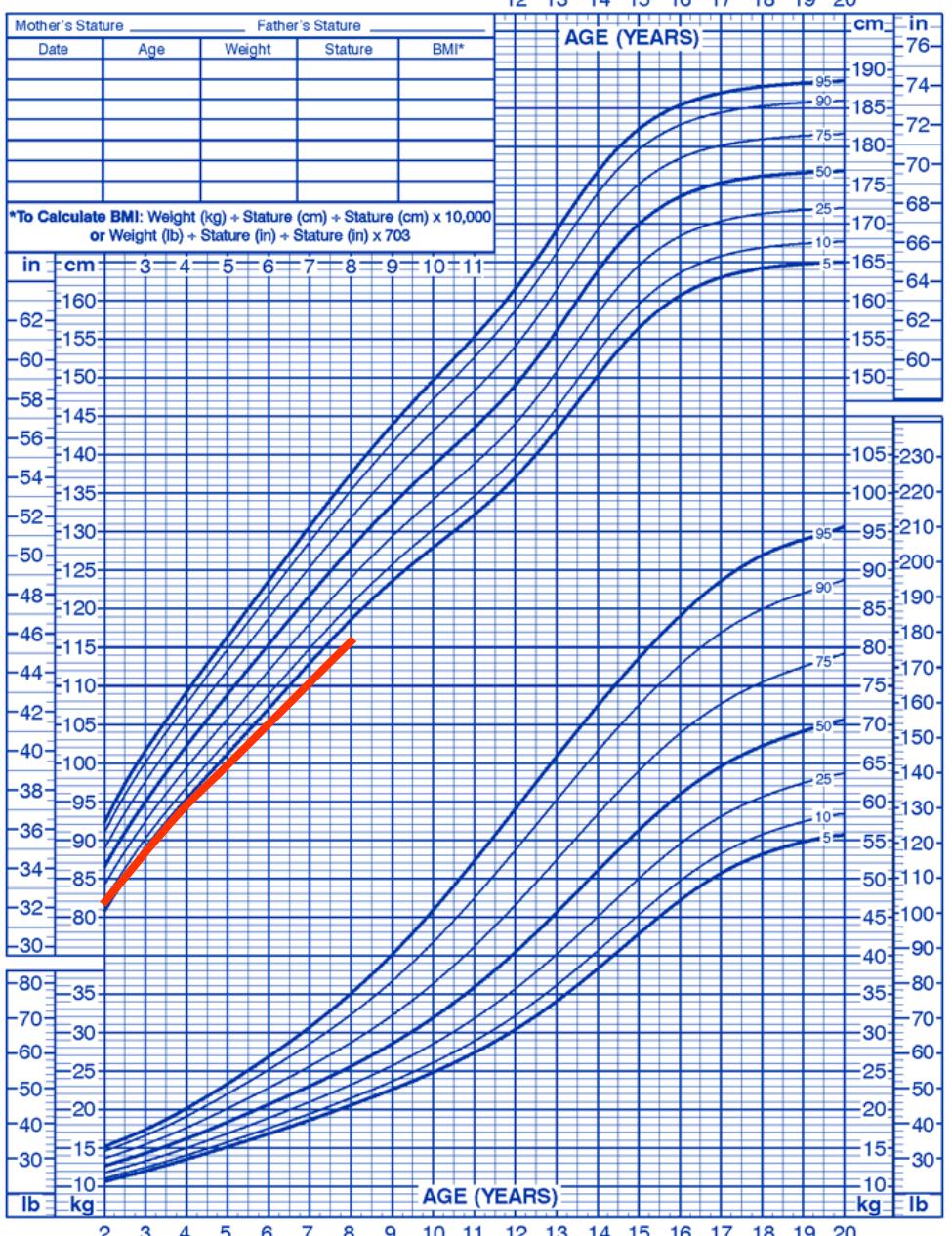


Published May 30, 2000 (modified 4/20/01)

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>



Stature-for-age and Weight-for-age percentiles



Published May 30, 2000 (modified 11/21/00).

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>

OK135S057



SAFER • HEALTHIER • PEOPLE™

معاینات و آرمايشات روتین و تست های تیروئید نرمال و پاسخ به تست تحريكی به شرح زیر
است:

$\text{GH}=0.3$ ----- 2 $\text{IGF1} = 160$ IGF BP=N

تشخيص چیست؟

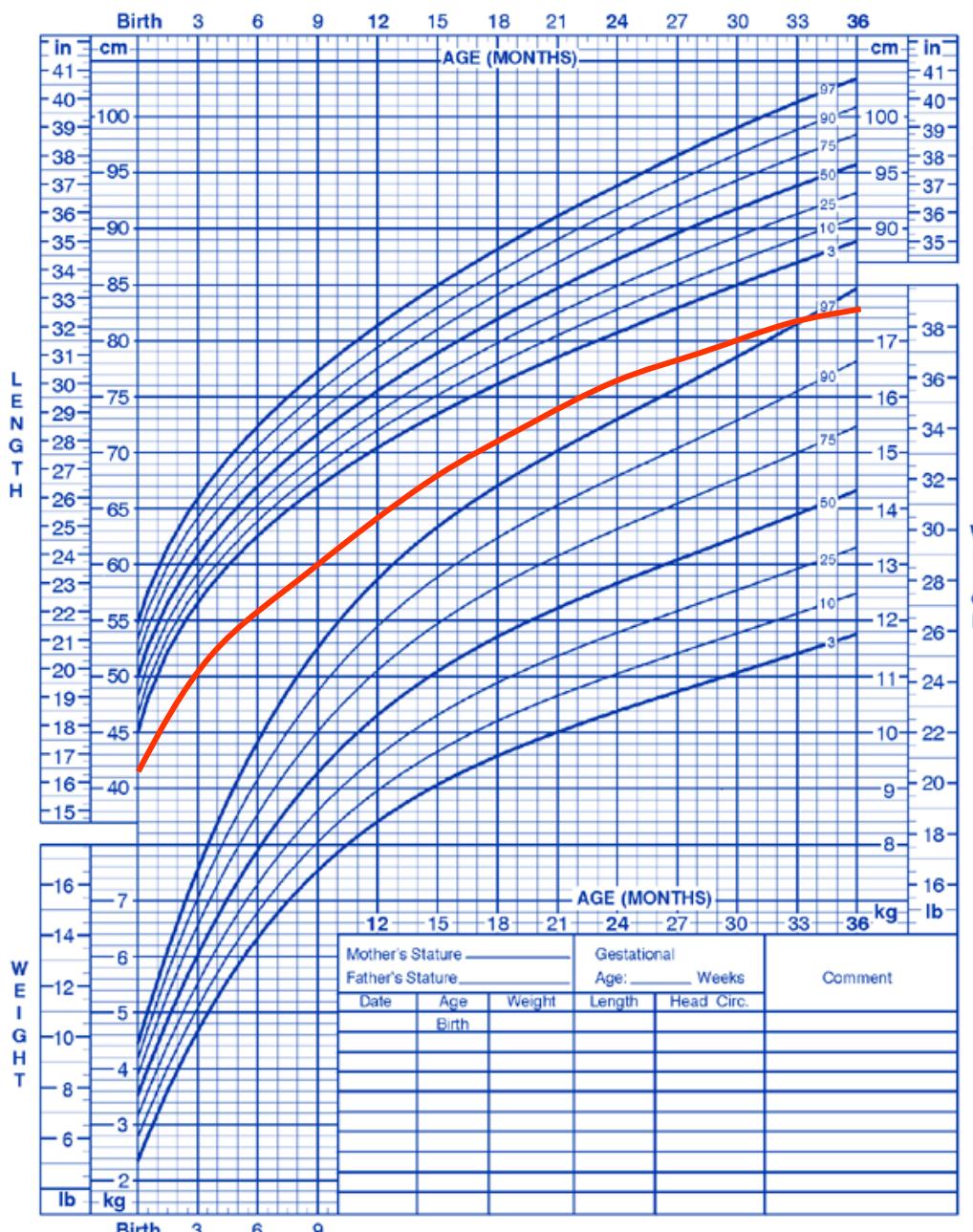
Constitutional delay of puberty

پسر ۱۰ ساله با قد ۱۱۵ سانتی متر جهت بررسی کوتاهی قد ارجاع شده است. قد زمان تولد ۴۲ سانتی متر در معاینه نکته ای ندارد.

آزمایشات روتین و تست های تیروئید نرمال است

IGF1=170 IGFBP3=N GH=0.1-----10

منحنی رشد وی از بدو تولد را ملاحظه می فرمایید.



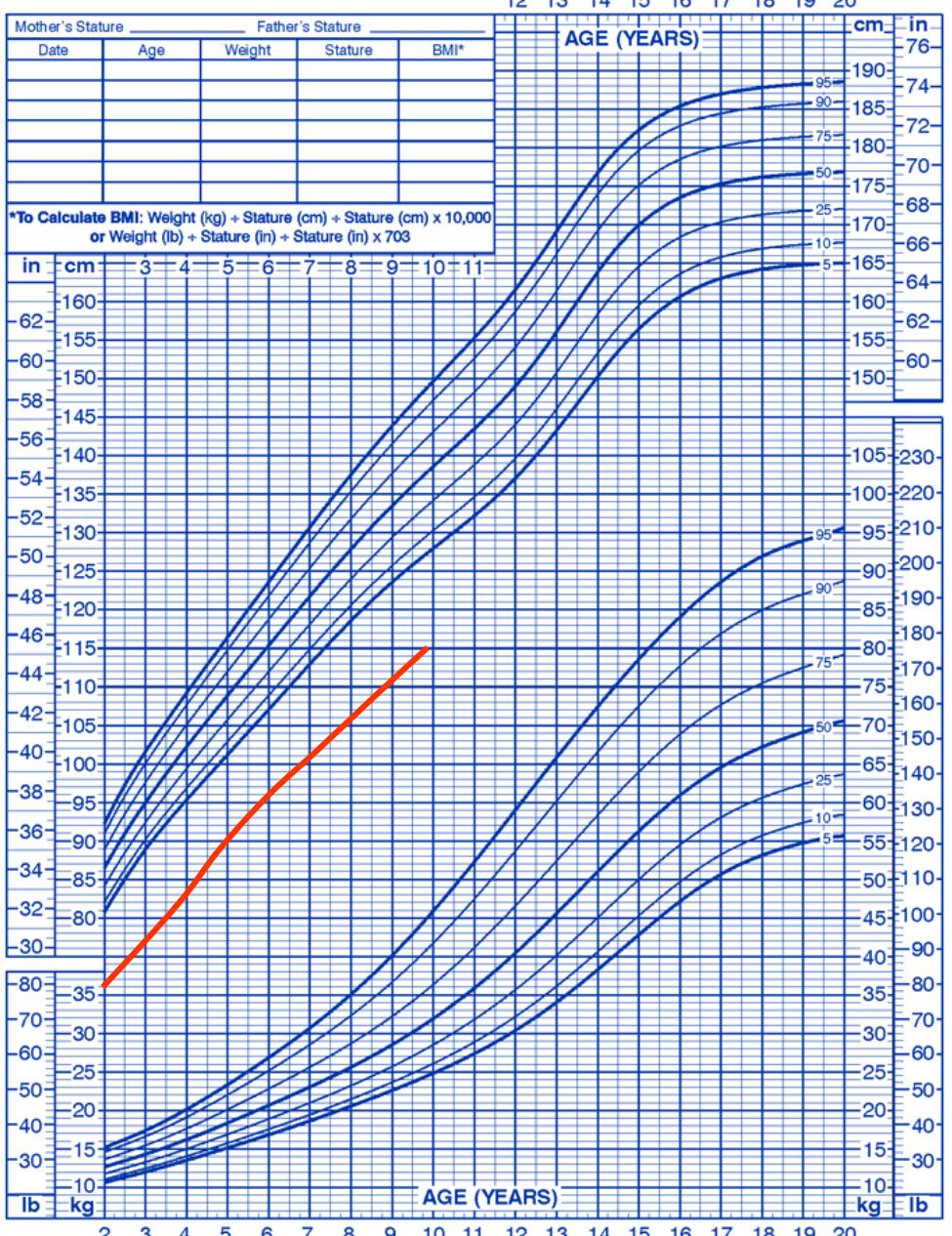
Published May 30, 2000 (modified 4/20/01).

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>

SAFER • HEALTHIER • PEOPLE™

OK135S063

Stature-for-age and Weight-for-age percentiles



Published May 30, 2000 (modified 11/21/00).

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>

OK135S057

تشخیص چیست؟

Prenatal Pathologic Short Stature

دختر ۹ ساله ای با قد ۱۲۳ سانتی متر جهت بررسی رشد ارجاع شده است پس

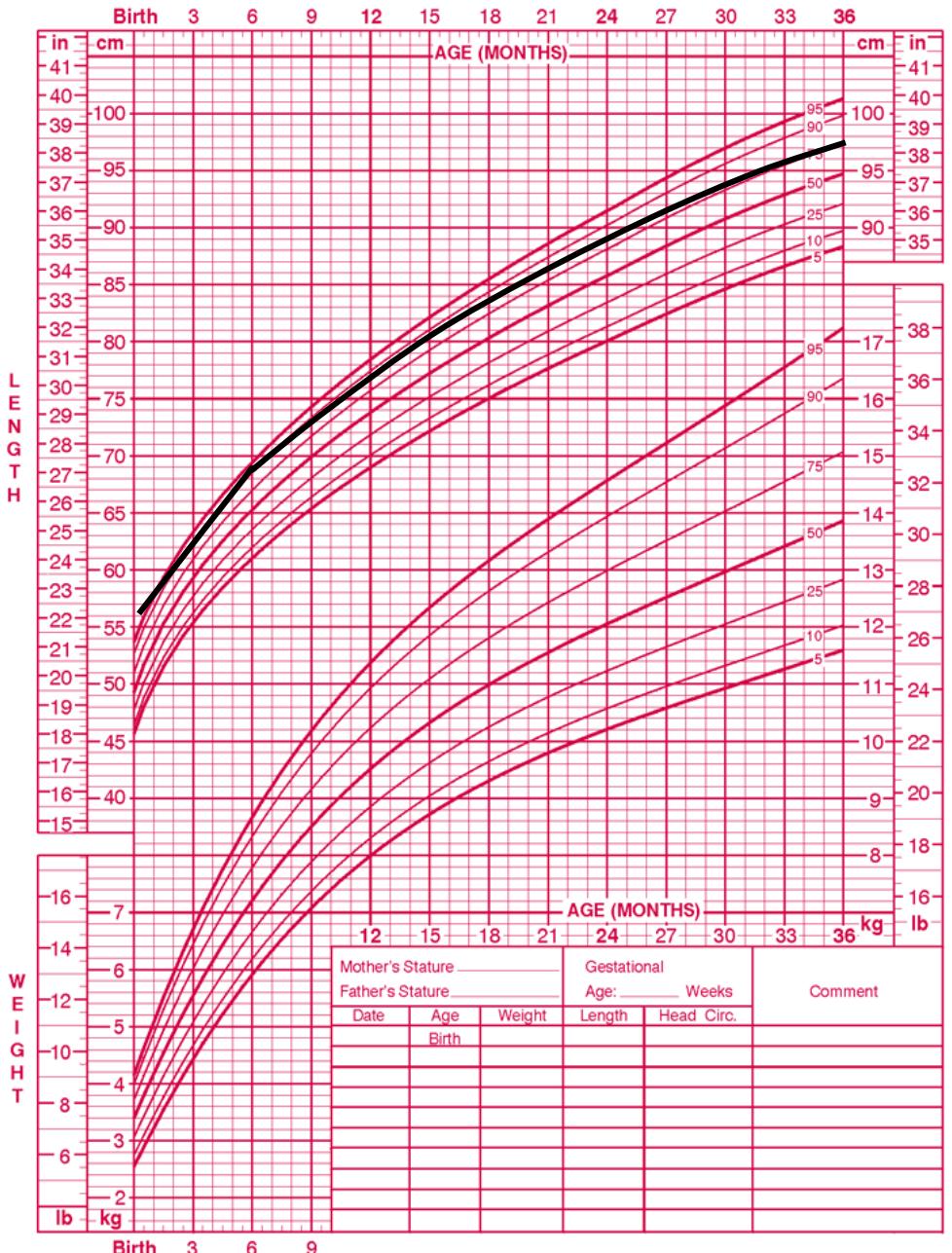
از بررسی قد روی منحنی percentile 5 است

منحنی رشد را از بدو تولد ملاحظه بفرمایید

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

NAME _____

RECORD # _____



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>



SAFER • HEALTHIER • PEOPLE™

OK135S054

2 to 20 years: Girls

Stature-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____ Date _____

Date	Age	Weight	Stature	BMI*
	2	10	30	
	3	15	35	
	4	20	40	
	5	25	45	
	6	30	50	
	7	35	55	
	8	40	60	
	9	45	65	
	10	50	70	
	11	55	75	
	12	60	80	
	13	65	85	
	14	70	90	
	15	75	95	
	16	80	100	
	17	85	105	
	18	90	110	
	19	95	115	
	20	100	120	

