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Hong Kong Growth Study 2020

Use of the new growth charts in primary care setting

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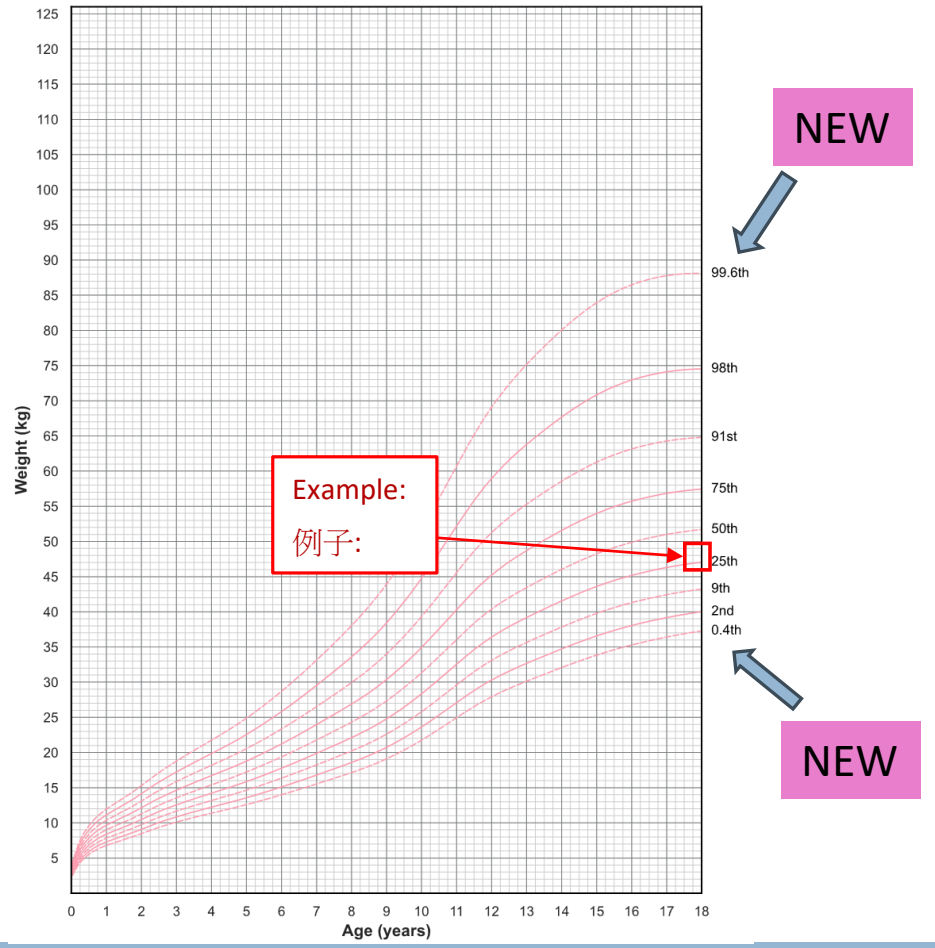
Growth Charts and Centile Lines (2 extreme lines)

- Growth measurements have little meaning until they are accurately measured and plotted on the growth chart.
- Standard method of measurement is essential.
- Correct plotting – corrected age for infants
- Each line at *N*th centile marks the measurement below which *N*% of children of that age and gender fall, *e.g*. 25% of children are below the 25th centile.



User guide: https://www.cuhk.edu.hk/proj/hkgrowth/assets/Guide%20for%20Health%20Professionals%20HKGS_20240420.pdf

Head circumference

Key points

Failure to obtaining an accurate measurement, may delay the identification of an infant or young child with health and developmental concerns associated with deviations in head size.

Head circumference reflects brain size, and it is used for screening for potential health, nutrition or developmental problems among infants.

Microcephaly is defined as ≤ 2^{nd} centile.

Macrocephaly is defined as ≥ 98^{th} centile.

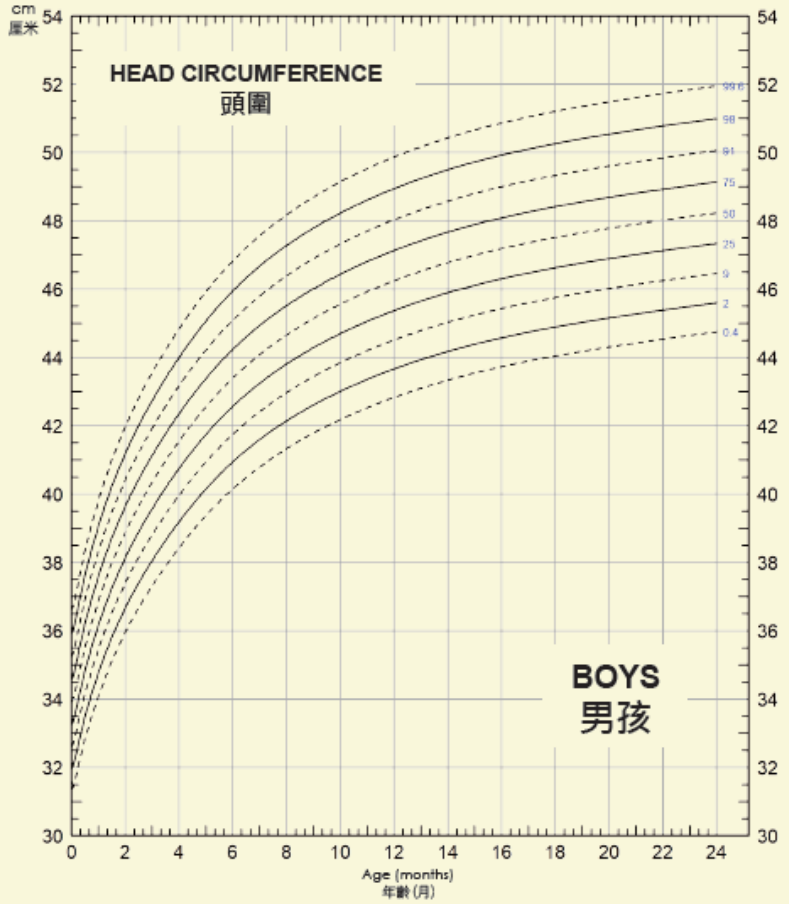
The parental head circumference should be taken into consideration if the head circumference of a child is in question.

Prenat Diagn. 2023 Dec;43(13):1650-1661.

GROWTH CHARTS FOR BOYS 男孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

Head Circumference in cm (0 - 2 years)
頭圍(厘米) (0–2歲)

