



Childhood Obesity: Etiologies, Consequences and Treatments.

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The Burden Pediatric Obesity

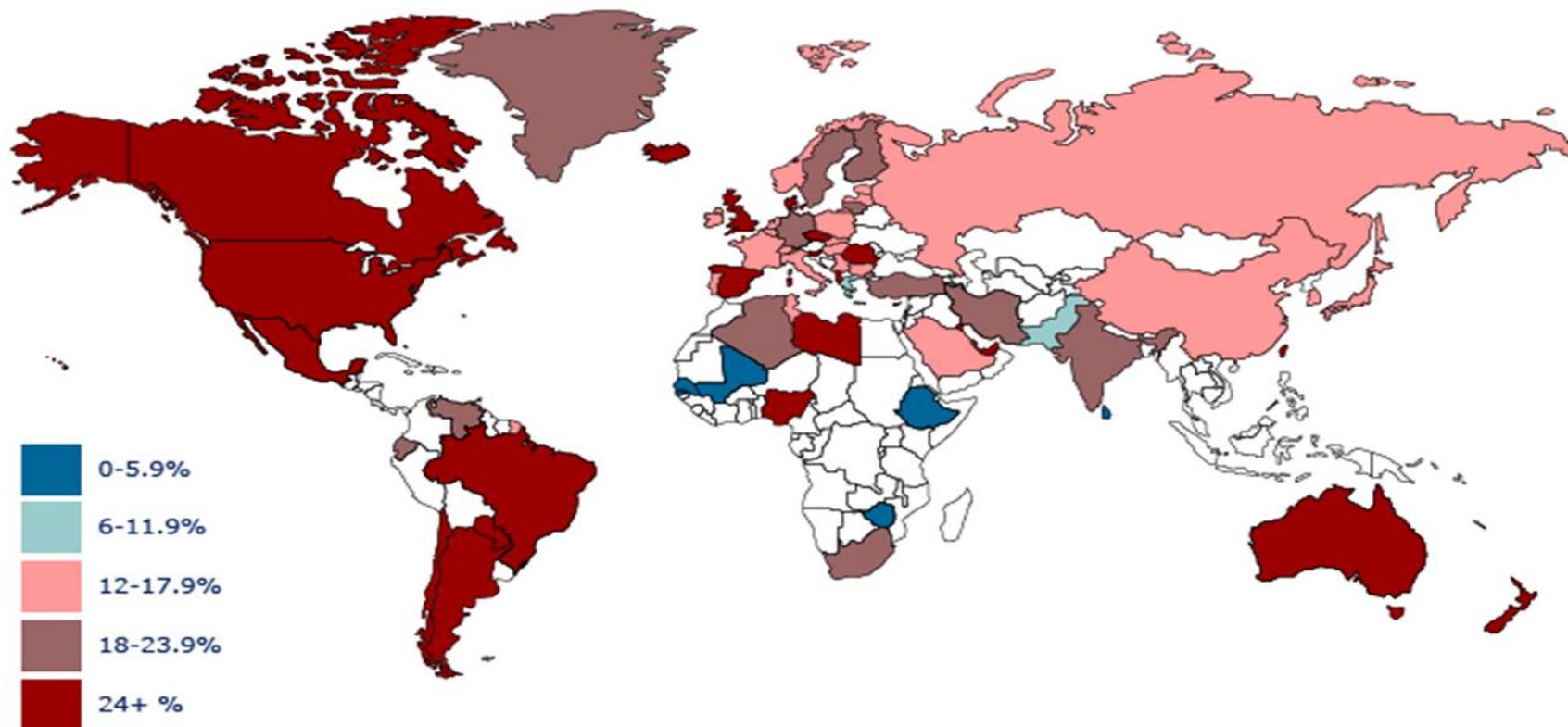
Obesity has become one of the most important public health problems in the world.

The prevalence of comorbidities has consequently increased

For this reason, it is imperative that health care providers identify overweight and obese children so that counseling and treatment can be provided.