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

In cm 3 4 5 6 7 8 9 10 11

cm 76 74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30

lb 160 155 150 145 140 135 130 125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50 45 40

kg 175 170 165 160 155 150 145 140 135 130 125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50 45 40

AGE (YEARS)

Published May 30, 2009 (modified 11/21/09)

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>



این منحنی طبیعی است یا غیر طبیعی؟

BA≤5.5 yer

T3PU↓

T4↓

TSH↑

G.H=0.1-----0.2

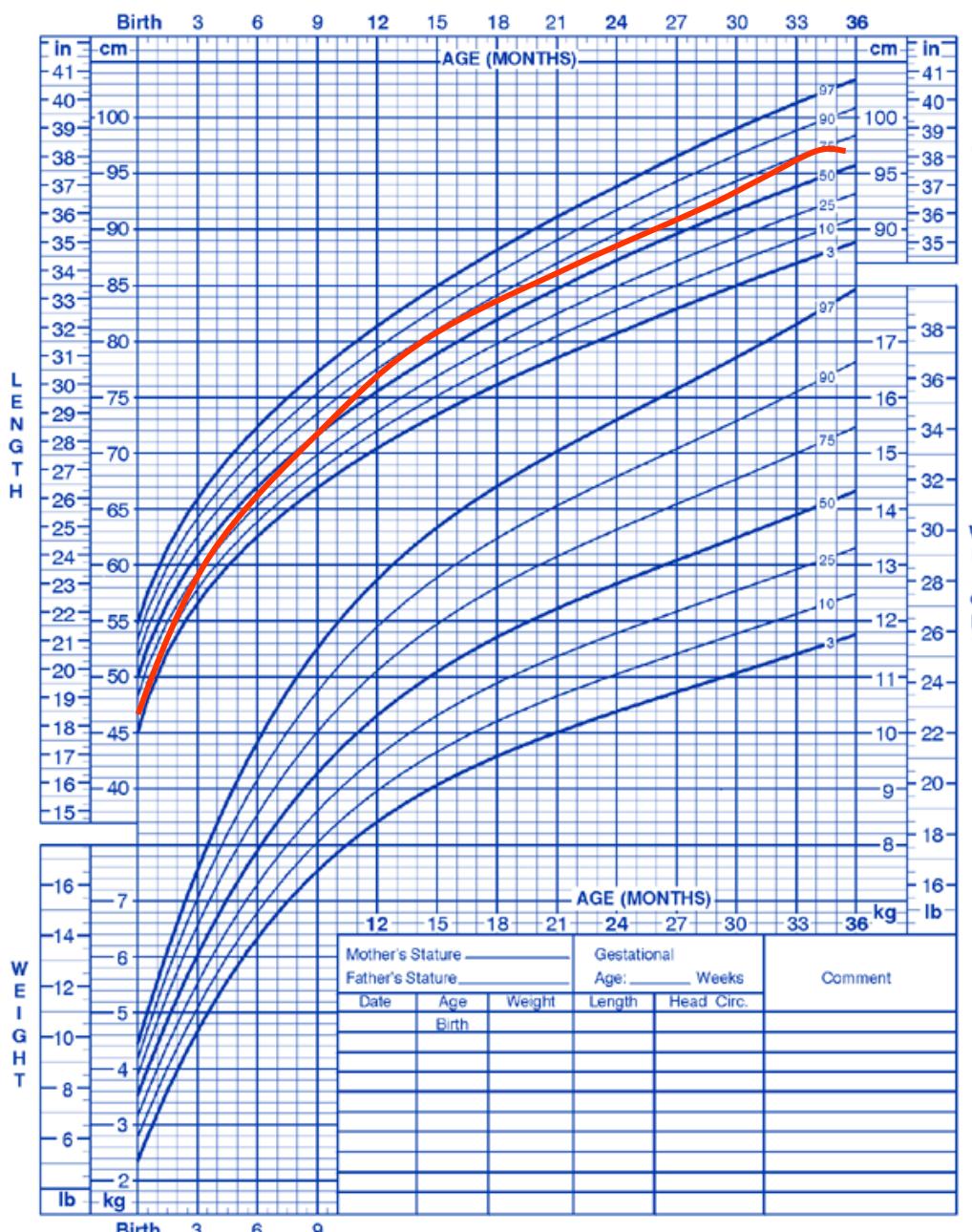
|G12|=50

|G12BP3|=↓

تشخيص چیست؟

Pathologic Short Stature due to Primary hypothyroid

پسر ۸ ساله با قد ۱۲۰ جهت بررسی رشد ارجاع شده است قد موقع تولد ۴۵ سانتی متر بوده به منحنی رشد وی را
ملاحظه بفرمایید



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>

SAFER • HEALTHIER • PEOPLE™

OK135S063

Stature-for-age and Weight-for-age percentiles

Published May 30, 2000 (modified 11/21/00)

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>



رشد کودک طبیعی است یا غیر طبیعی؟

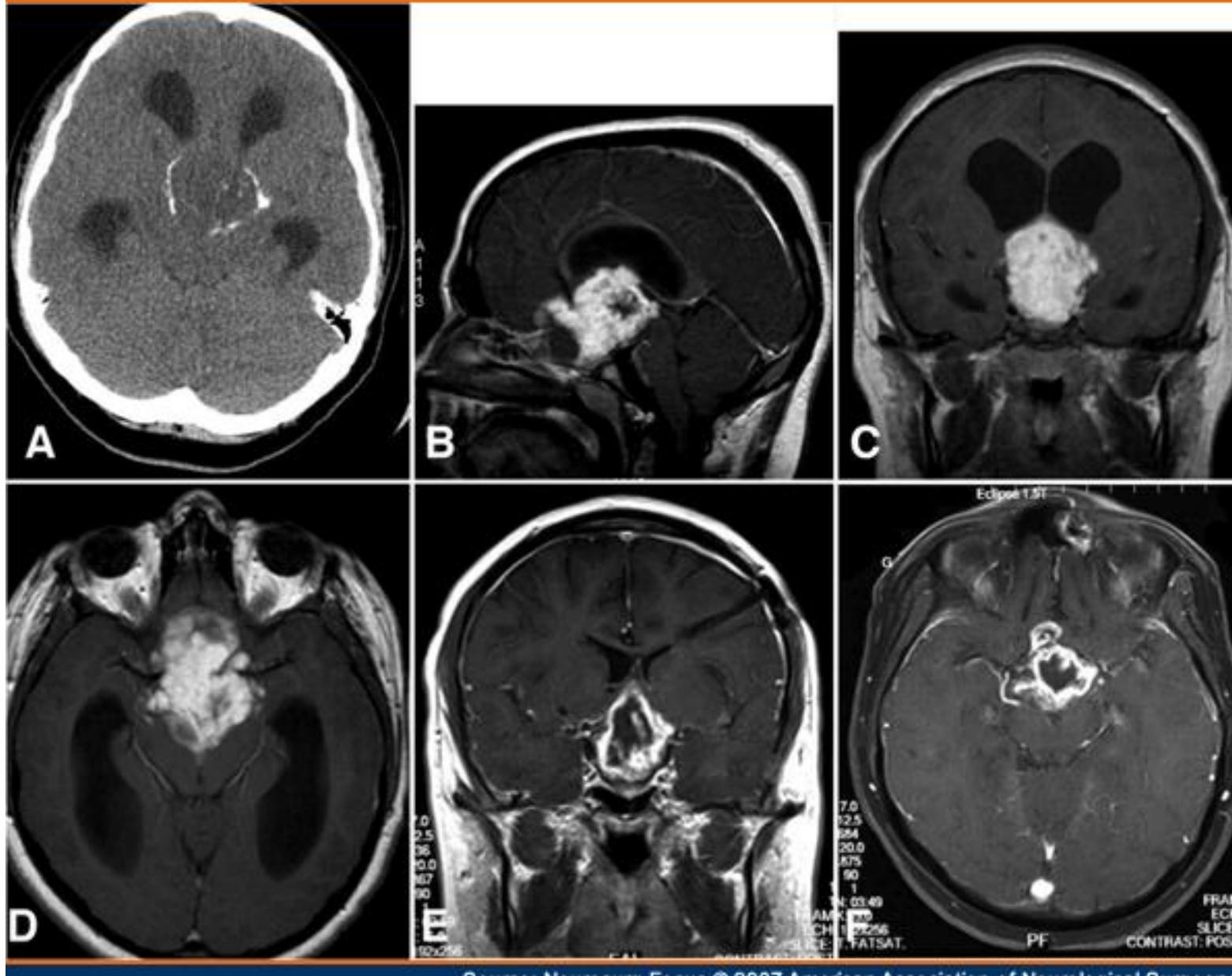
GH =0.1- 0-1

IGFI=60

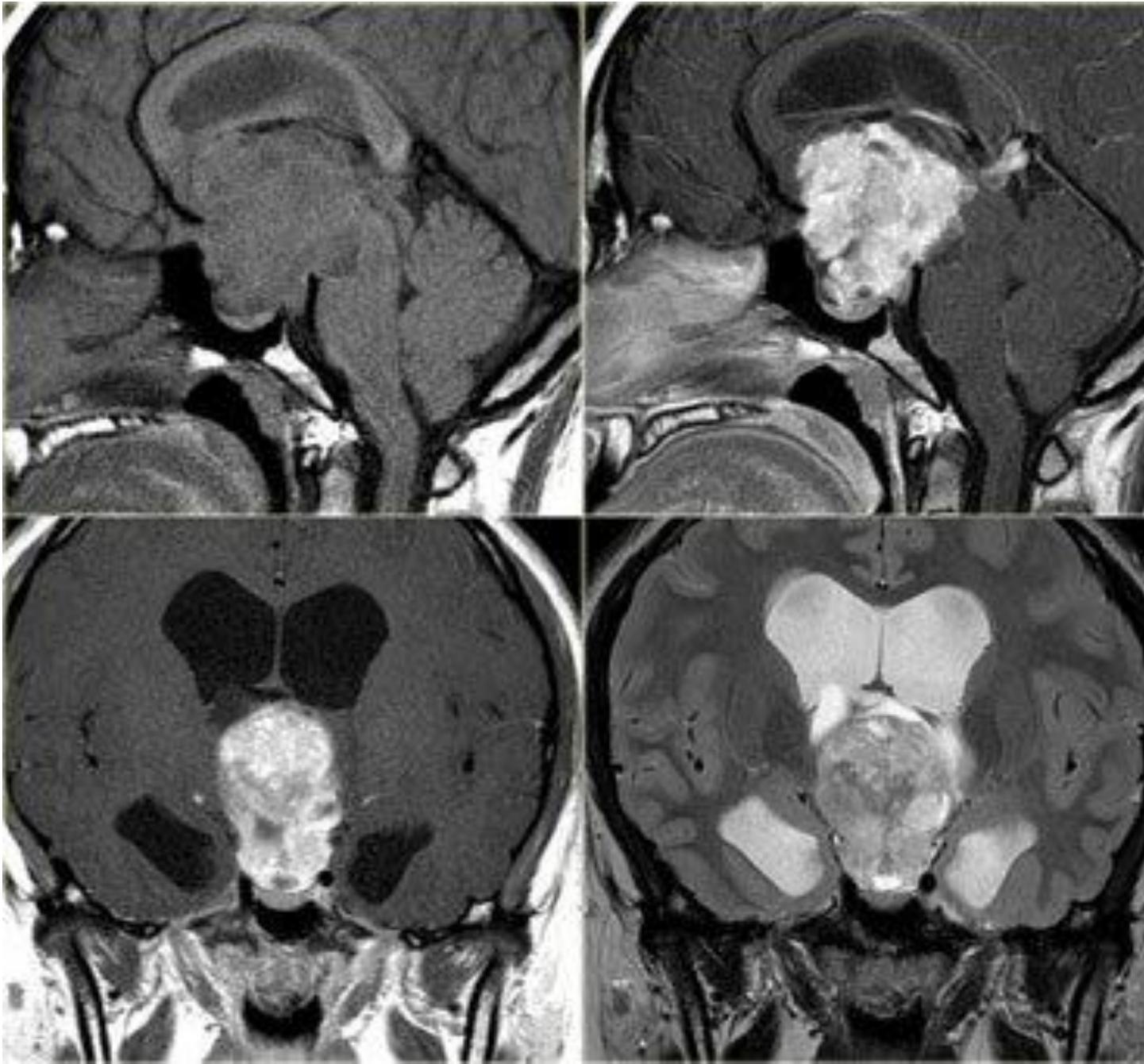
IGFBP=↓

BA≤6 year

تشخیص چیست؟







Brain CT Scan shows craniopharingioma

دختر ۸ ساله ای جهت بررسی اختلال رشد ارجاع شده است قد وی ۱۱۵

سانتی متر است

2 to 20 years: Girls

Stature-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____

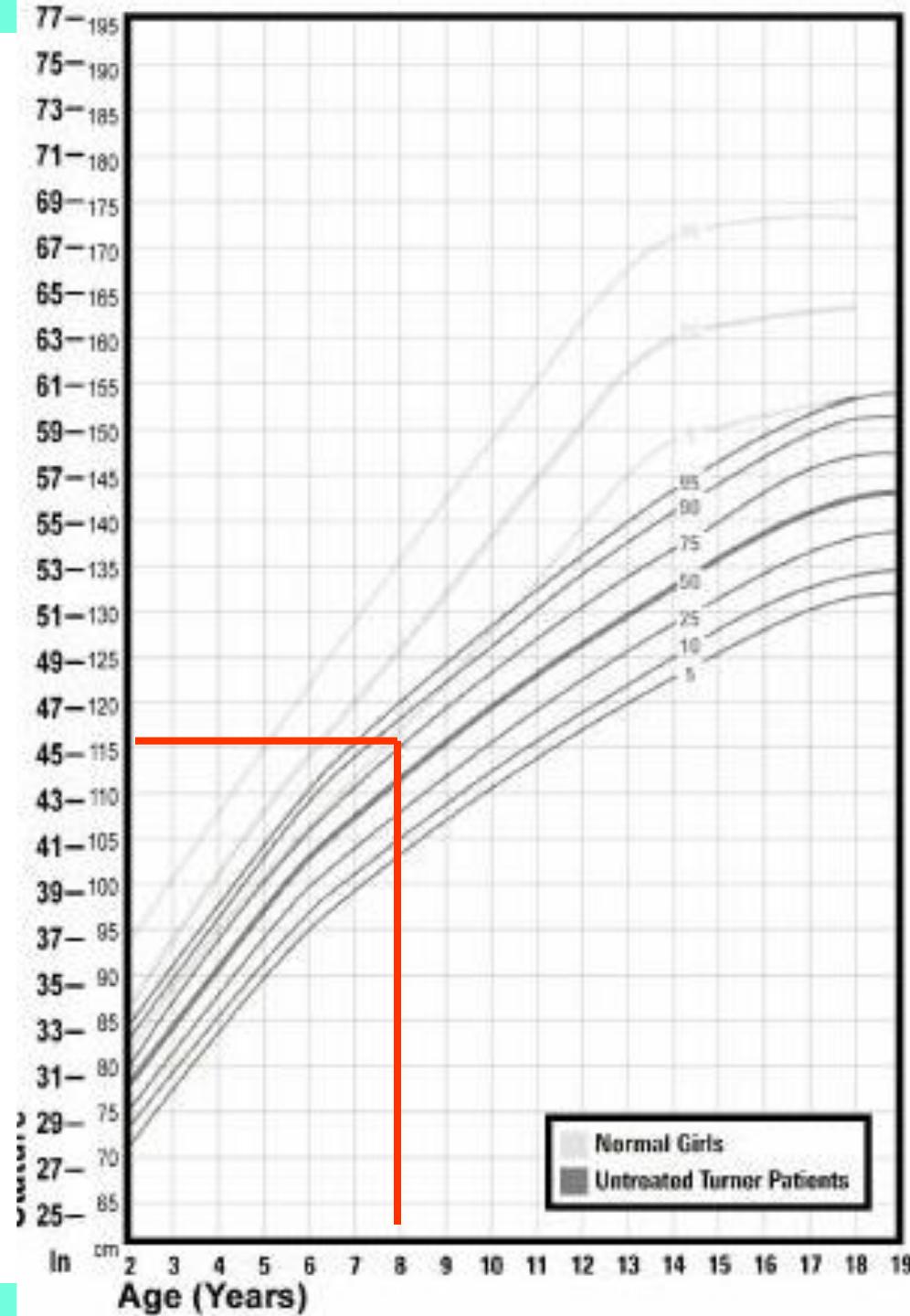
Published May 30, 2009 (modified 11/21/09)