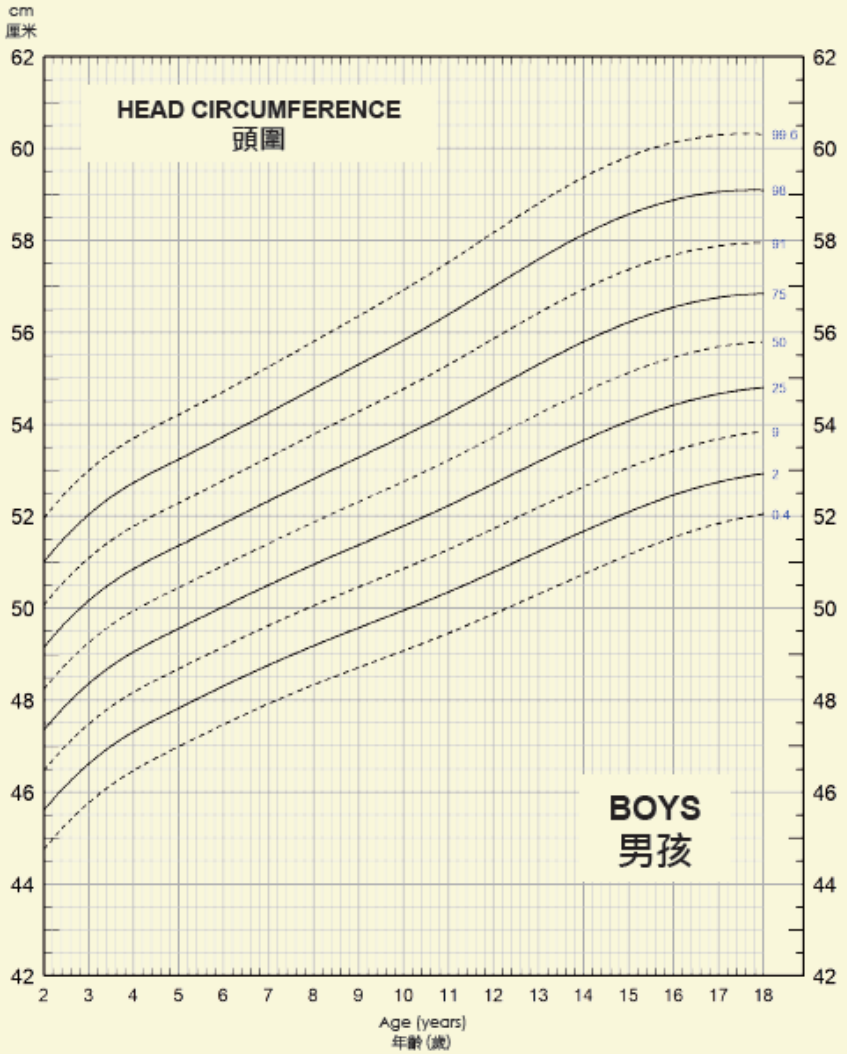
Parents' Head Circumference (cm) 父母頭圍 (厘米)	
Father 父親	Mother 母親



Date 日期	Age 年齡	Head Circumference(cm) 頭圍(厘米)	Date 日期	Age 年齡	Head Circumference(cm) 頭圍(厘米)

01

Head Circumference in cm (2 - 18 years)
頭圍(厘米) (2–18歲)



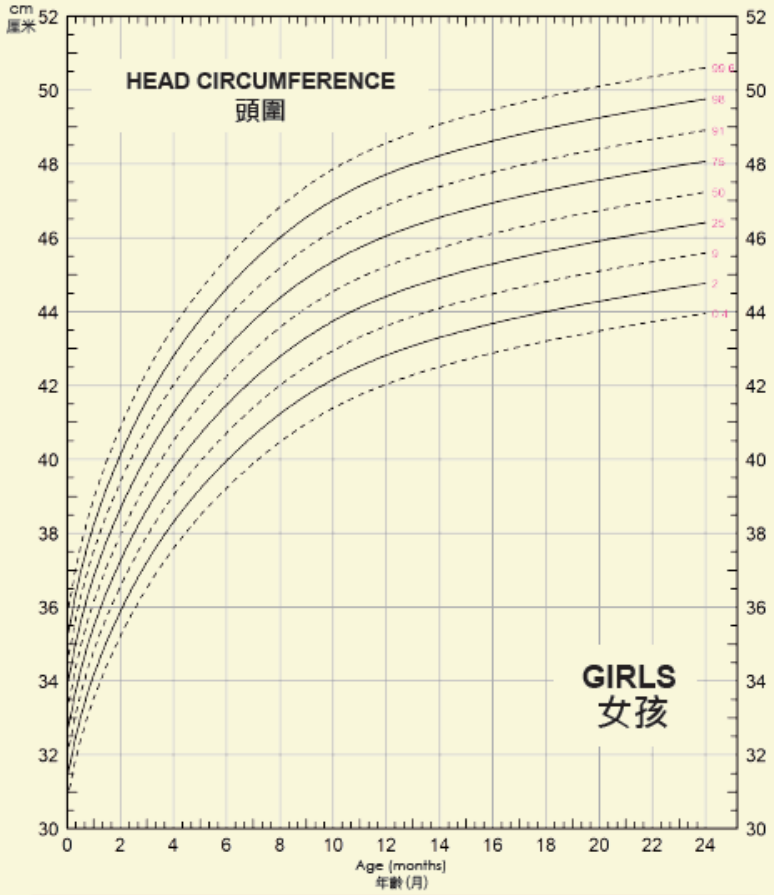
GROWTH CHARTS FOR BOYS 男孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

The age range is from 0-18 years in the NEW charts.

GROWTH CHARTS FOR GIRLS 女孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

Head Circumference in cm (0 - 2 years)
頭圍(厘米) (0–2歲)

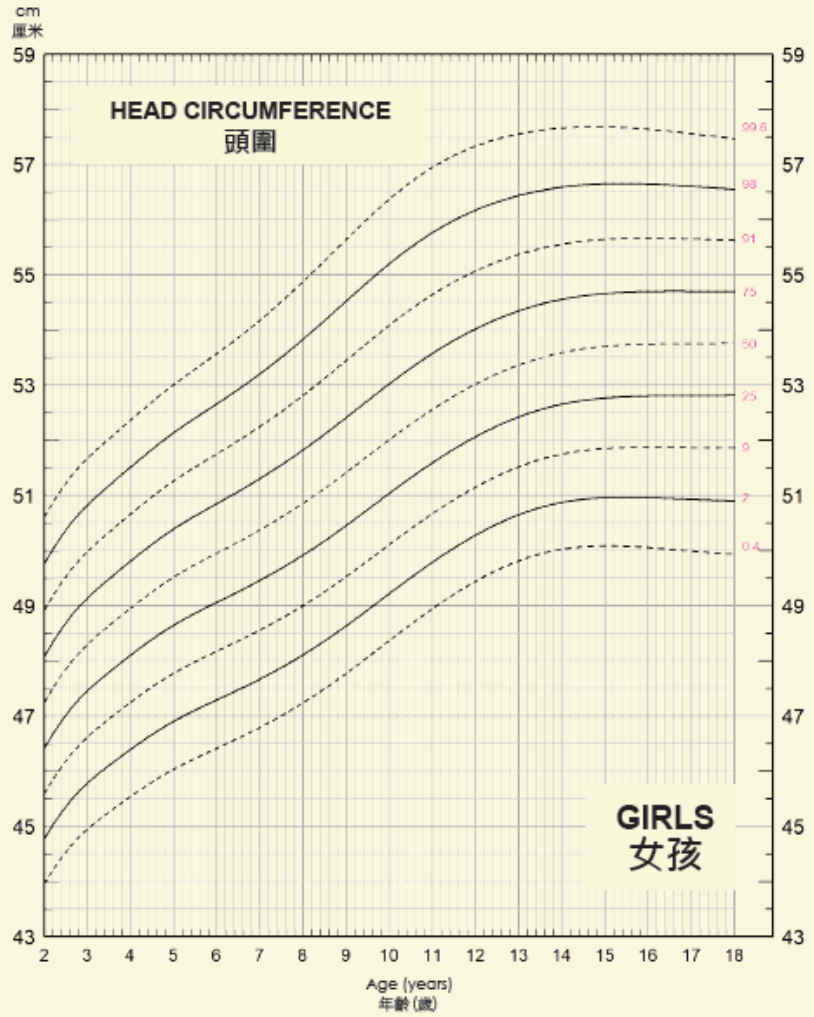
Parents' Head Circumference (cm) 父母頭圍 (厘米)	
Father 父親	Mother 母親



Date 日期	Age 年齡	Head Circumference(cm) 頭圍(厘米)	Date 日期	Age 年齡	Head Circumference(cm) 頭圍(厘米)

11

Head Circumference in cm (2 - 18 years)
頭圍(厘米) (2–18歲)



GROWTH CHARTS FOR GIRLS 女孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

The age range is from 0-18 years in the NEW charts.