The screenshot shows a PubMed search for "pediatric obesity treatment". The search results page displays 10,826 results. The first result is a Clinical Practice Guideline titled "Pediatric Obesity- Assessment, Treatment, and Prevention: An Endocrine Society Clinical Practice Guideline." by Styne DM, Arslanian SA, Connor EL, Farooqi IS, Murad MH, Silverstein JH, Yanovski JA, published in J Clin Endocrinol Metab. 2017 Mar 1;102(3):709-757. doi: 10.1210/je-2016-2573. PMID: 28359099. A "Free PMC article" link is visible. The second result is a systematic review titled "Treatment of Pediatric Obesity: An Umbrella Systematic Review." by Rajjo T, Mohammed K, Alsawas M, Ahmed AT, Farah W, Asi N, Almasri J, Prokop LJ, Murad MH, published in J Clin Endocrinol Metab. 2017 Mar 1;102(3):763-775. doi: 10.1210/je-2016-2574. PMID: 28359101. A "Review" link is visible. On the left side of the search results, there is a "RESULTS BY YEAR" section with a bar chart showing a significant increase in publications starting around 2010 and peaking in 2017. Below the chart, there are filters for "TEXT AVAILABILITY" including "Abstract", "Free full text", and "Full text". The browser's taskbar at the bottom shows several open files related to pediatric obesity prevalence and BMI curves.

World prevalence of childhood overweight, 2000s



Prevalence of overweight or obesity, defined as body mass index (BMI) $\geq 85^{\text{th}}$ percentile for age and gender, using reference standards from the International Obesity Task Force (IOTF). Data for most of the countries shown are from 2005 or later*.

* Data from the late 1990s are used for Ethiopia, Iceland, Japan, Mali, Venezuela, and Zimbabwe.

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Prevalence of short stature, underweight, overweight, and obesity among school children in Jordan

[Ayman A. Zayed](#)^{✉3}, [Abdallah M. Beano](#)¹, [Faris I. Haddadin](#)¹, [Sohab S. Radwan](#)¹, [Suhaib A. Allauzy](#)¹,
[Motasem M. Alkhayyat](#)¹, [Zaid A. Al-Dahabrah](#)¹, [Yanal G. Al-Hasan](#)¹, and [Al-Motassem F. Yousef](#)²

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Aim: to investigate, on a national level, the prevalence of short stature (SS), underweight, overweight, and obesity among school aged children in Jordan.

Methods

- cross-sectional study
- May 2015 to January 2016
- 2702 subjects aged 6–17 years
- Jordan was classified into 3 regions; North, Center (urban), and South (rural).
- Public and private schools were randomly selected from a random sample of cities from each region.

Obesity rate 15.7 % , most prevalent in Central town.