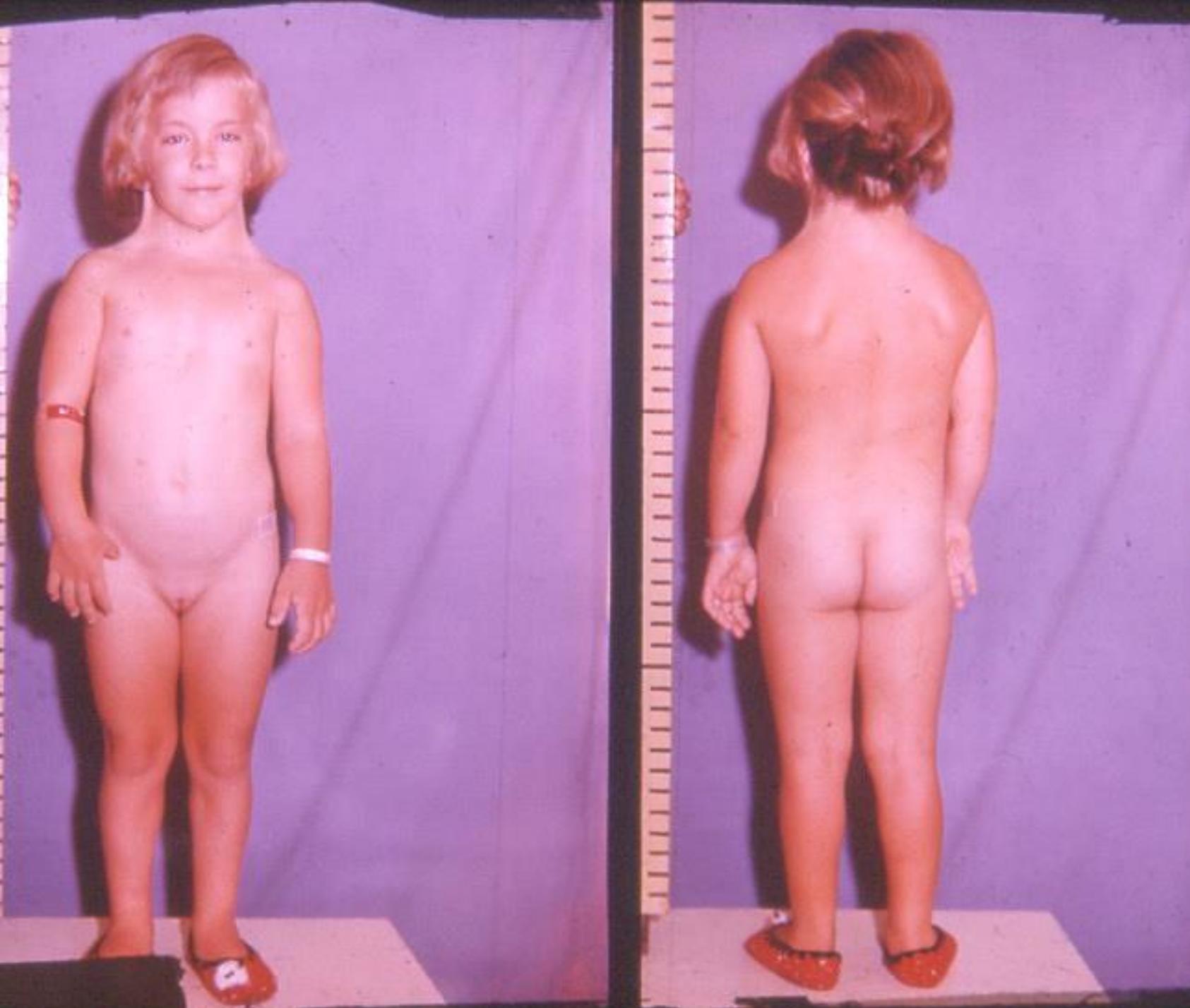
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000). <http://www.cdc.gov/growthcharts>





**Turner syndrome results when all or part of one of the X chromosomes
is lost before or soon after the time
of conception.**





Pathologic short



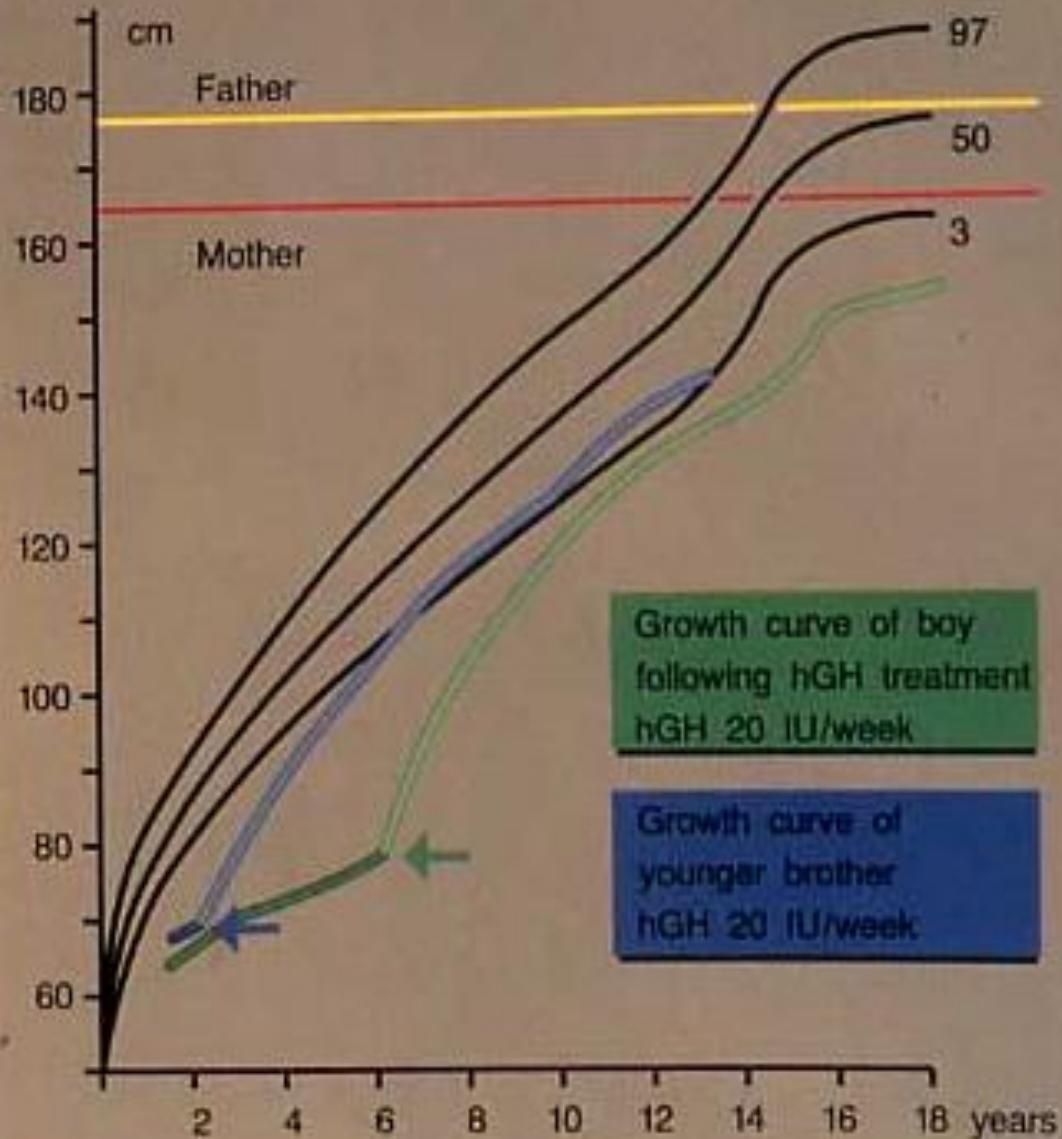


Fig. 3: Growth curve of two GHD brothers, illustrating the importance of early diagnosis and treatment (9).





- **Normal growth**
- **Abnormal growth**
- **Approach to Abnormal growth**

Causes of short stature

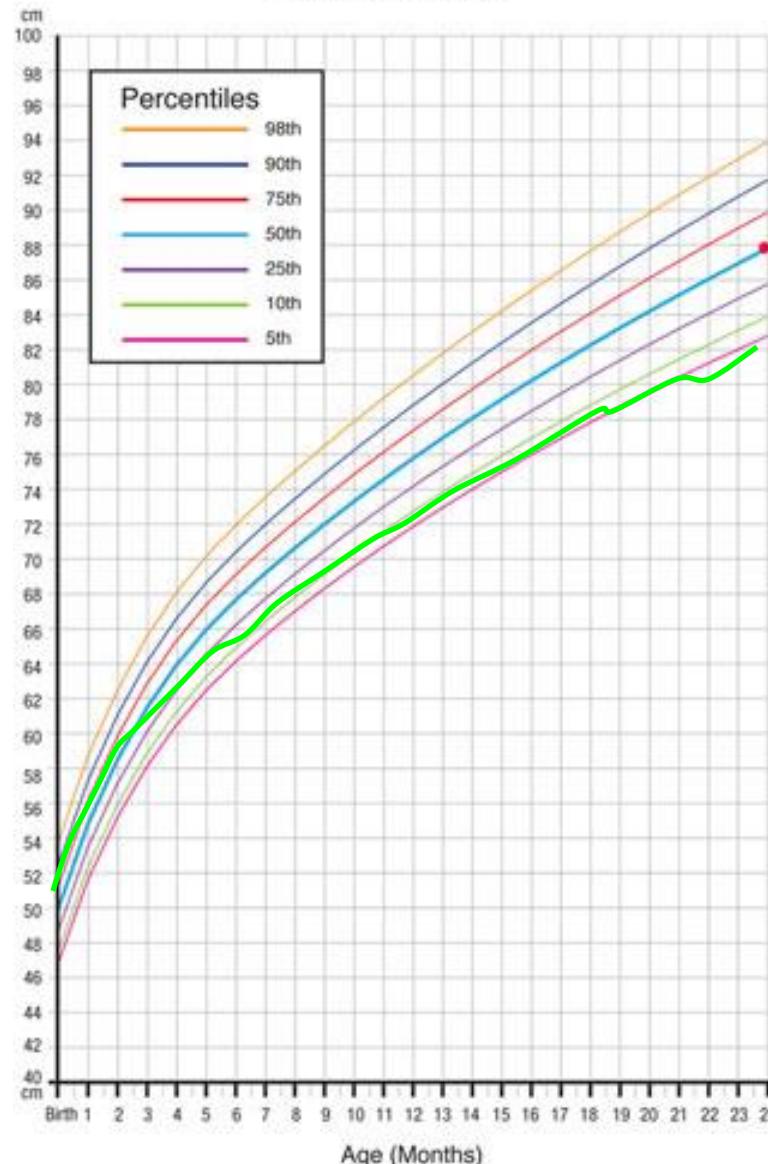
- **80% percent N.V.S.S**
- **20% is pathologic**

Causes of short stature

- **Normal Variants of short stature**
- **Constitutional (delayed bone age)**
- **Genetic (short familial heights)**
- **Constitutional and genetic**

Boys Length-for-age Percentiles

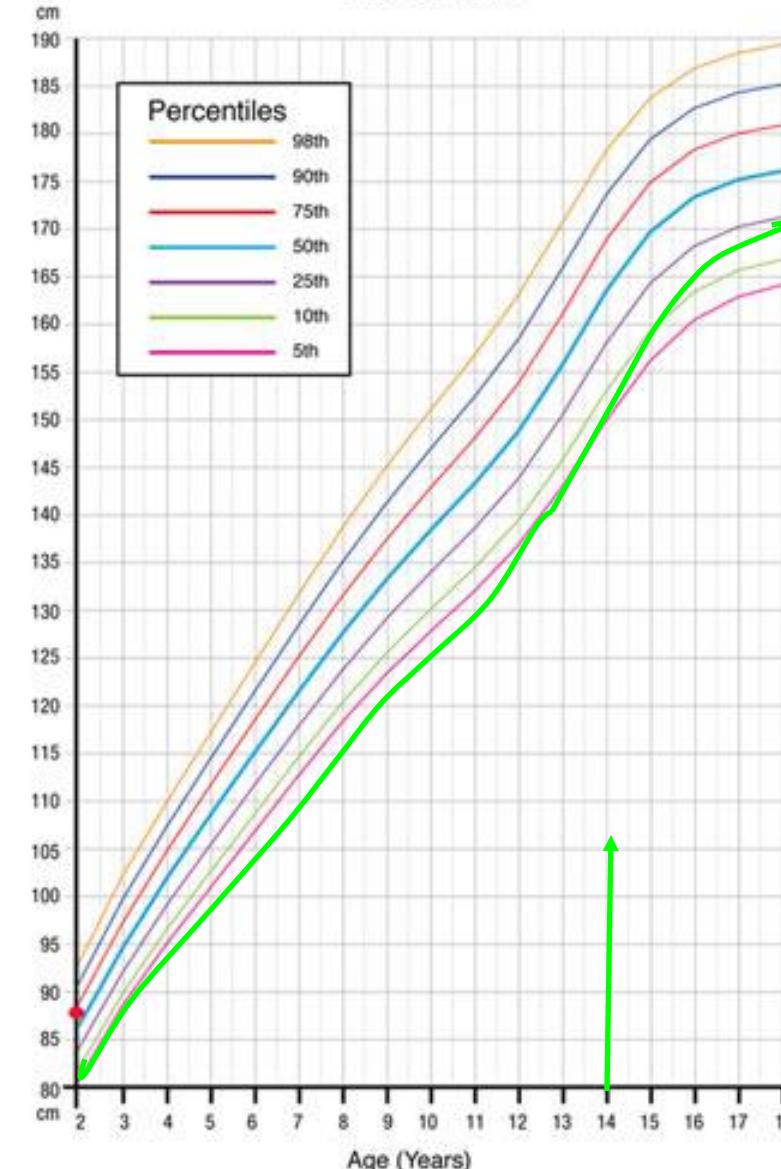
Birth to 24 Months



SOURCE: World Health Organisation Child Growth Standards <http://www.who.int/childgrowth/en>