Body length/height

Short stature

- Short stature is defined as height that is less than 2nd percentile on growth chart.

- Causes of short stature
  - Idiopathic short stature
    - defined as short stature with normal birth weight,
    - sufficient growth hormone, and
    - without evidence of systemic, endocrine, nutritional, skeletal or chromosomal abnormalities.
  - Constitutional delay of growth
    - is a transient deceleration of growth.
    - more prevalent in boys than girls.
    - family history usually reveals one of the parents, siblings or relatives who had history of growth delay.
  - Familial short stature
    - children with family history of short stature may present with early deceleration in linear growth, depending on their birth parameters.
    - final adult height is short, but appropriate for mid-parental height.

Importance of parental height

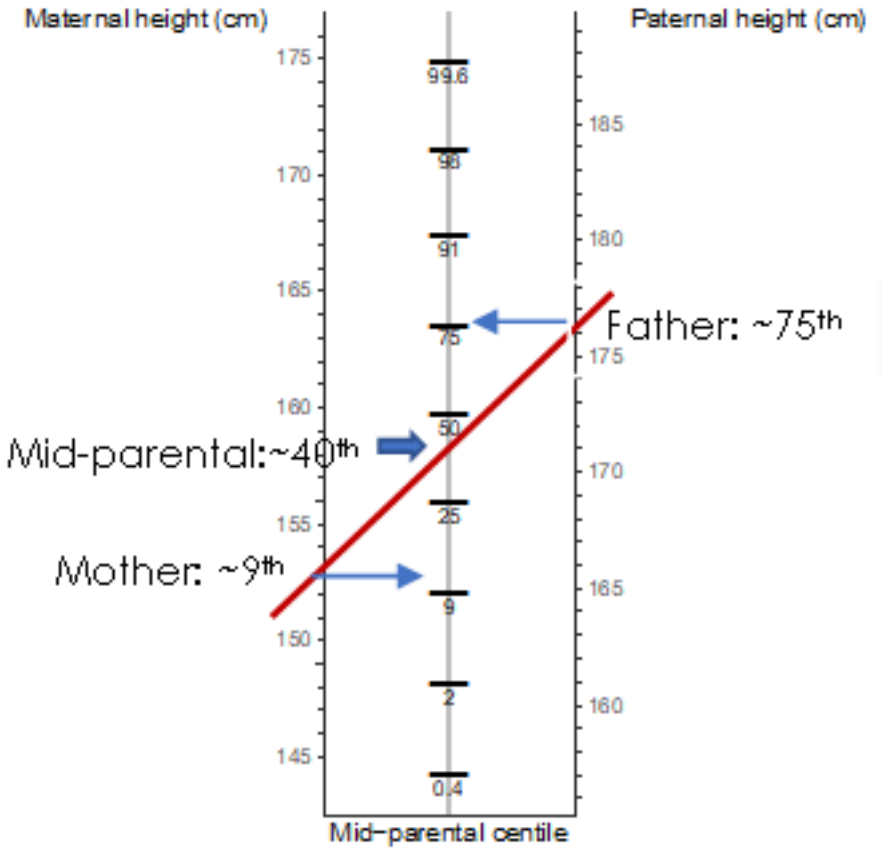
An auxiliary growth assessment tool, mid-parental height comparator was created for healthcare professionals' use.

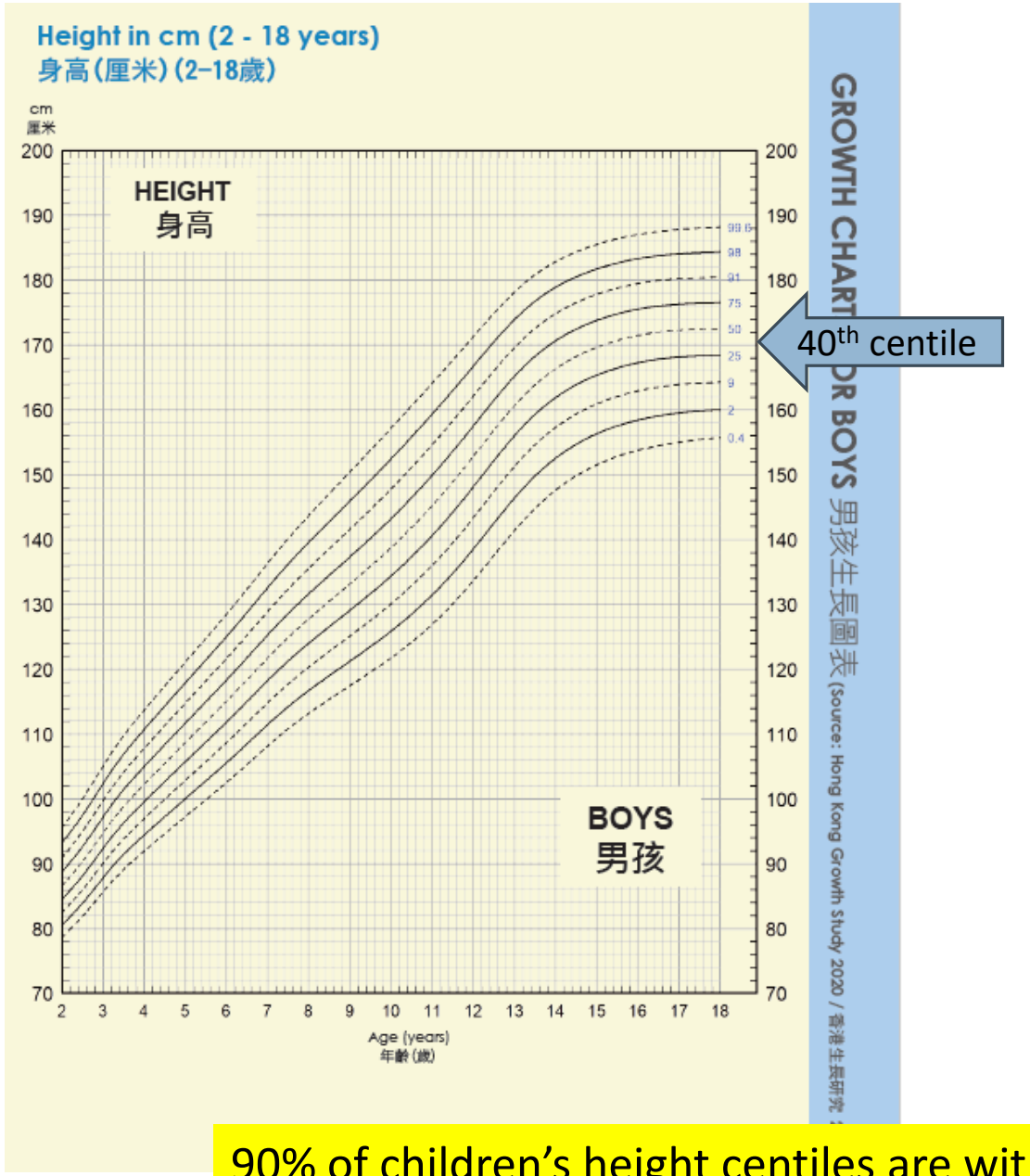
Majority of children's height centiles are within two centile spaces above or below the mid-parental centile.