Boys Height-for-age Percentiles

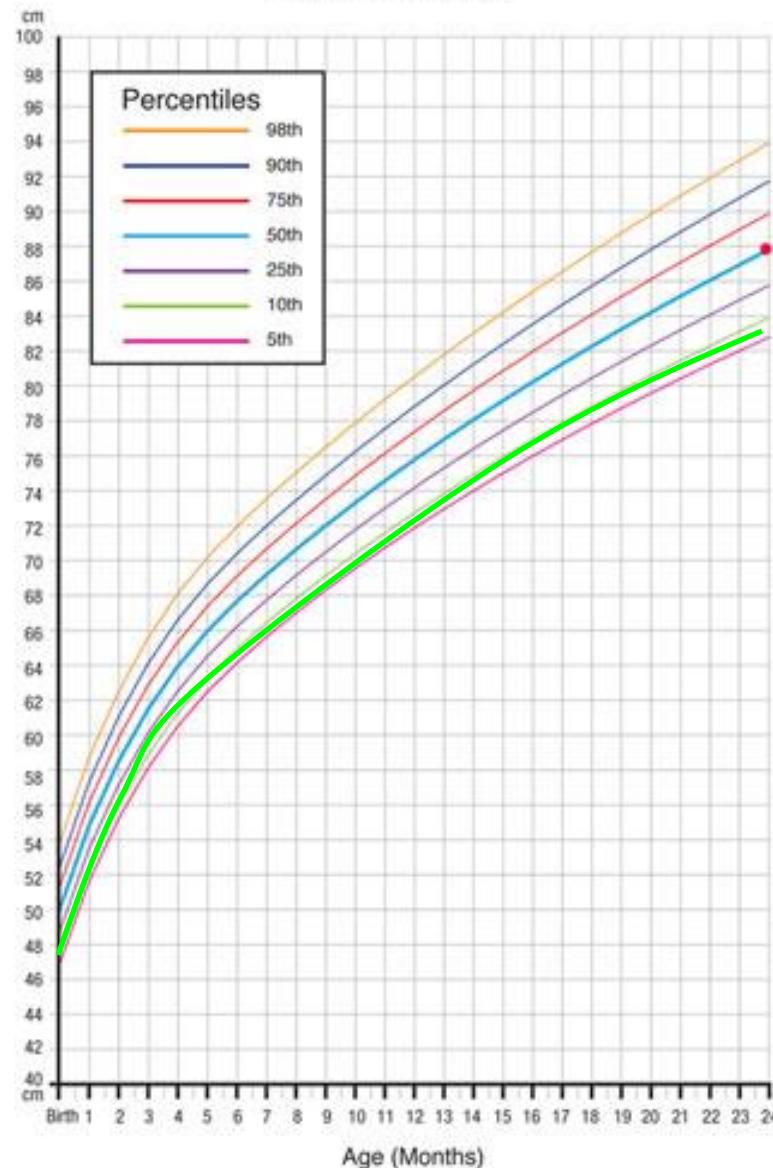
2 to 18 Years



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>

Boys Length-for-age Percentiles

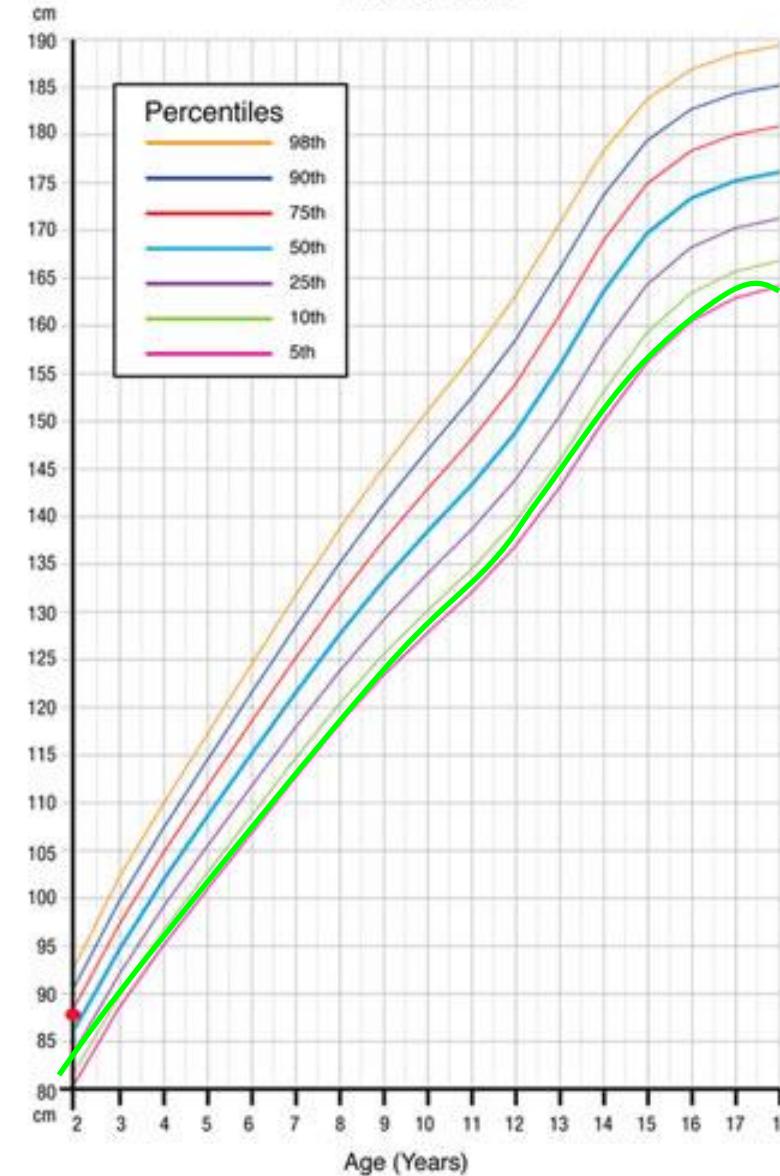
Birth to 24 Months



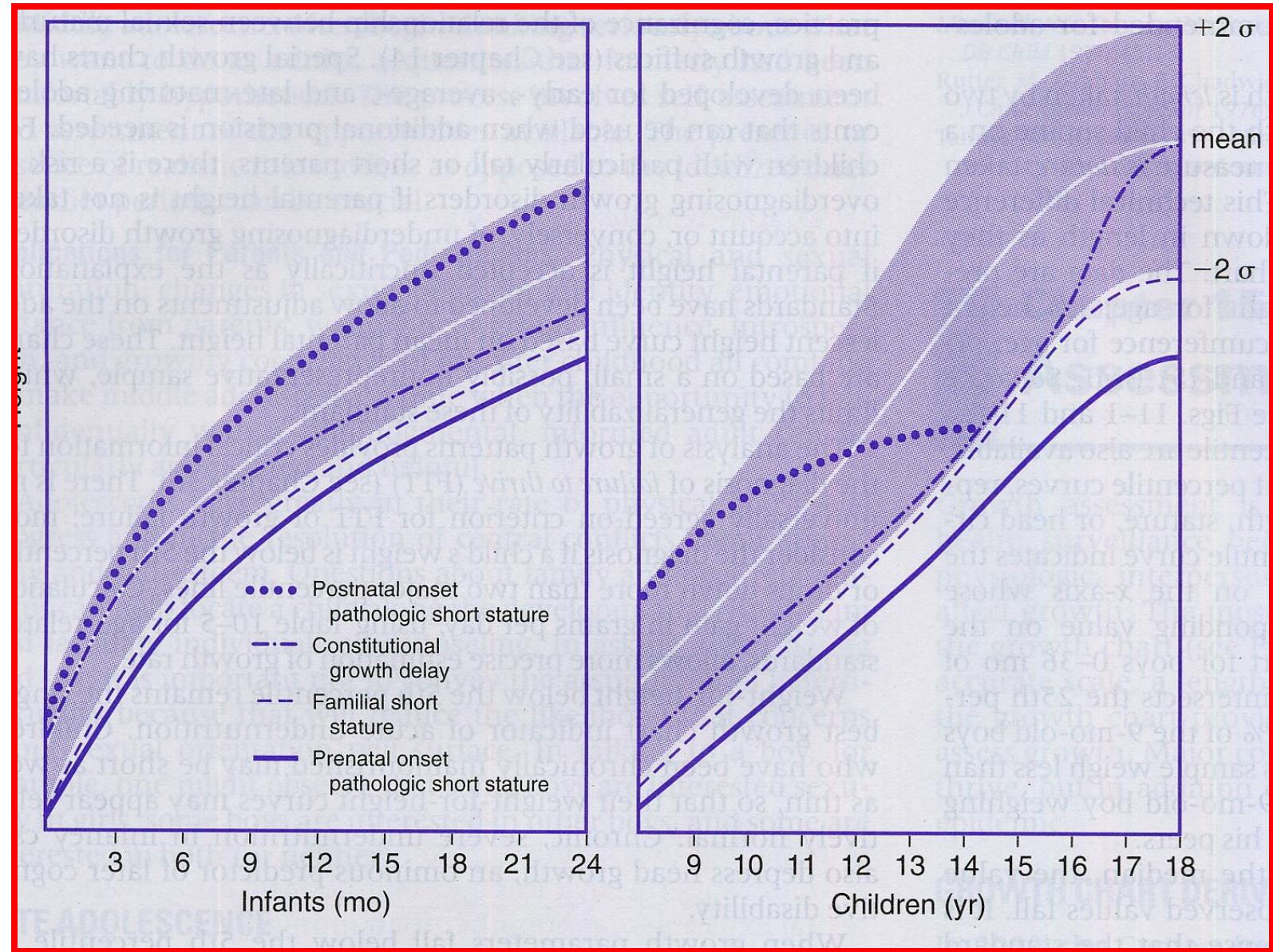
SOURCE: World Health Organisation Child Growth Standards <http://www.who.int/childgrowth/en>

Boys Height-for-age Percentiles

2 to 18 Years

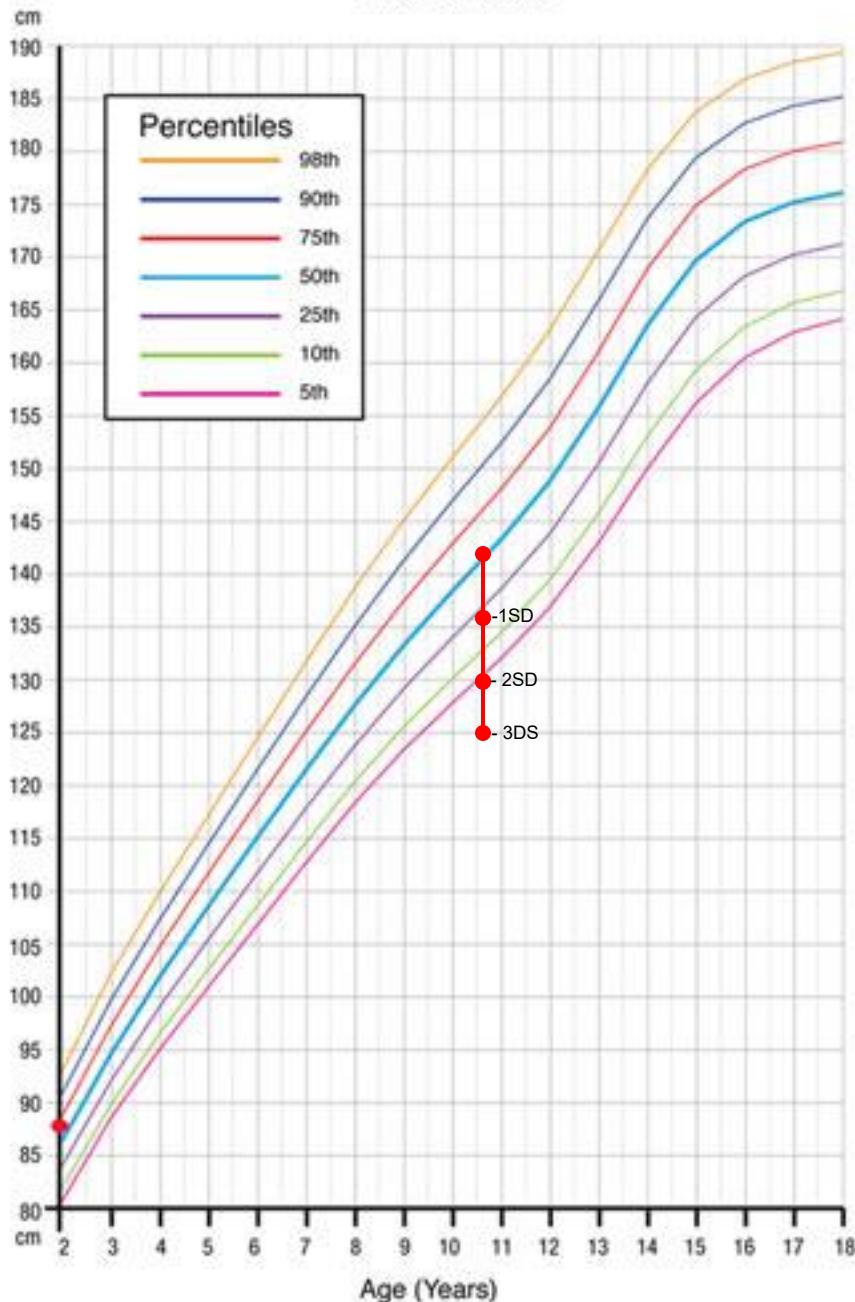


SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000) <http://www.cdc.gov/growthcharts>



- SDS
- Height Velocity
- MPH (Target Height)
- Final Height
- Normal Variant Short

Boys Height-for-age Percentiles 2 to 18 Years



Mid Parental Height

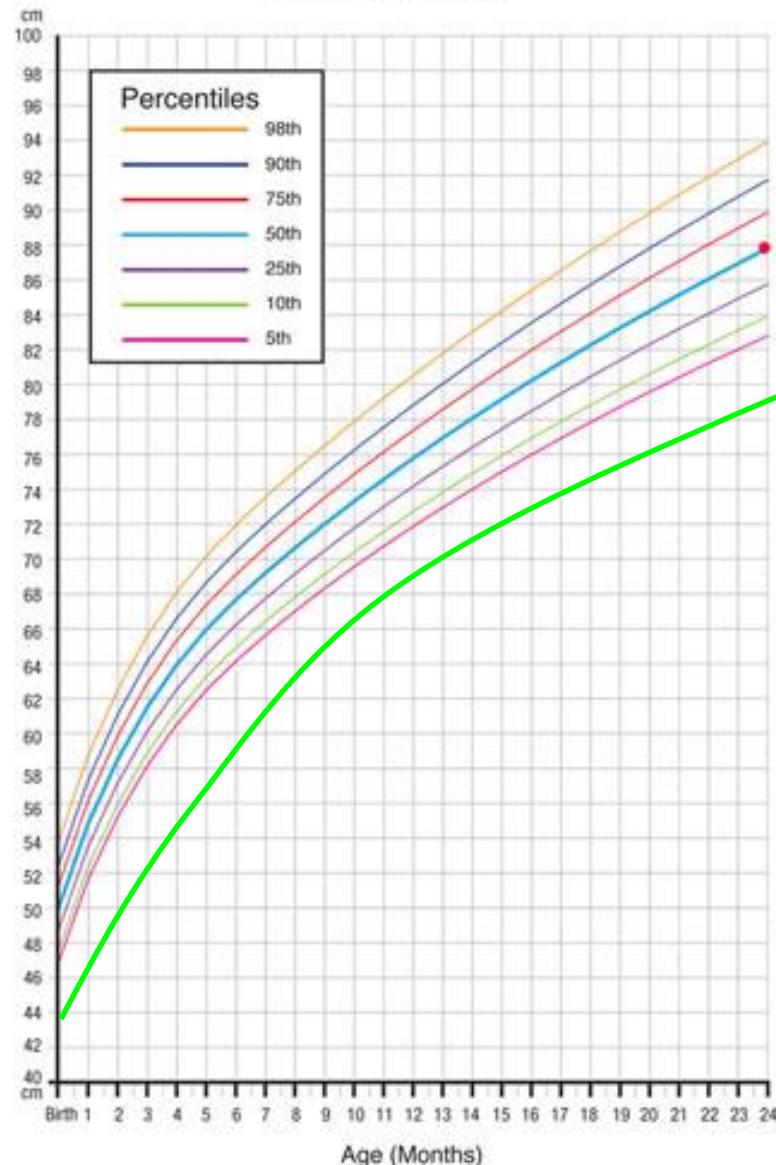
Girl Mother Height + father Height - 6

Taraet heiiaht

- The genetic potential or mid – parental height (MPH) of a child is calculated simply by the following formulae.
- Target height for boy = ([father’s height + mother’s height]/2)+7cm.
- Target height for girl = ([mother’s height +father’s height]/2)-7cm.

Boys Length-for-age Percentiles

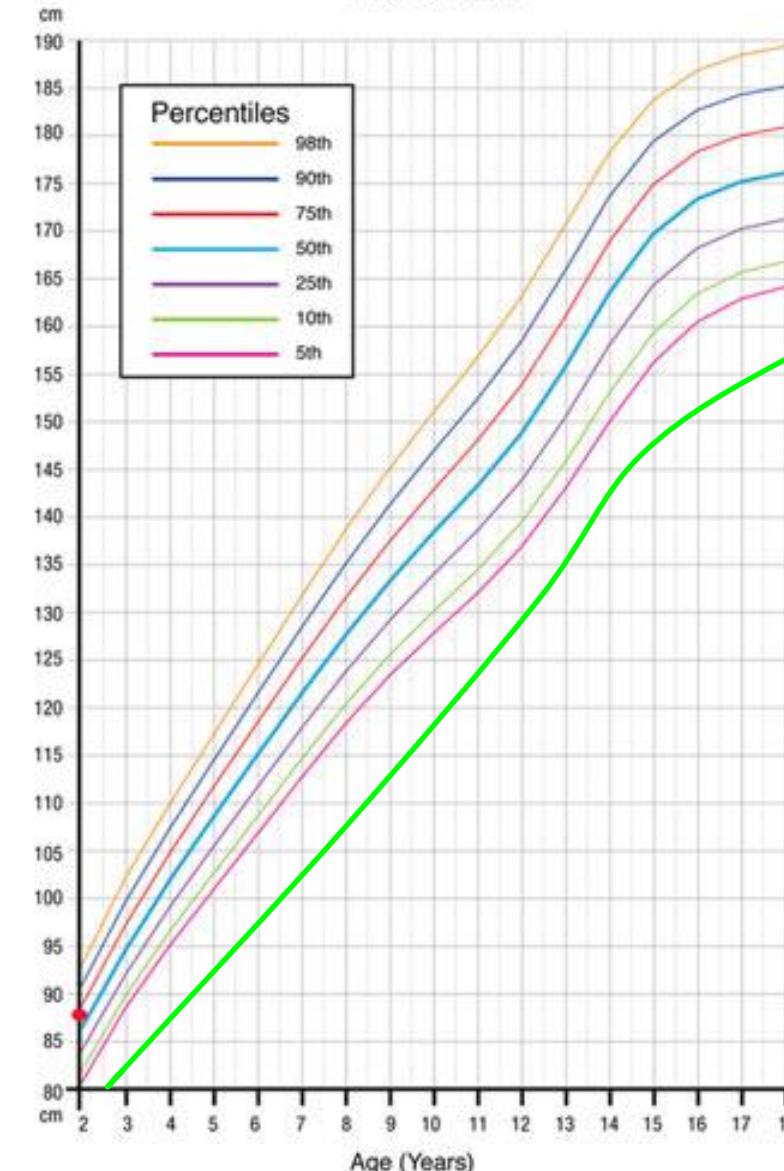
Birth to 24 Months



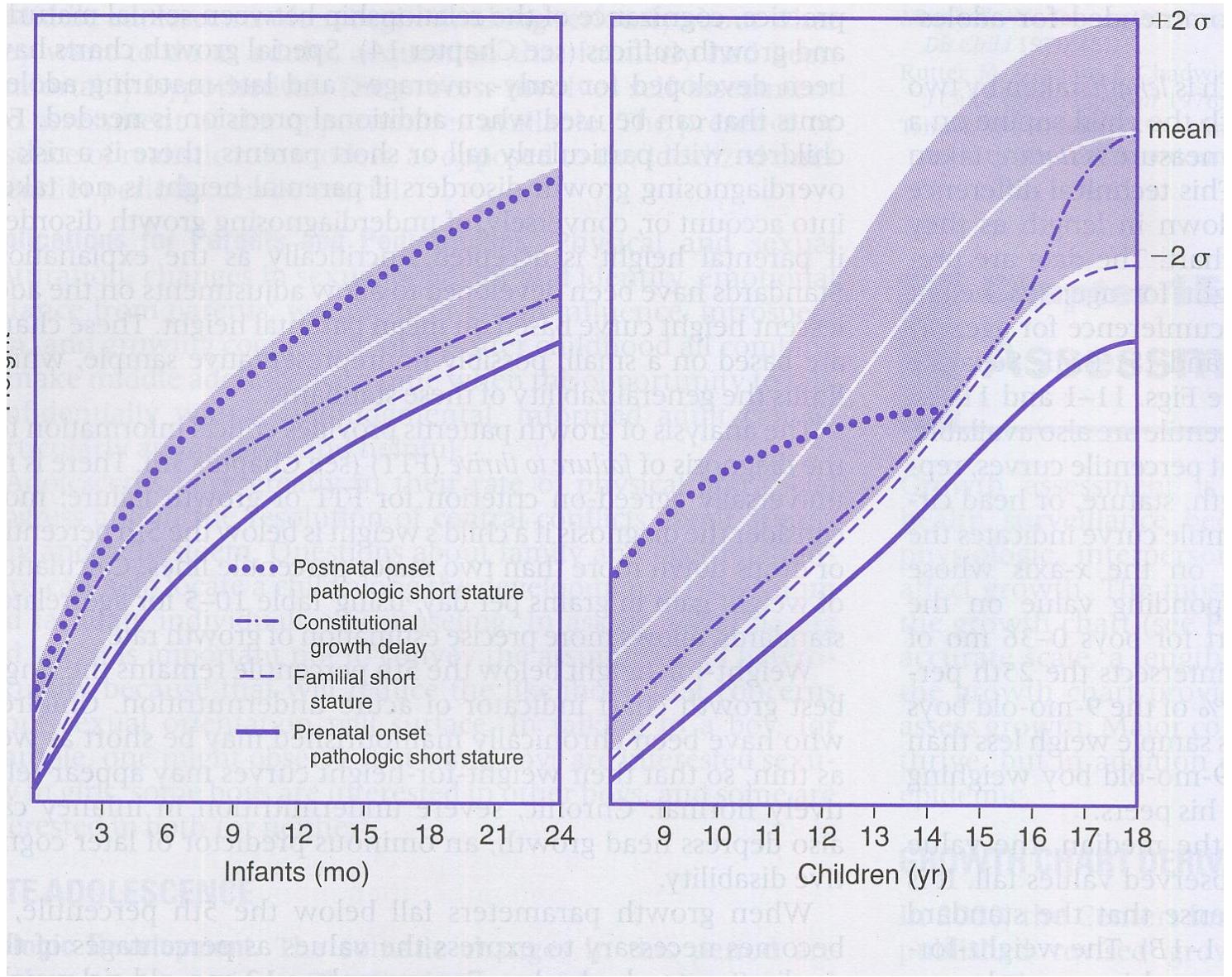
SOURCE: World Health Organisation Child Growth Standards <http://www.who.int/childgrowth/en>

Boys Height-for-age Percentiles

2 to 18 Years



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>



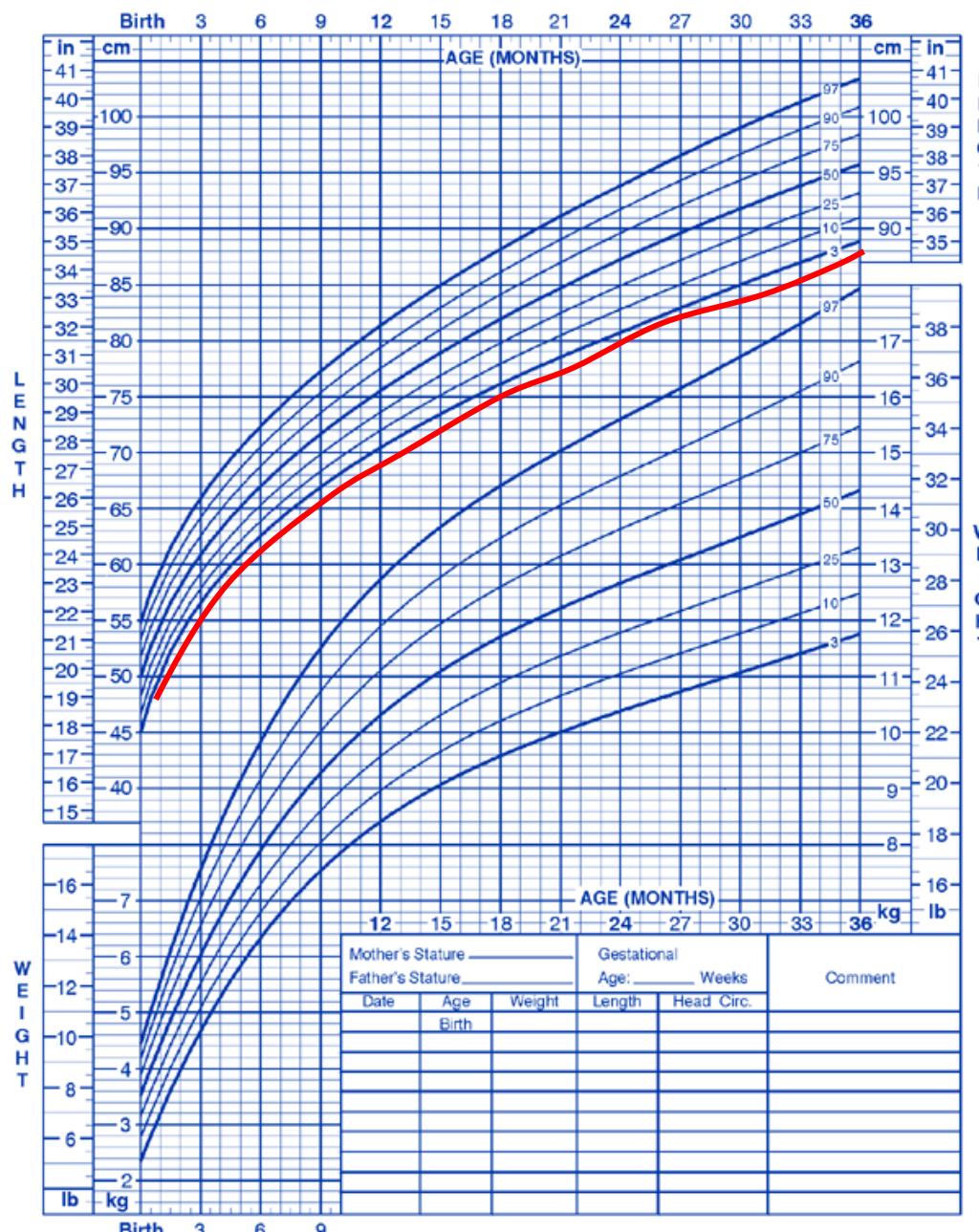
بیمار اول:

پسر ۱۰ ساله‌ای با قد ۱۲۵ سانتی متر جهت بررسی رشد ارجاع شده است. قد زمان تولد ۴۷ سانتی متر

بررسی روی چارت رشد همراه بیمار را ملاحظه بفرمایید

Birth to 36 months: Boys

NAME _____



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>



SAFER • HEALTHIER • PEOPLE

OK135S063

Stature-for-age and Weight-for-age percentiles

Published May 30, 2000 (modified 11/21/00)

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>



آزمایشات همراه شامل تست های تیروئید نرمال و پاسخ به تست تحریکی برای هورمون رشد به شرح زیر است:

GH ---- 0.1----- 3 IGF1=140 IGFBP3=Normal

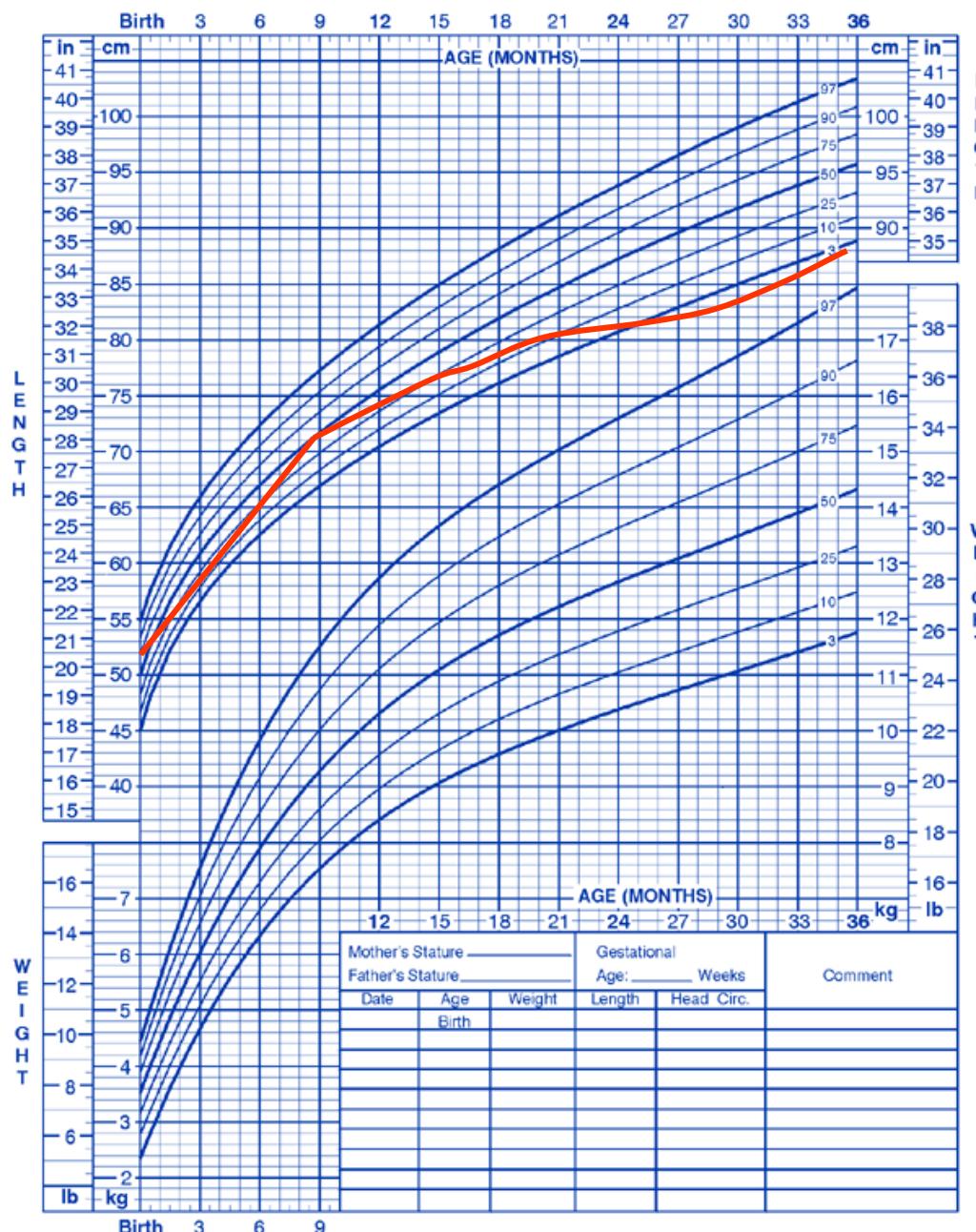
Bone age =10-10.5

تشخیص چیست؟

Familial Short Stature

بیمار دوم:

پسر ۸ ساله قد ۱۱۷ سانتی متر قد موقع تولد ۵۲ سانتی متر جهت بررسی رشد ارجاع شده است منحنی رشد همراه
بیمار را ملاحظه می فرمایید