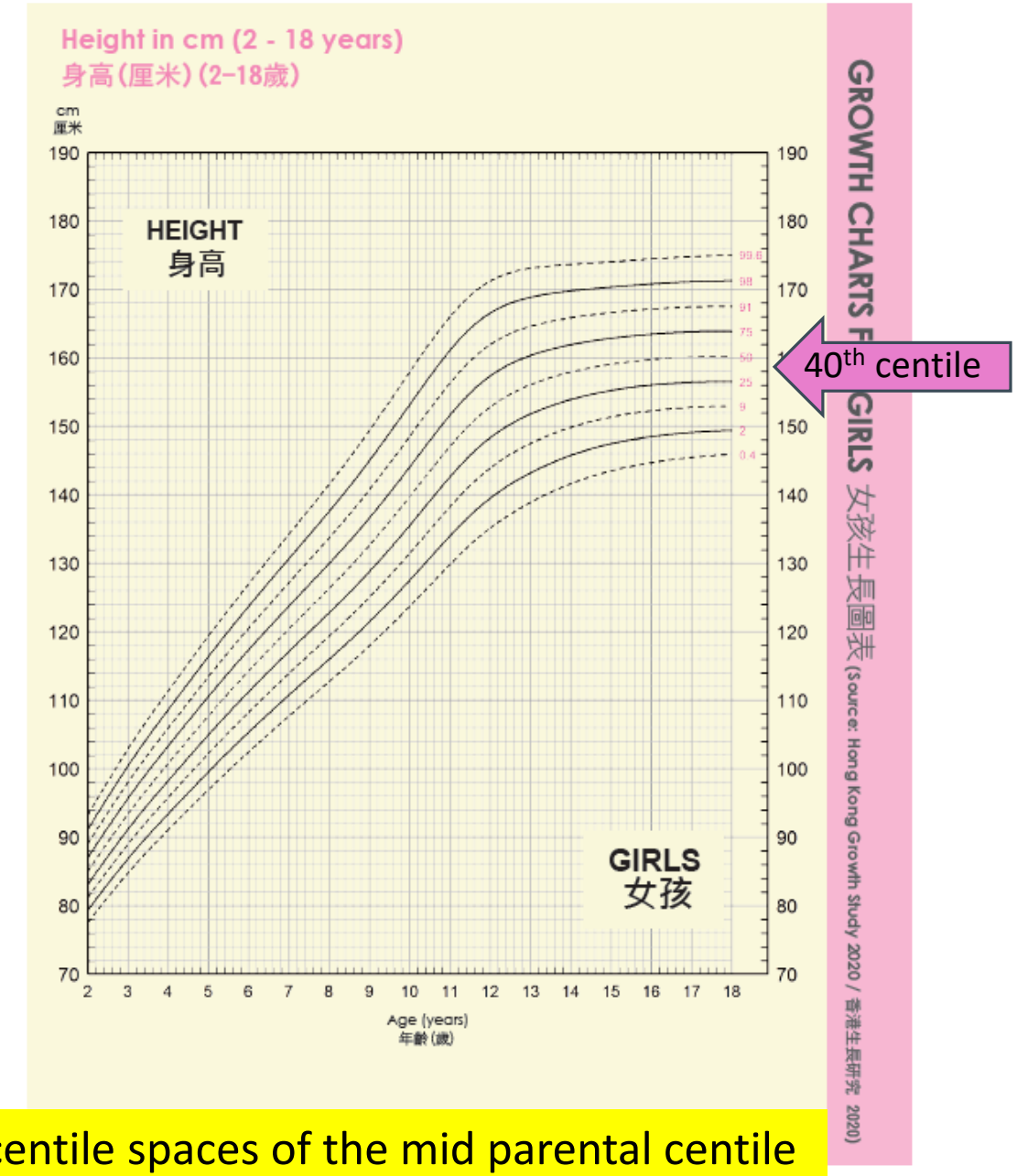
Comparison with parents' height should not be seen as a test for normal height and a child growing abnormally may still be within the parental height range.

Example:

- Mid-parental height comparator was developed from the HK2020 height-for-age reference at **18 years old**.
- The mid-parental height centile of a mother 153cm tall (~ 9th centile referenced to HK2020) and a father 176.5cm tall (~ 75th centile referenced to HK2020) is roughly 40th centile (for both boys and girls).
- The approximate height centile for mother's, father's and mid-parental height can be estimated from the comparator.







90% of children's height centiles are within 2 centile spaces of the mid parental centile

It is NOT a prediction of the adult height.

Archives of Disease in Childhood 1999;81:257-260

Limitations

- Although mid-parental height provides a useful guide to expected height centile for children and parents of average stature
  - it can be misleading when used to assess short children.
- There is a significant difference in paternal measured versus reported heights with an overall trend for fathers to overestimate their own height.
  - When a child's growth is in question, measured rather than reported parental heights should be obtained.
- Inaccuracy is even greater when one parent reports the other parent's height.
  - When a child's growth is in question, measured rather than reported parental heights should be obtained.

Arch Dis Child. 1999 Sep;81(3):257-60.

BMC Endocr Disord. 2007 Apr 2;7:2.

How do I tell parents their children who were all along slightly around 3rd percentile but <2nd percentile in the new chart

Explain to parents the slight drop is due to a difference in the comparison group (children in 1993 vs children in 2020). The new chart is derived from children measured in 2020-2022. Children are on average taller than those measured in 1993.

A slight drop of height centile for the same height will happen to children at all ages and parental height at the transition of growth charts.

Inform parents it is more important to monitor the gain in height / height velocity than the absolute centile of one measurement.

BMI

Body composition data show that high BMI centiles overdiagnose obesity in children aged under 6 years

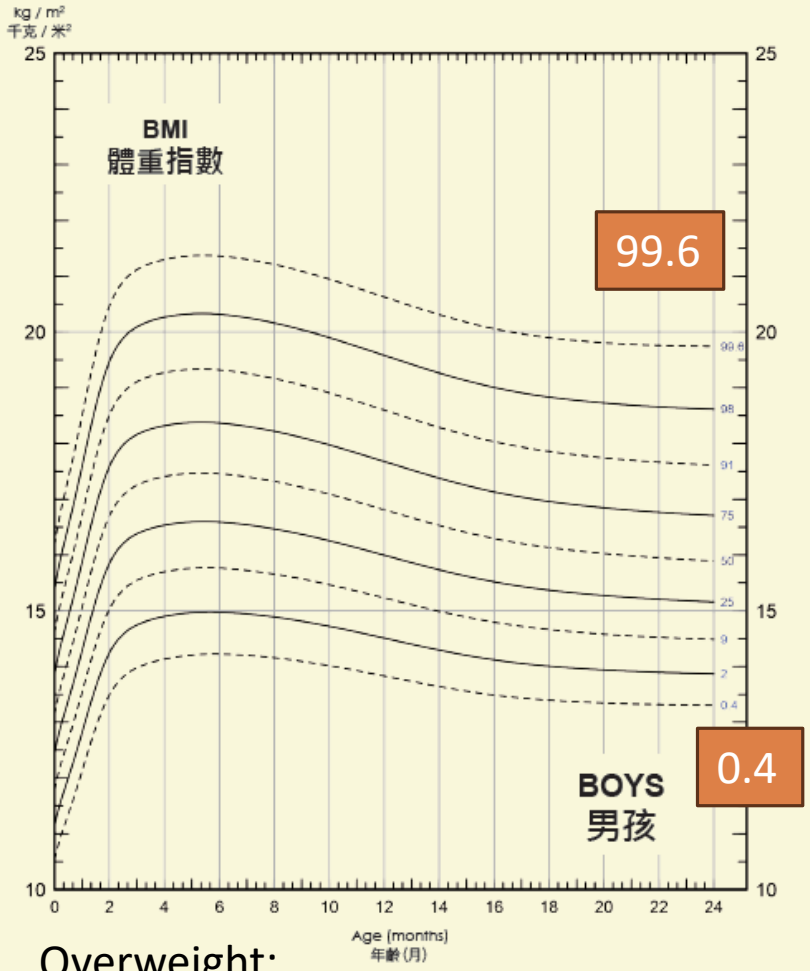
Charlotte M Wright,[1] Tim J Cole,[2] Mary Fewtrell,[2] Jane E Williams,[2] Simon Eaton,[3] and Jonathan C Wells[2]