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>



Stature-for-age and Weight-for-age percentiles

Published May 29, 2009 (modified 11/21/09)

SOURCE: Developed by the National Center for Health Statistics in collaboration with

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>



معاینات و آرمايشات روتین و تست های تیروئید نرمال و پاسخ به تست تحریکی به شرح زیر 6 است:

$\text{GH}=0.3$ ----- 2 $\text{IGF1} = 160$ IGF BP=N

تشخیص چیست؟

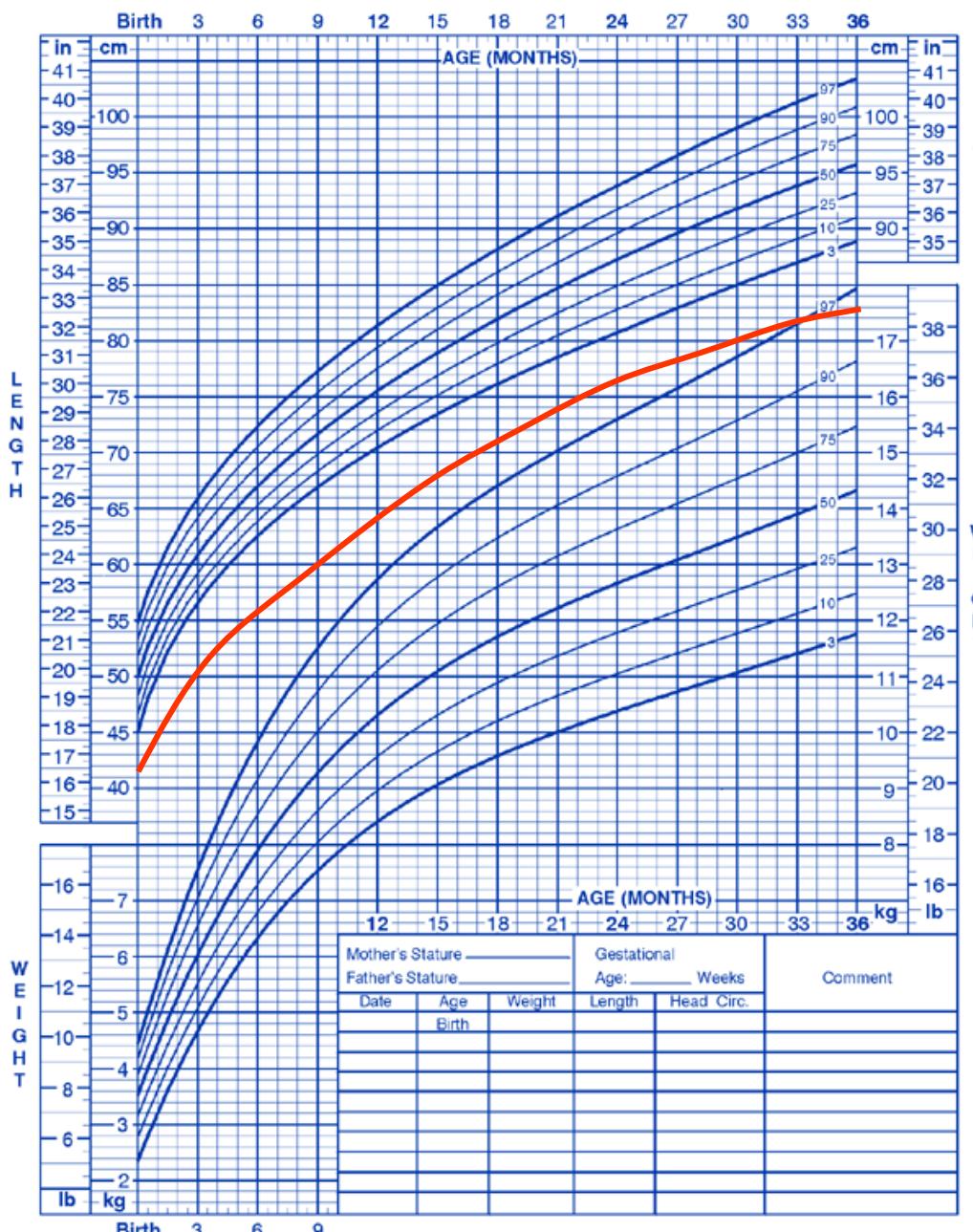
Constitutional delay of puberty

پسر ۱۰ ساله با قد ۱۱۵ سانتی متر جهت بررسی کوتاهی قد ارجاع شده است. قد زمان تولد ۴۲ سانتی متر در معاينه نکته اي ندارد.

آزمایشات روتین و تست های تیروئید نرمال است

GH=0.1-----10 IGF1=170 IGFBP3=N
تست تحریکی هورمون رشد

منحنی رشد وی از بدو تولد را ملاحظه می فرمایید.



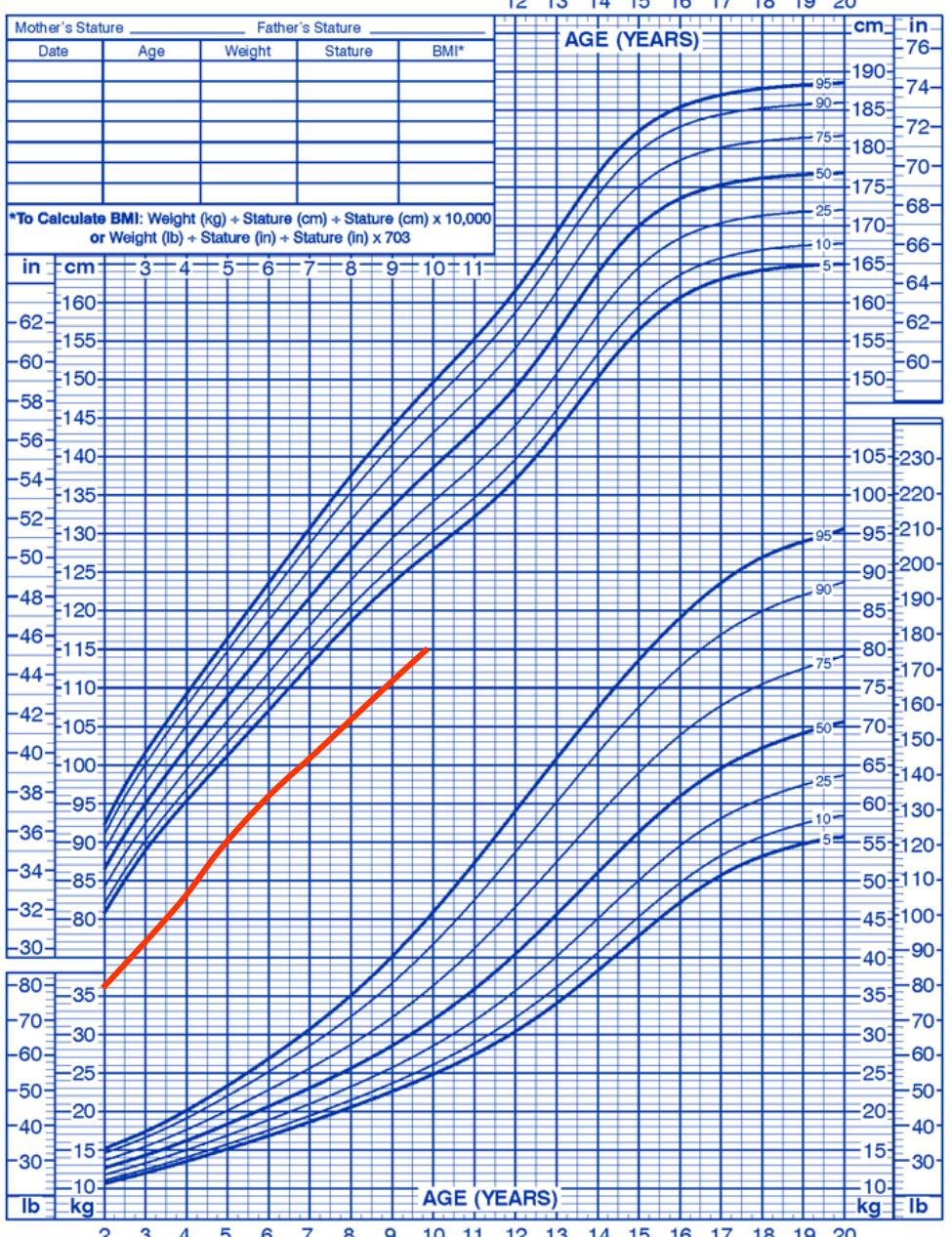
Published May 30, 2000 (modified 4/20/01).

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>

SAFER • HEALTHIER • PEOPLE™

OK135S063

Stature-for-age and Weight-for-age percentiles



Published May 30, 2000 (modified 11/21/00).

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>



OK135S057

SAFER • HEALTHIER • PEOPLE™

تشخیص چیست؟

Prenatal Pathologic Short Stature

دختر ۹ ساله ای با قد ۱۲۳ سانتی متر جهت بررسی رشد ارجاع شده است پس

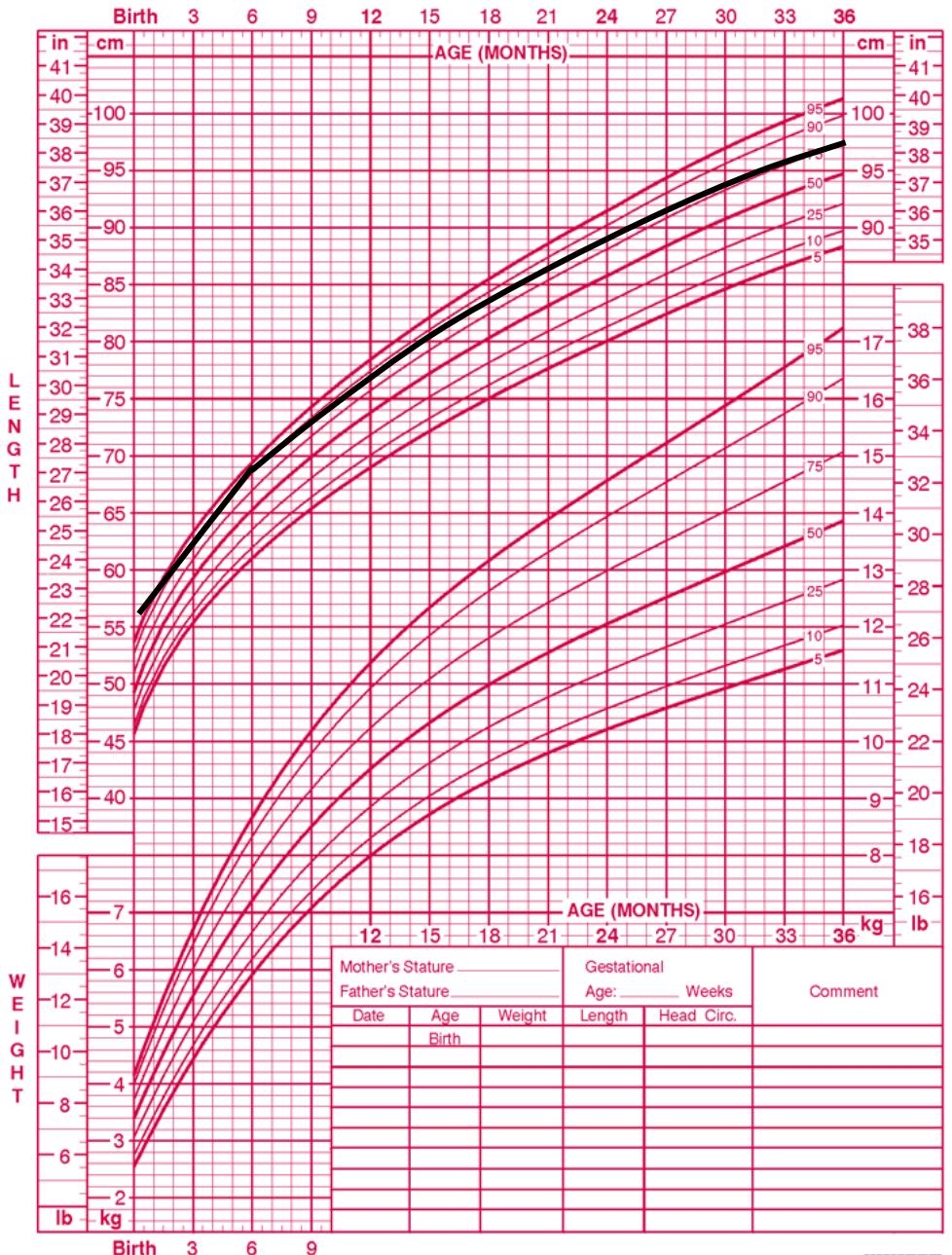
است percentile ۵ از بررسی قد روی منحنی

منحنی رشد را از بدو تولد ملاحظه بفرمایید

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

NAME _____

RECORD # _____



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>



SAFER • HEALTHIER • PEOPLE™

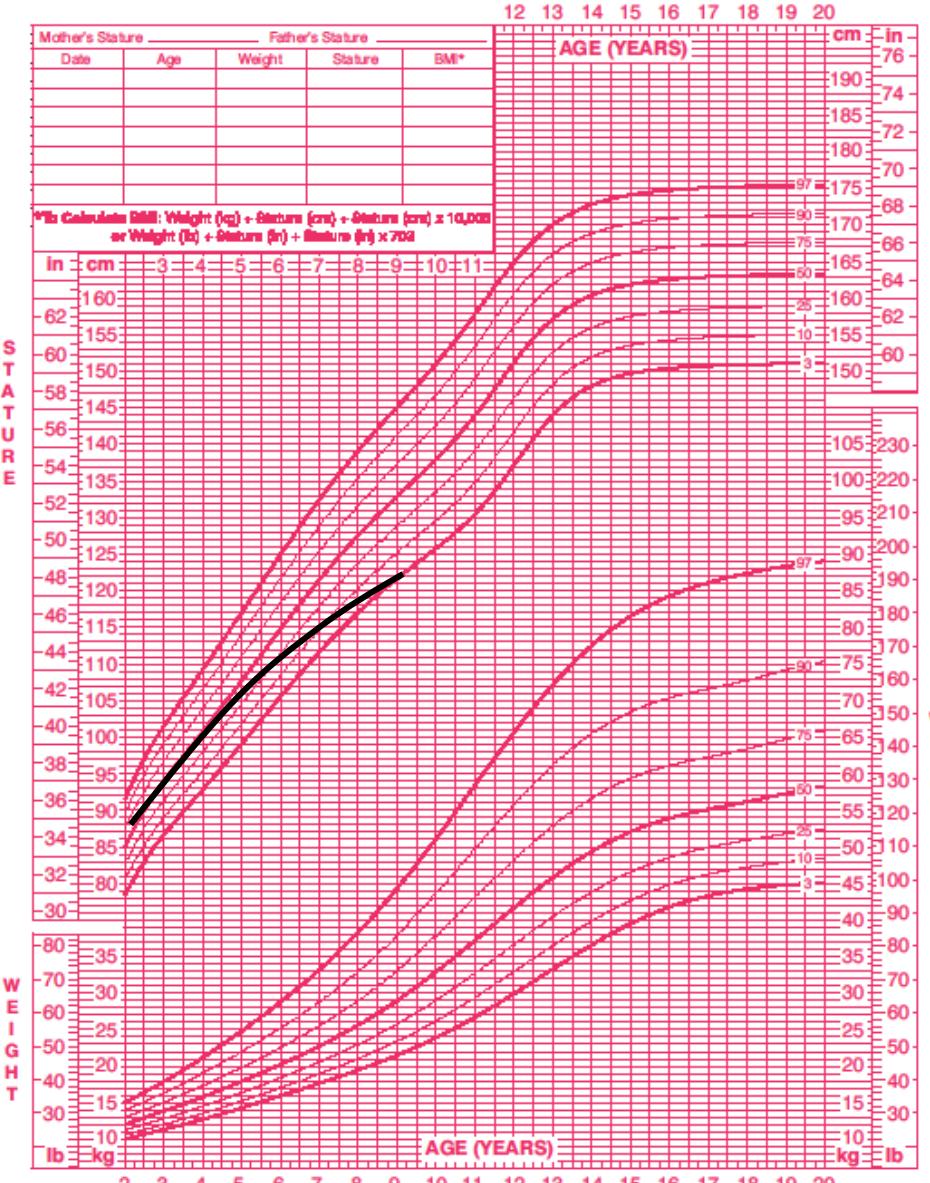
OK135S054

2 to 20 years: Girls

Stature-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____



Published May 30, 2000 (modified 11/21/00)

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>

این منحنی طبیعی است یا غیر طبیعی؟

BA≤5.5 yer

T3PU↓

T4↓

TSH↑

G.H=0.1-----0.2

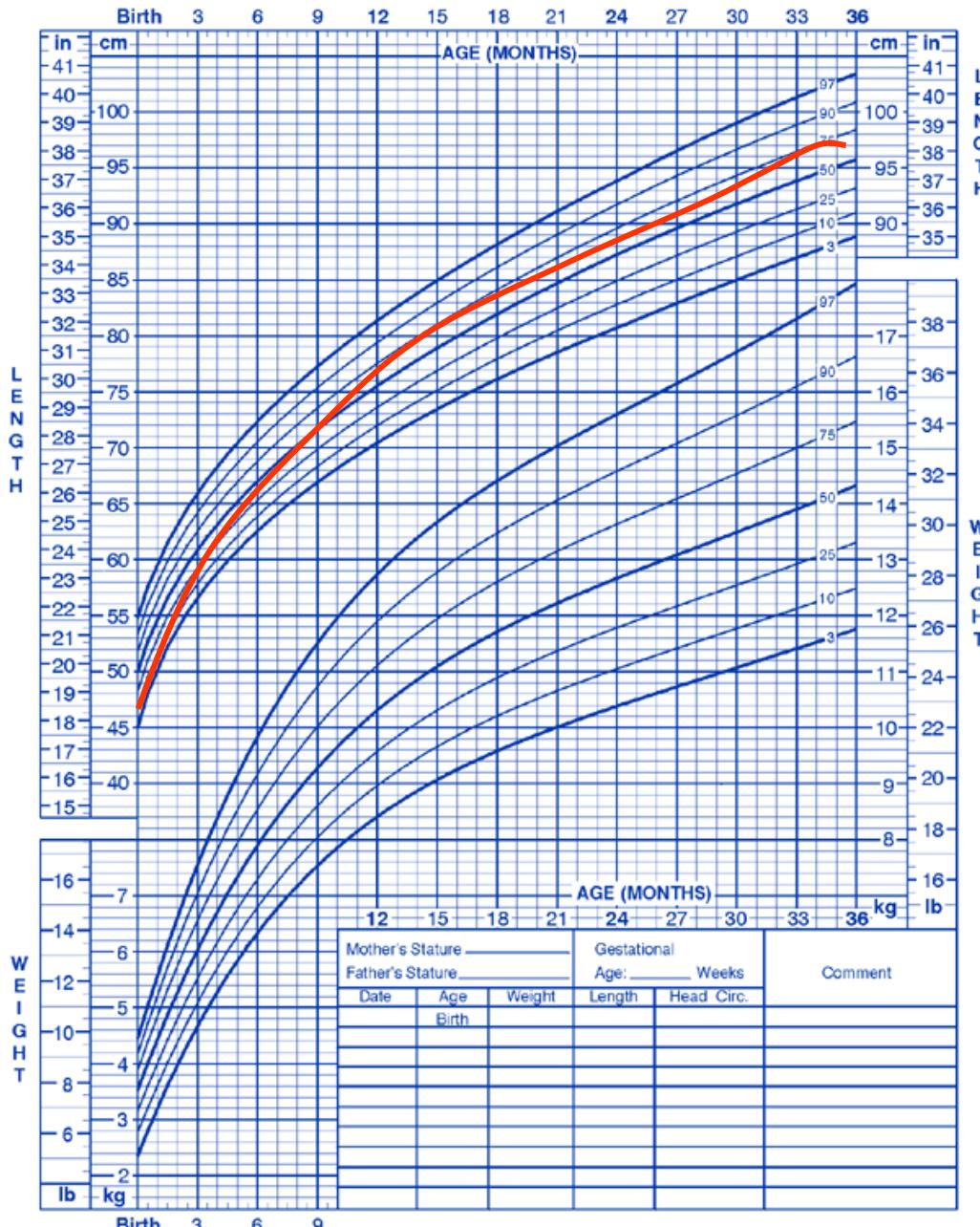
|G12|=50

|G12BP3|=↓

تشخيص چیست؟

Pathologic Short Stature due to Primary hypothyroid

پسر ۸ ساله با قد ۱۲۰ جهت بررسی رشد ارجاع شده است قد موقع تولد ۴۵ سانتی متر بوده به منحنی رشد وی را
ملاحظه بفرمایید



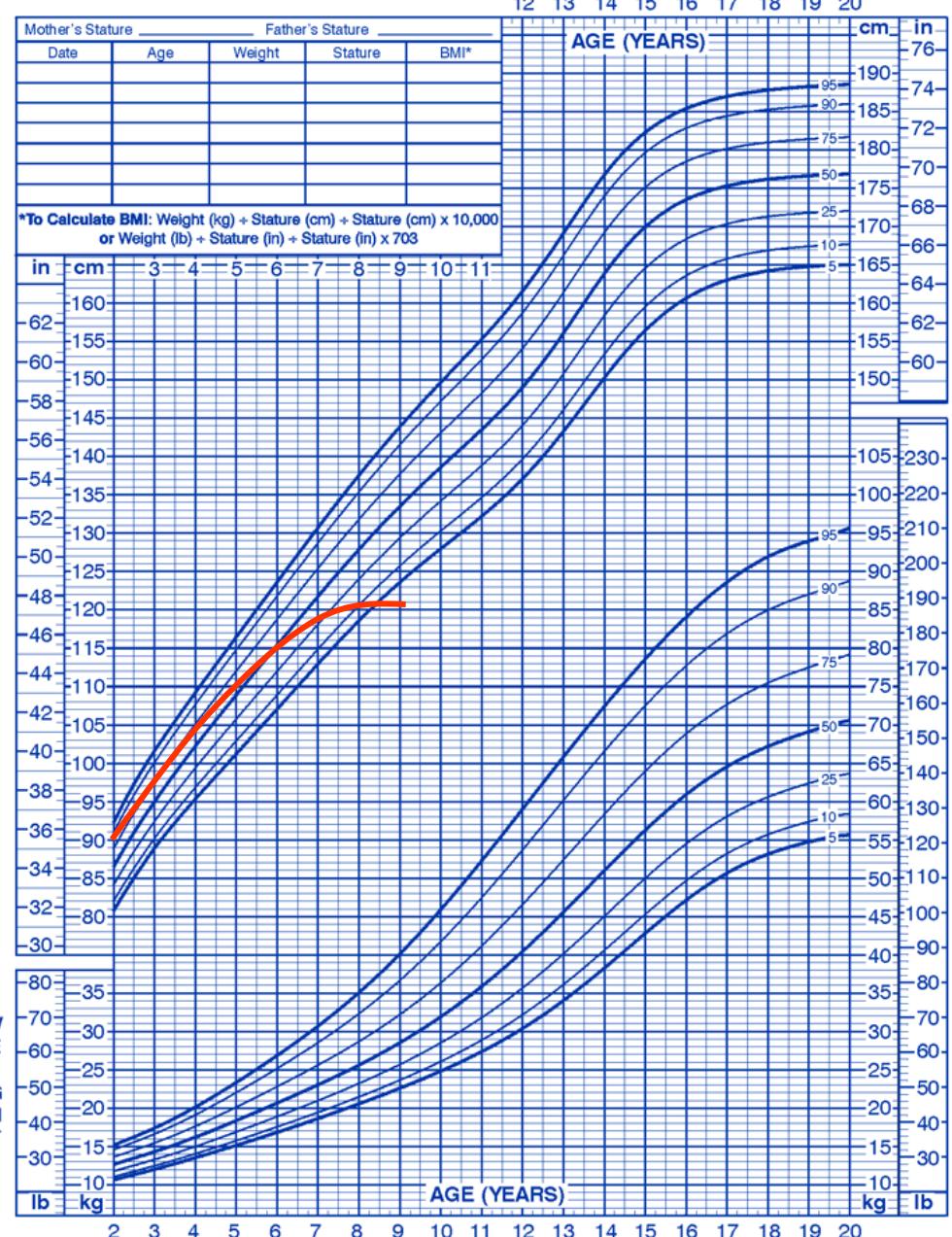
Published May 30, 2000 (modified 4/20/01).

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>



SAFER • HEALTHIER • PEOPLE™

OK135S063



Published May 30, 2000 (modified 11/21/00).