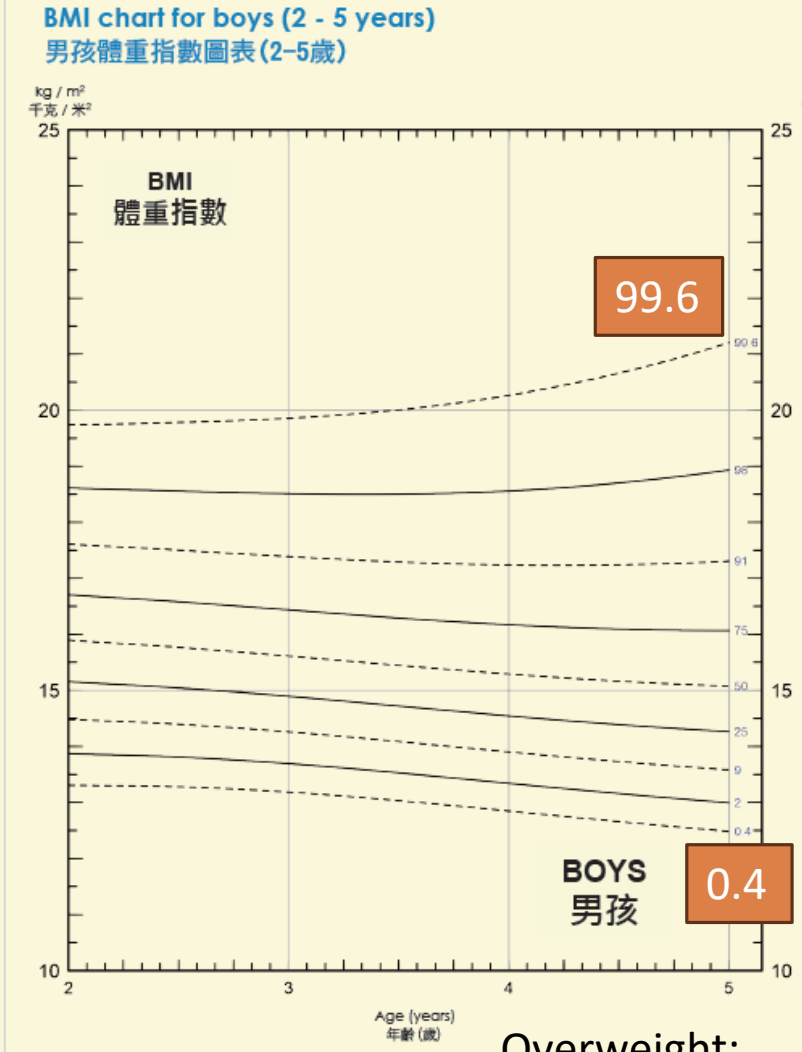
Raised fat levels are much less common at younger than older ages, and young children with a high BMI centile have lower fat mass index than older children with the same BMI centile.

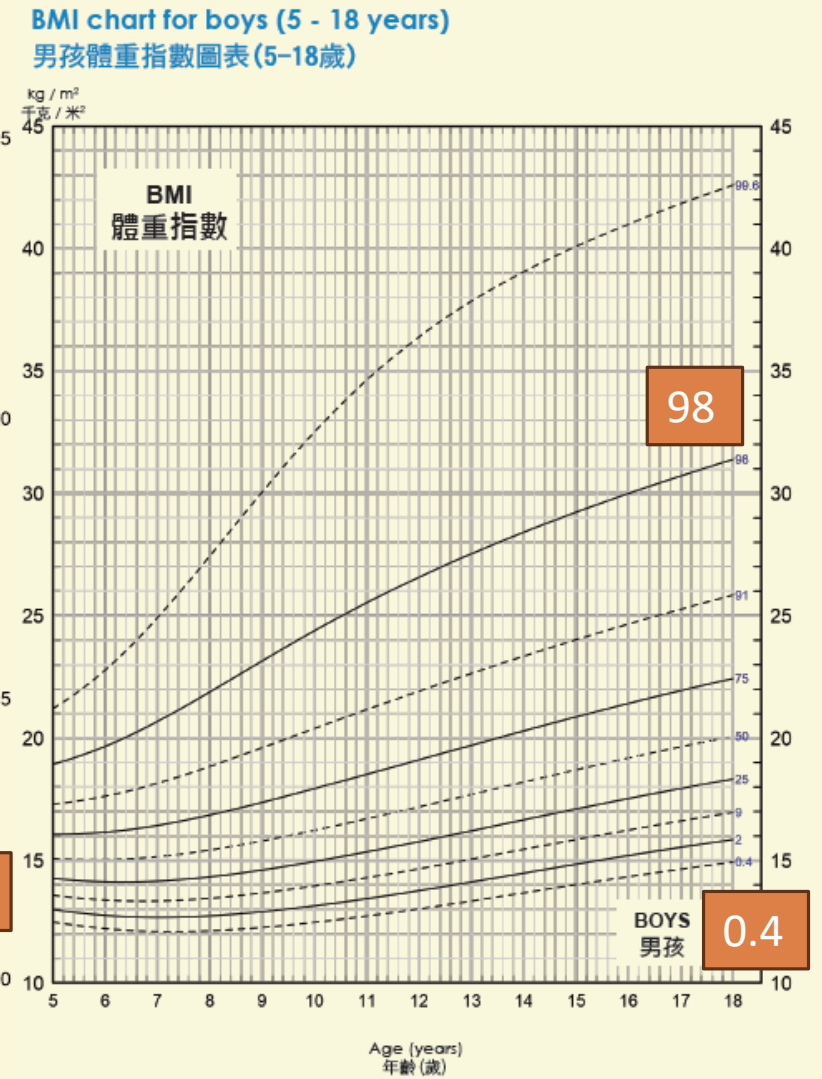
Different cut-offs are applied for different age groups

Am J Clin Nutr. 2022 Jul 6;116(1):122-131.

GROWTH CHARTS FOR BOYS 男孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)





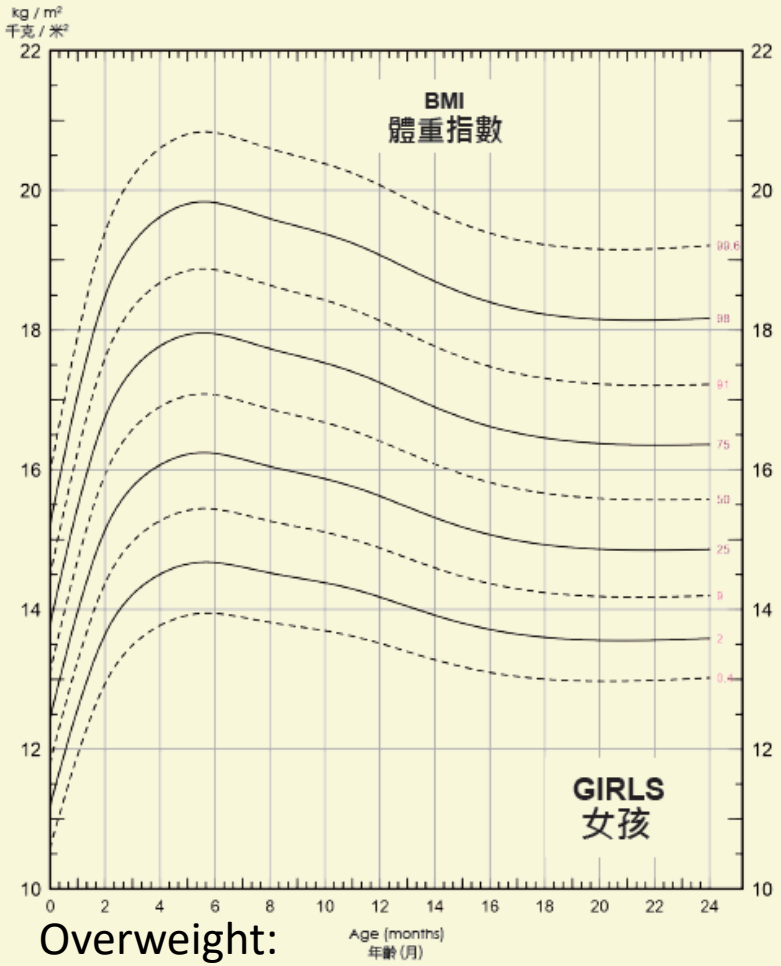


Overweight:
99.6th centile ≥ BMI > 98th centile (0-60 months)
Obesity:
>99.6th centile (0-60 moths)
Wasting ≤ 2nd centile

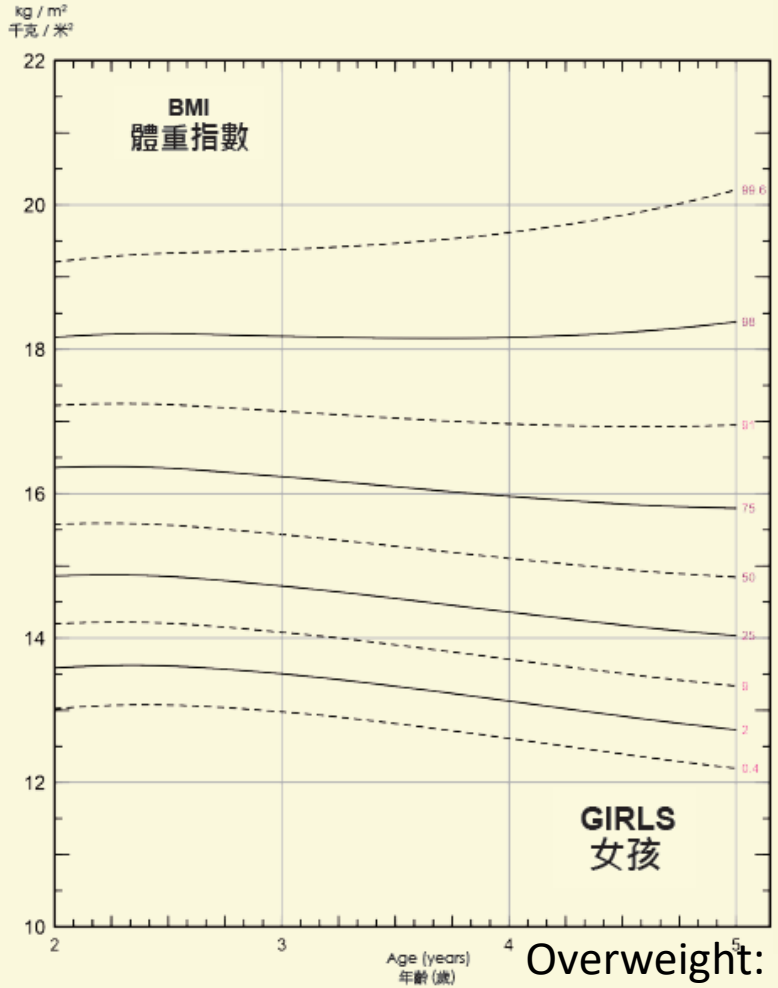
Overweight:
98th centile ≥ BMI > 91st centile (>5.0 to <18.0 years)
Obesity:
>98th centile (>5.0 to <18.0 years)
Wasting ≤ 2nd centile

GROWTH CHARTS FOR GIRLS 女孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

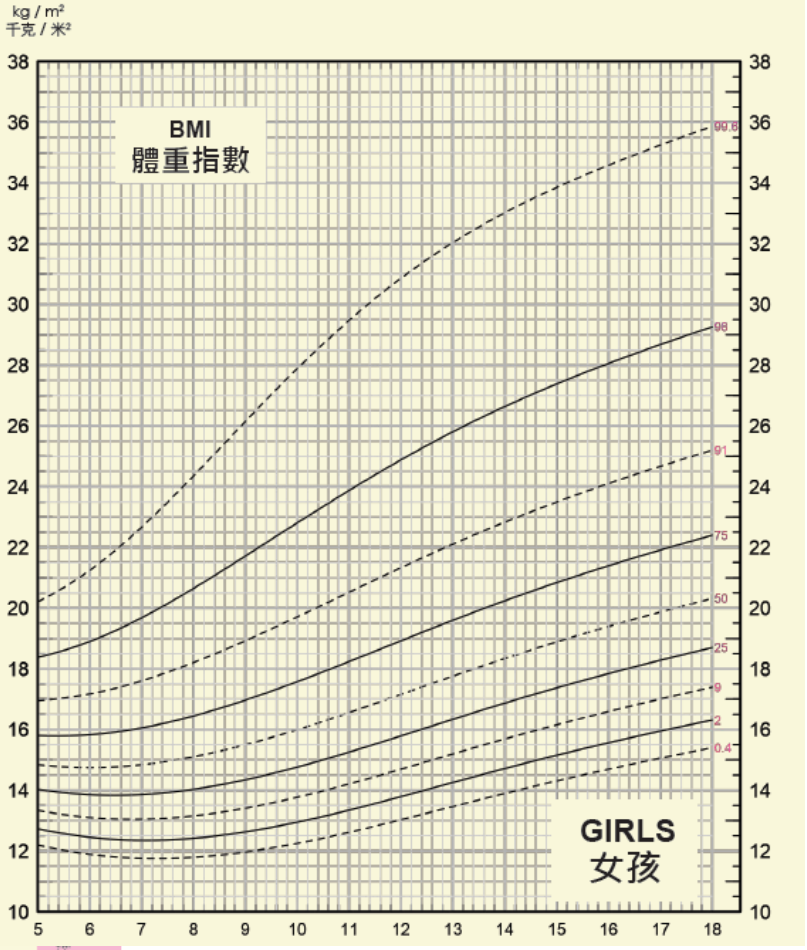
BMI chart for girls (0 - 2 years)
女孩體重指數圖表(0–2歲)



BMI chart for girls (2 - 5 years)
女孩體重指數圖表(2–5歲)



BMI chart for girls (5 - 18 years)
女孩體重指數圖表(5–18歲)



Overweight:
99.6th centile ≥ BMI > 98th centile (0-60 months)
Obesity:
>99.6th centile (0-60 moths)
Wasting ≤ 2nd centile

Overweight:
98th centile ≥ BMI > 91st centile (>5.0 to <18.0 years)
Obesity:
>98th centile (>5.0 to <18.0 years)
Wasting ≤ 2nd centile

Use BMI charts instead of Weight-for-length/height charts

The HK2020 growth reference does not include weight-for-length/height charts

Because body shape related to height varied by age in young children, making the ratio of weight to length/height an unsatisfactory marker of obesity.