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>

OK135S057

رشد کودک طبیعی است یا غیر طبیعی؟

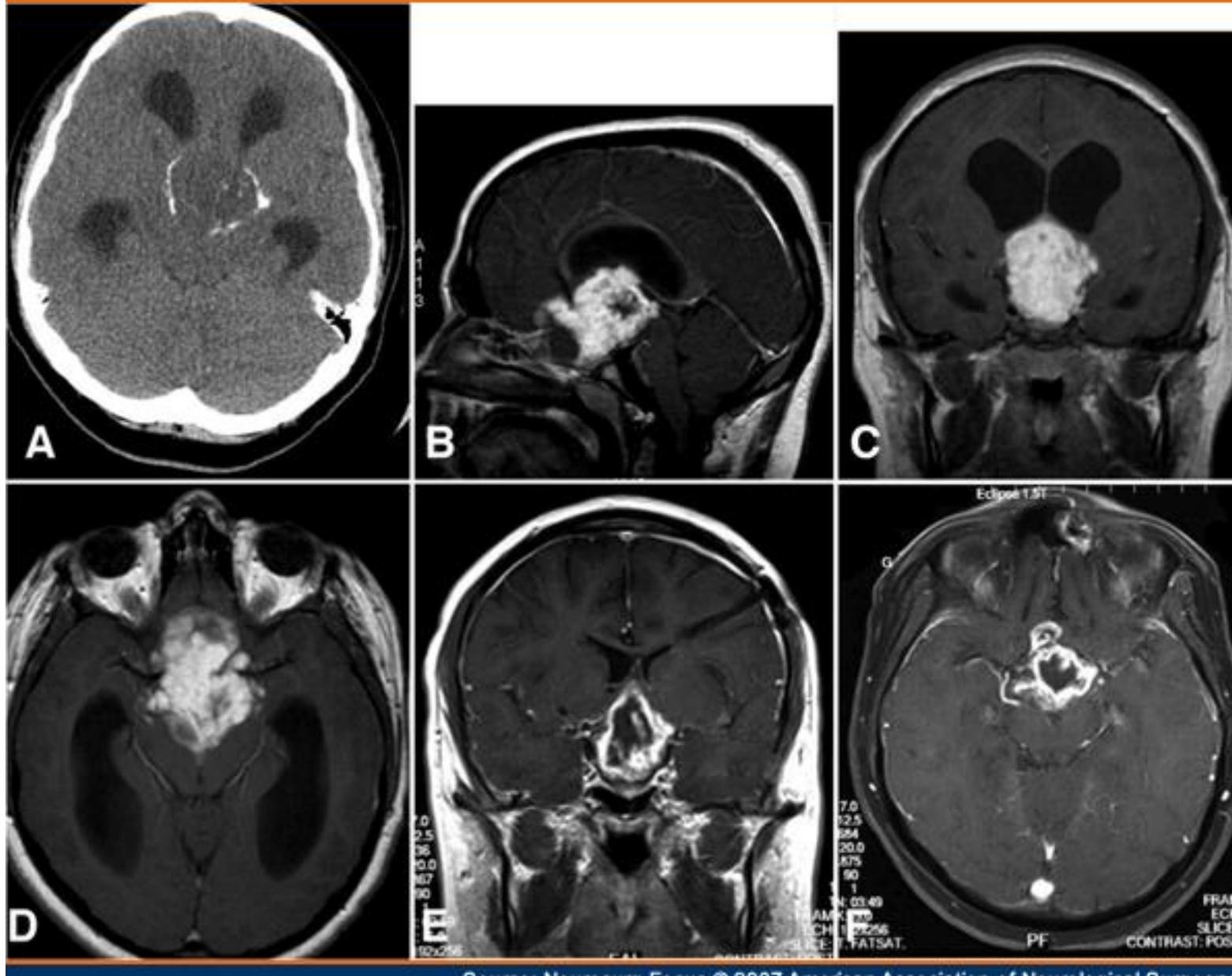
GH =0.1- 0-1

IGFI=60

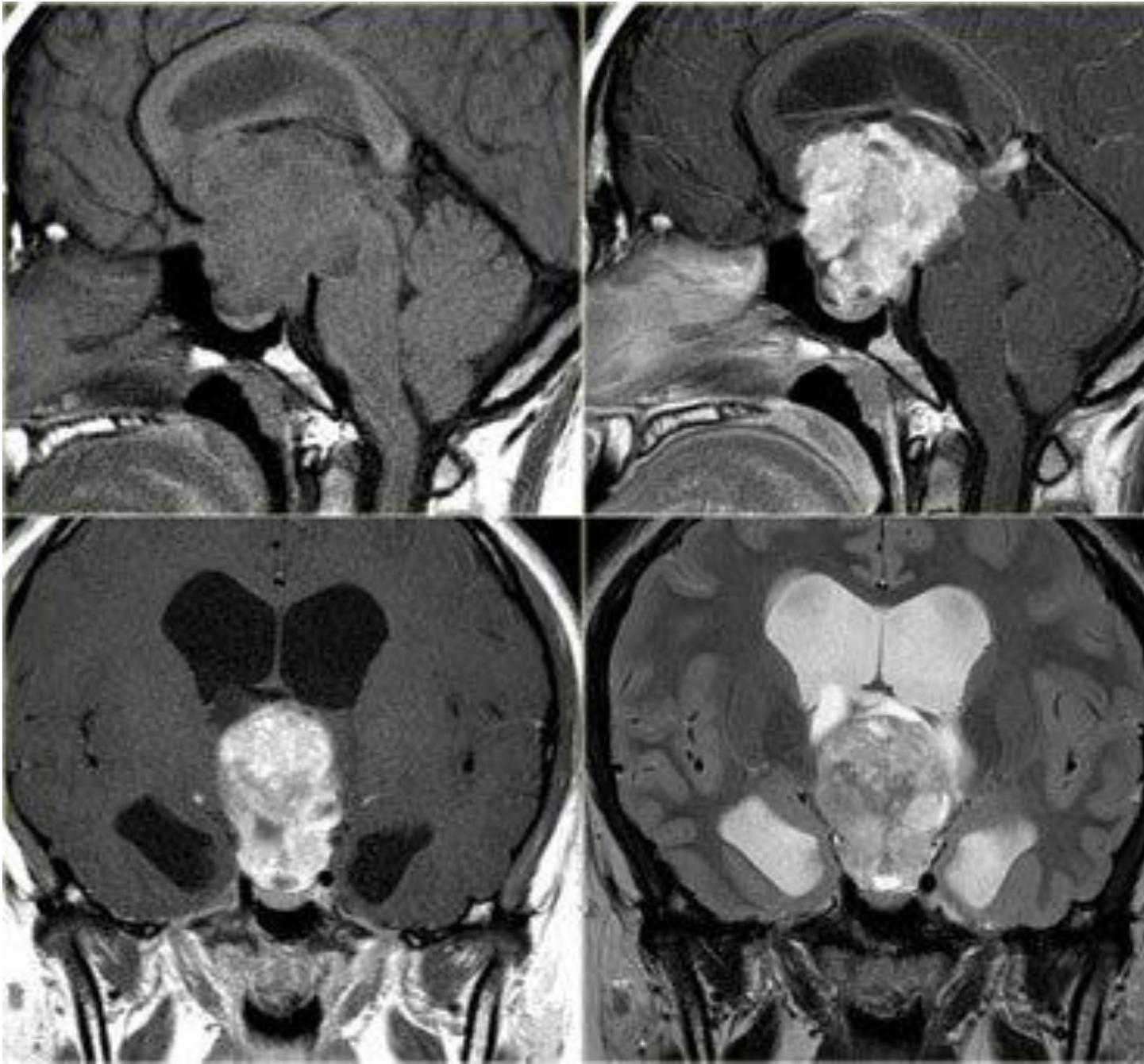
IGFBP= \downarrow

BA \leq 6 year

تشخیص چیست؟







Brain CT Scan shows craniopharingioma

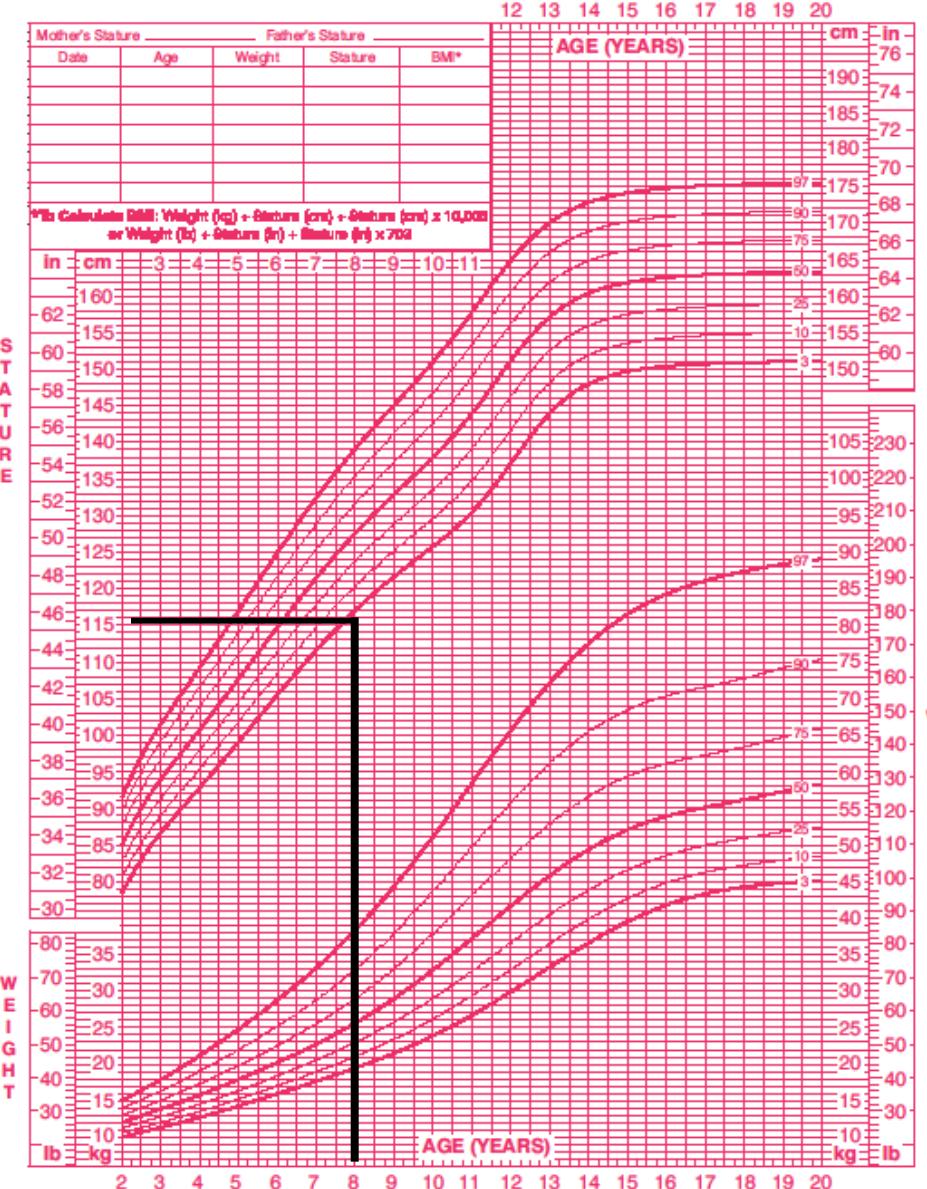
دختر ۸ ساله ای جهت بررسی اختلال رشد ارجاع شده است قد وی ۱۱۵
سانتی متر است

2 to 20 years: Girls

Stature-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____

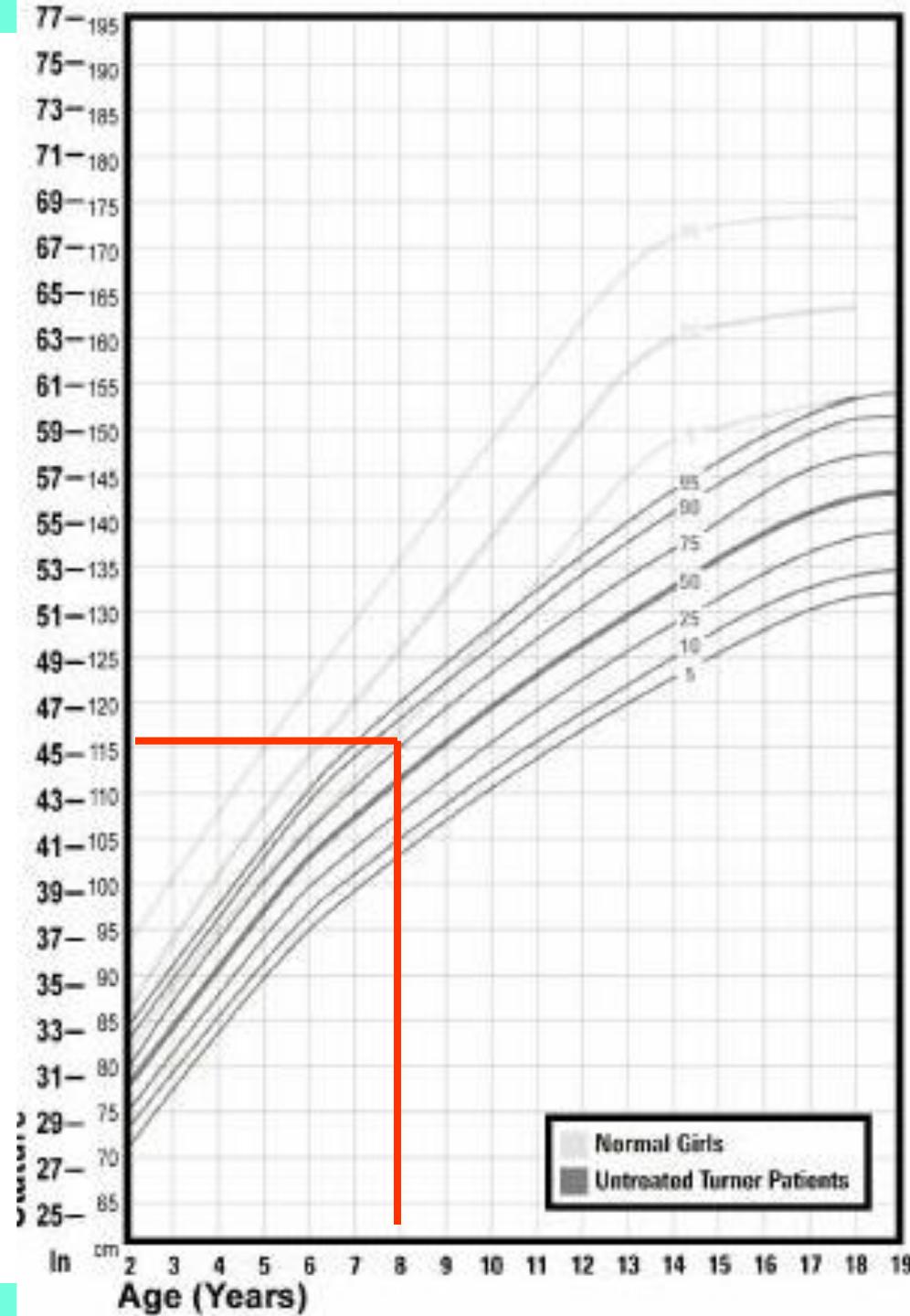


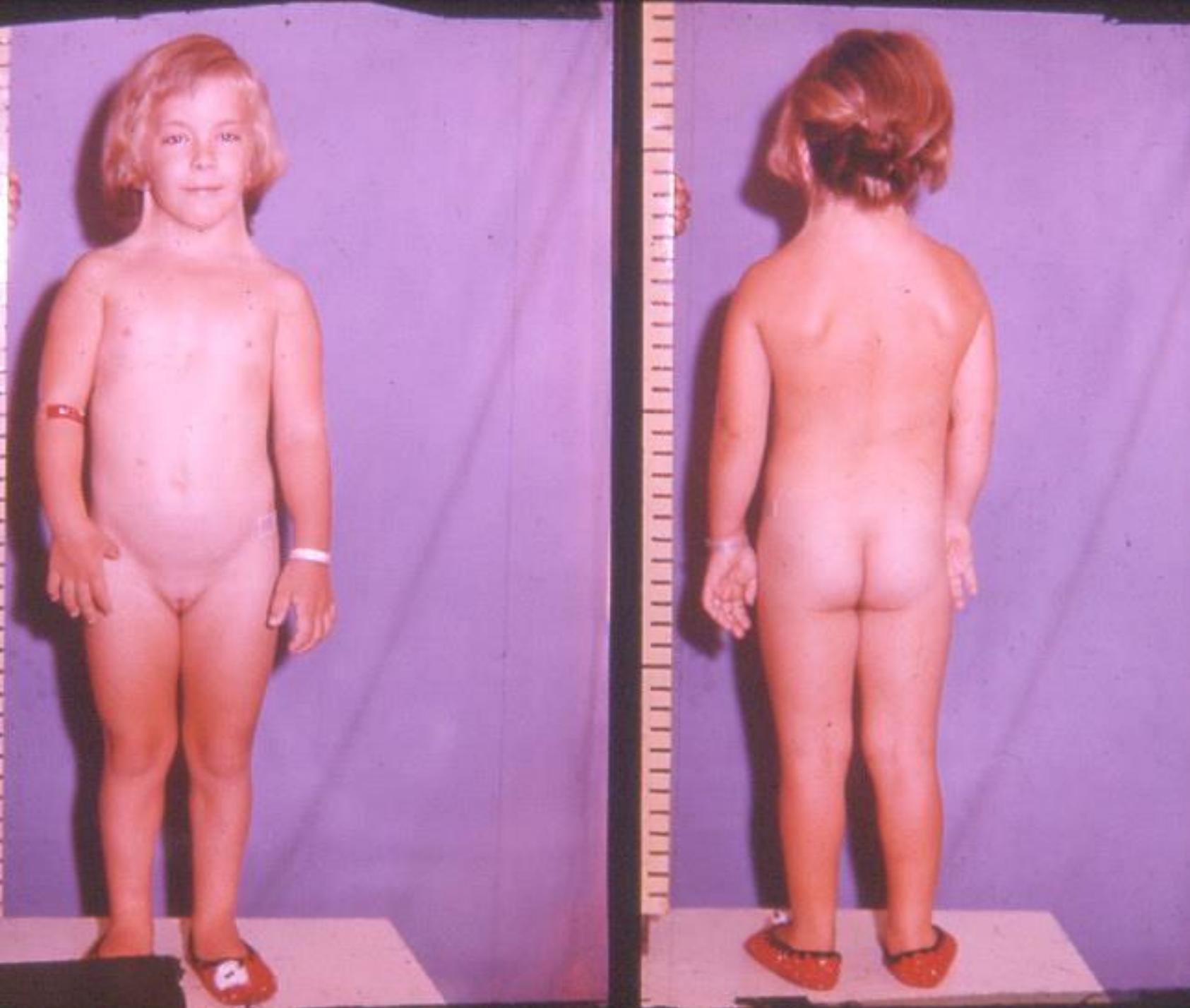
Published May 30, 2000 (modified 11/21/00).

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>



**Turner syndrome results when all or part of one of the X chromosomes
is lost before or soon after the time
of conception.**





Pathologic short



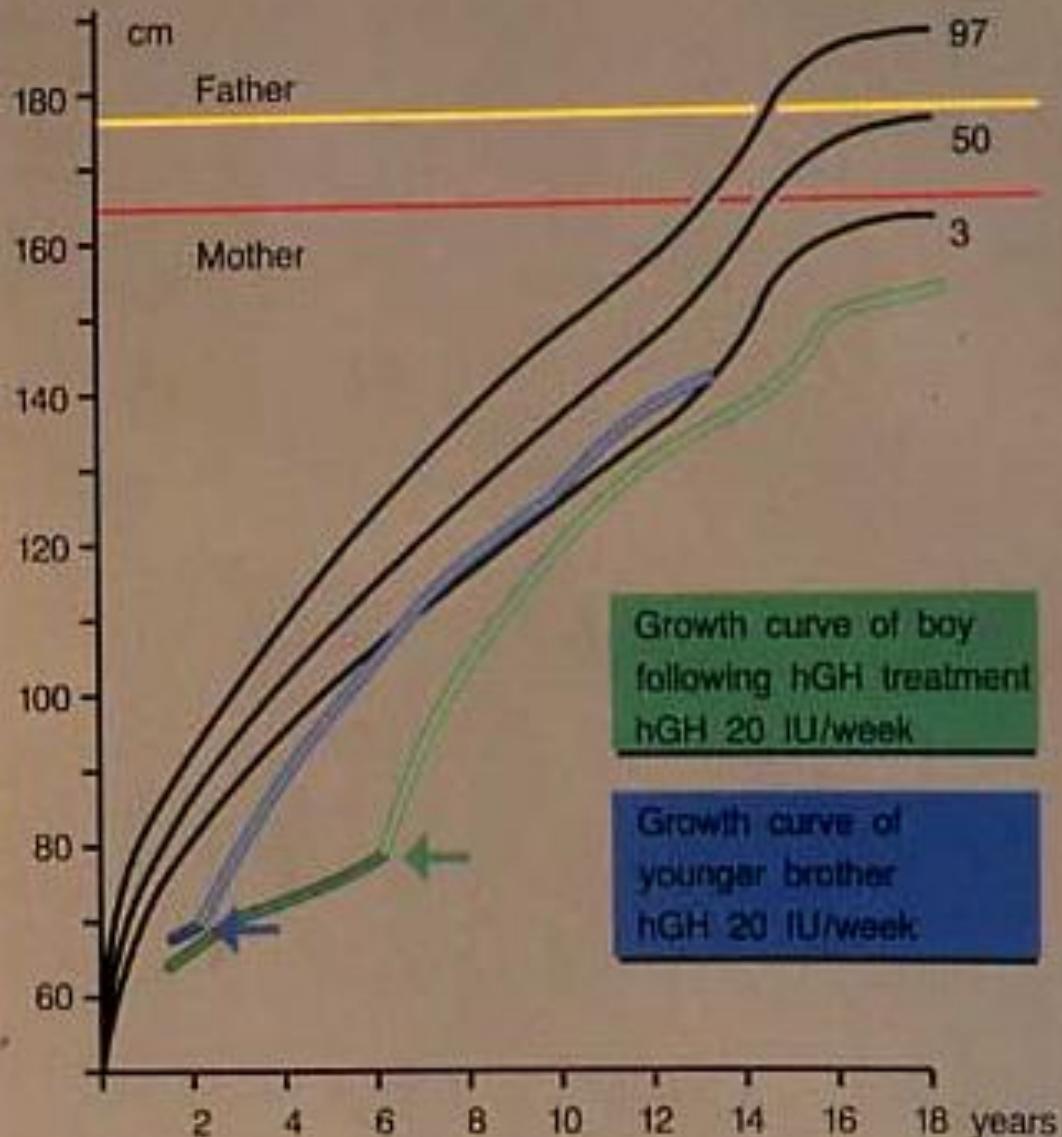


Fig. 3: Growth curve of two GHD brothers, illustrating the importance of early diagnosis and treatment (9).