Childhood obesity will be defined by BMI-for-age instead of weight-for-length/height.

The change is consistent with the practice in many countries.

Limitations

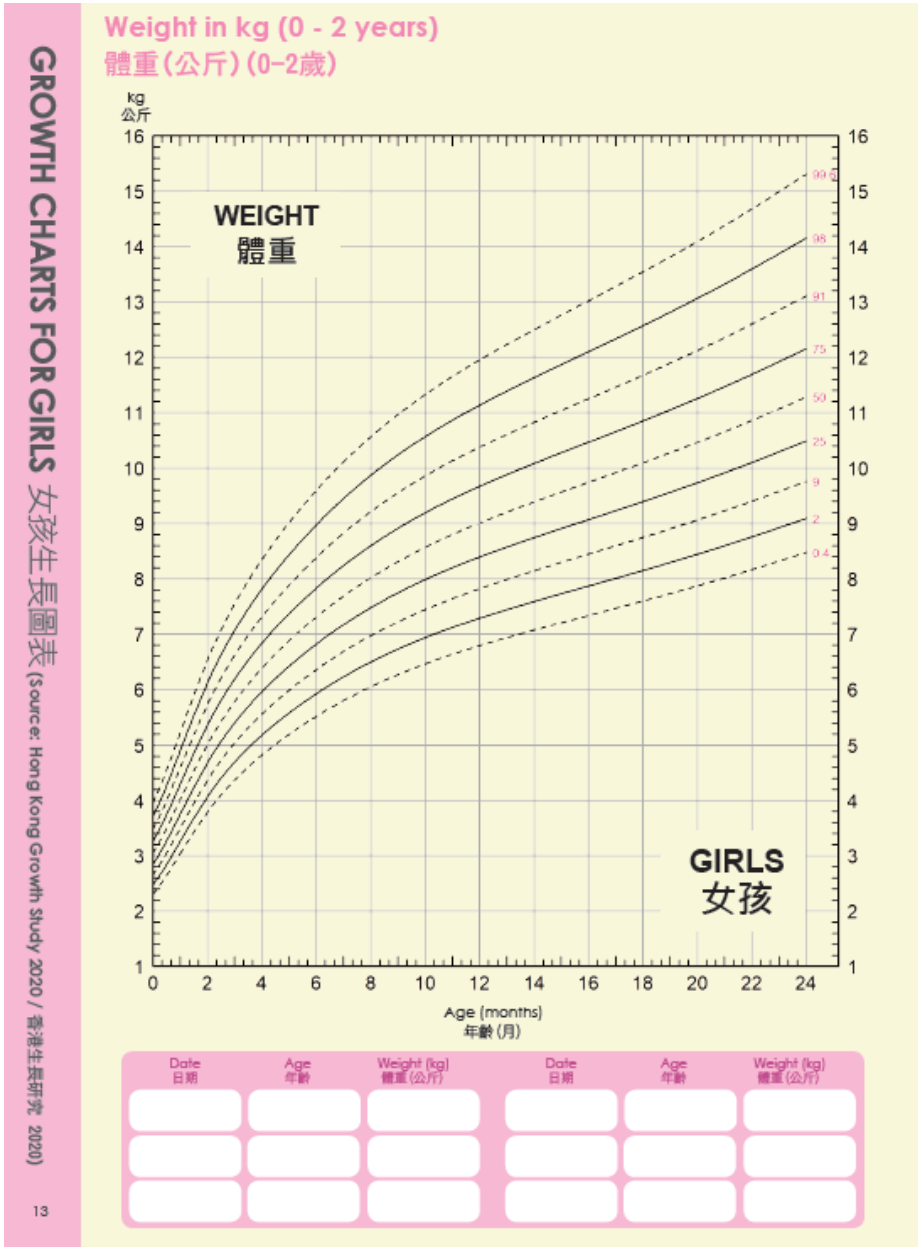
BMI is an indirect measure of body fat because it does not distinguish between excess fat, muscle, or bone mass.

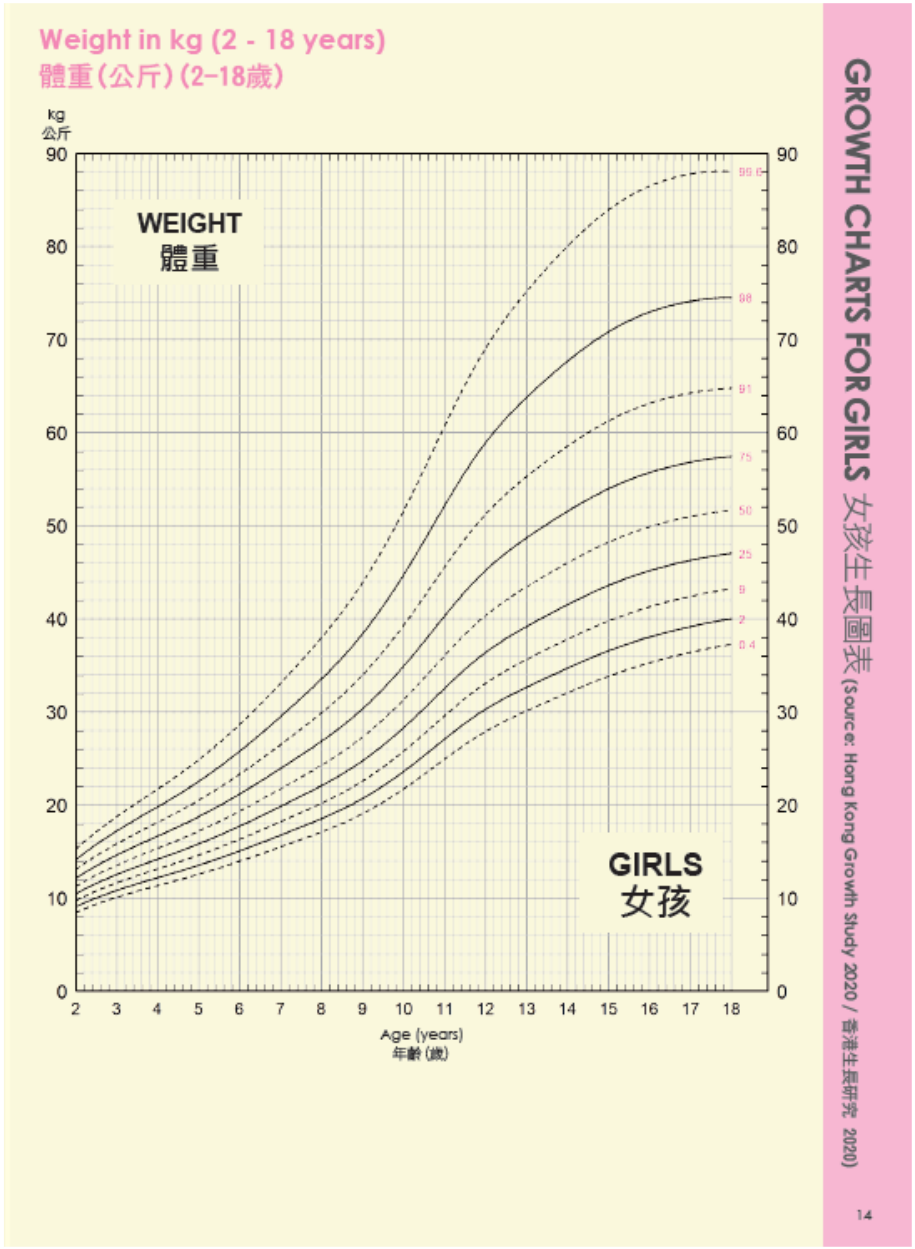
Among children with extreme high BMI, BMI likely is a good indicator of excess body fat.

Abdomen circumference can provide additional information.

BMI should be a screening tool to identify potential weight problems in individuals.

Weight status





- BMI will be used to identify the weight status.
- Weight is a routine measure in MCHC for children under 2 years old but not body length.

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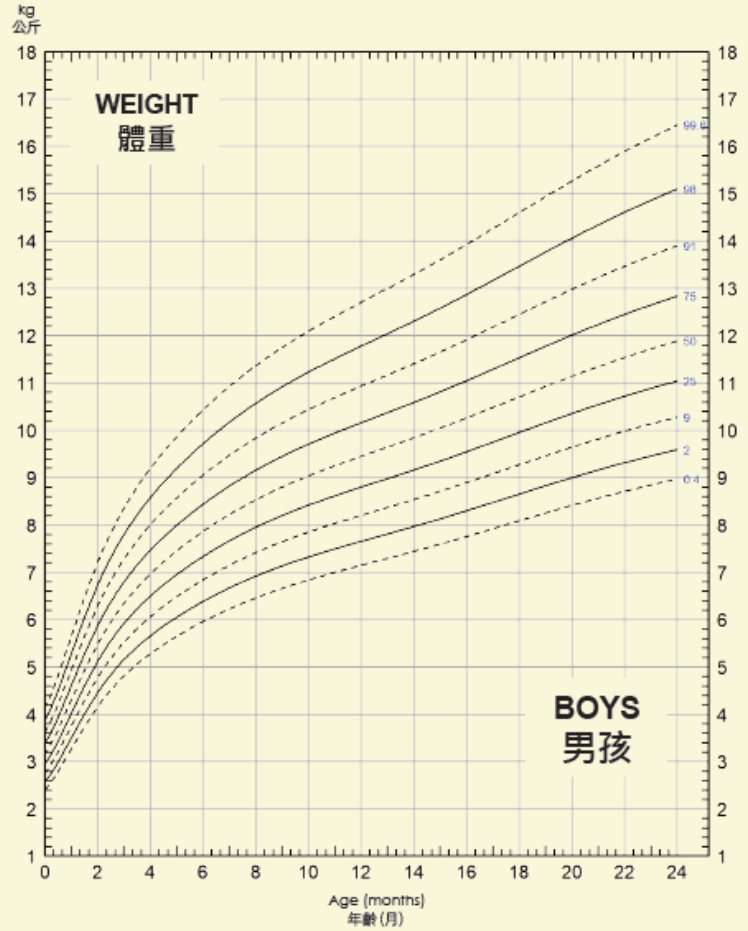
The Government of the Hong Kong Special Administrative Region

兒童健康記錄
CHILD HEALTH RECORD
生長圖表

GROWTH CHARTS FOR BOYS 男孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

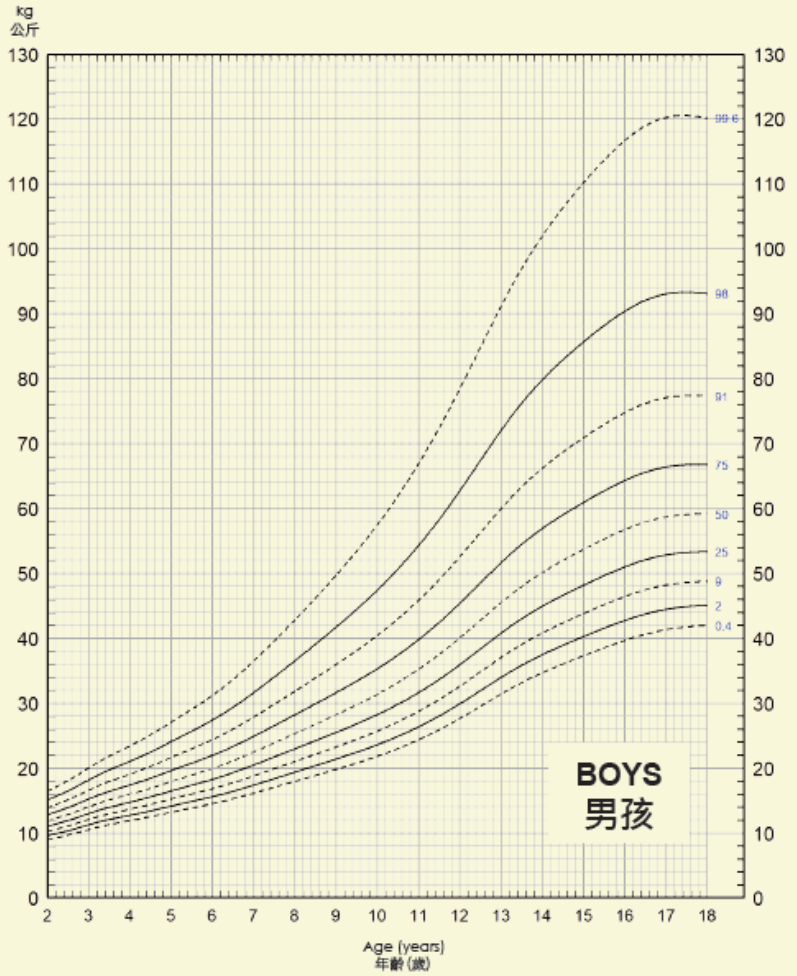
03

Weight in kg (0 - 2 years)
體重(公斤) (0–2歲)



Date 日期	Age 年齡	Weight (kg) 體重(公斤)	Date 日期	Age 年齡	Weight (kg) 體重(公斤)

Weight in kg (2 - 18 years)
體重(公斤) (2–18歲)



GROWTH CHARTS FOR BOYS 男孩生長圖表 (Source: Hong Kong Growth Study 2020 / 香港生長研究 2020)

04

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Department of Health
The Government of the Hong Kong Special Administrative Region

兒童健康記錄
CHILD HEALTH RECORD

生長圖表

Summary of the cut-offs

The cut-offs for growth problems

Parameter	**Doctor assessment & potential specialist referral**	**Doctor assessment & monitoring** (consider referral if other features on examination & history that raise concern of underlying growth issues)
Head Stature	< 0.4th centile OR > 99.6th centile	0.4th – 2nd centiles OR 98th – 99.6th centiles
BMI	< 0.4th centile OR Obesity: > 99.6th centile (0 to 60 months) > 98th centile (>5.0 to <18.0 years)	0.4th – 2nd centiles OR Overweight: 99.6th centile ≥ BMI > 98th centile (0 to 60 months) 98th centile ≥ BMI > 91st centile (>5.0 to <18.0 years)
Weight	Growth faltering in infants - Weight-for-age declines across for 2 or more centiles	

WHO2006

Non-Chinese children

Given that HK2020 was developed from an ethnic Chinese Hong Kong population and that WHO2006 was developed from a sample from 6 countries, it can be argued that WHO2006 could be a better choice for non-ethnic Chinese children aged 0-5 years.

Compared to HK2020, WHO2006 screens out fewer infants with “growth faltering” for follow-up because infants in Hong Kong have lower birth weight than the median birthweight from WHO2006 and the variation of growth was greater (i.e. a wider SD) among the children recruited from six countries involved in constructing the WHO2006.

Healthcare professionals need to be aware of the lower weight of Hong Kong infants below 2 months and shorter children aged 3-5 years compared to WHO2006 growth standards to ensure correct interpretations when using these charts.

Growth Charts and Centile Lines

- All centile lines are normal, there is no particular centile line is optimal.
- Growth charts users need to observe the trends and consider factors including genetic potential etc., when monitoring the growth of children.