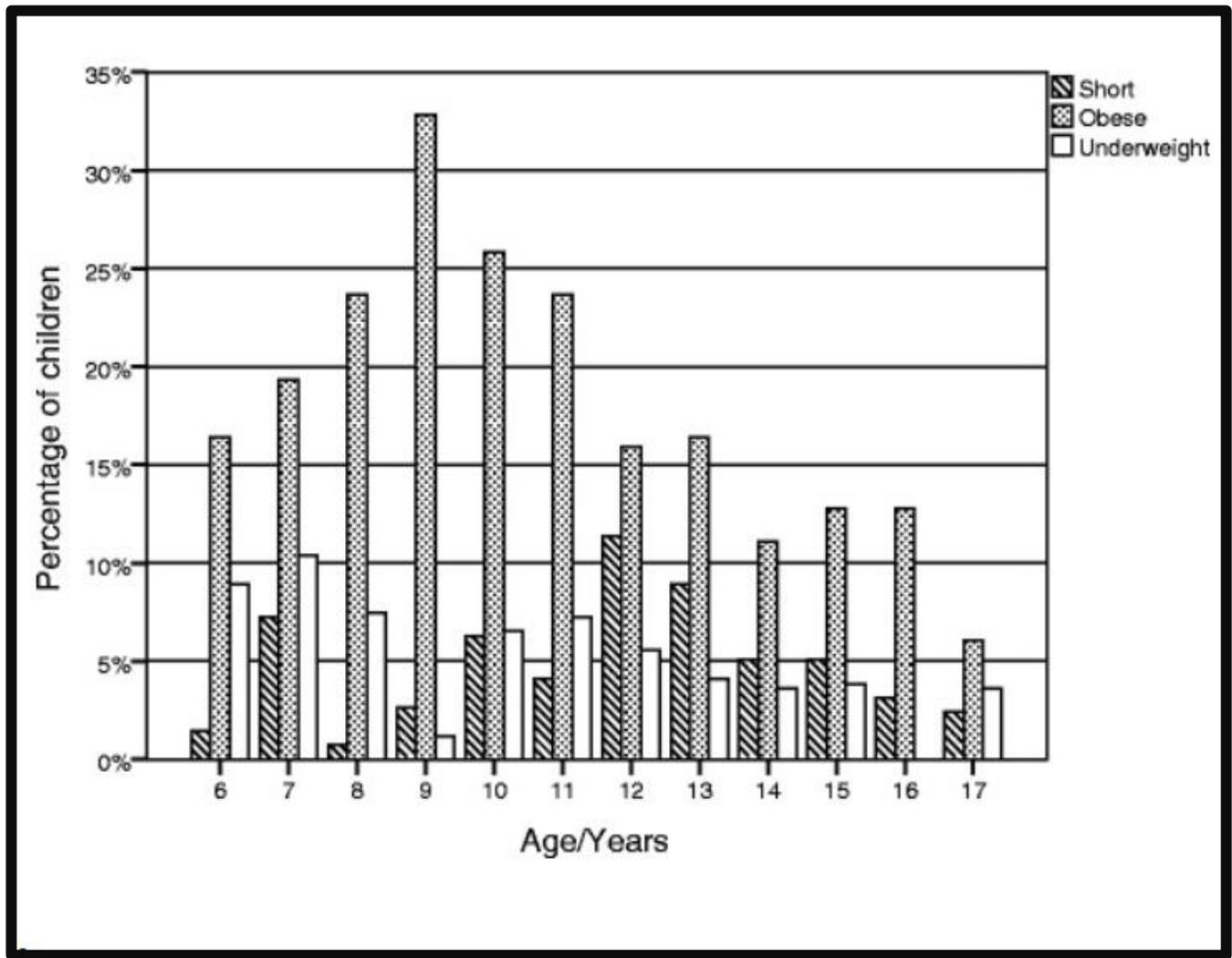
private schools 20.8 % found to be obese compared to 9.4 % in public schools (P-value <0.001).

More males, with 18.9 % being obese compared to 11.2 % of females (P-value <0.001).

overall prevalence of **overweight** was 17.3 % and it was not significantly associated with the region (P-value = 0.21)

females were more likely to be overweight compared to males (18.9 and 15.3 % , respectively, P-value = 0.018).

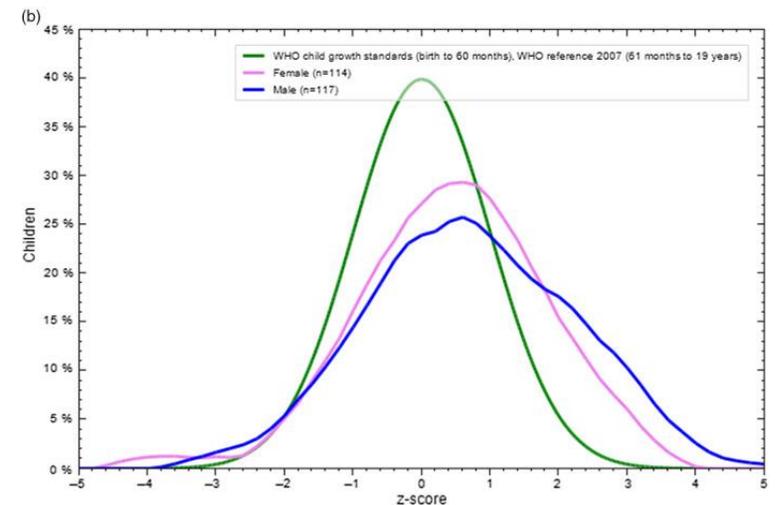
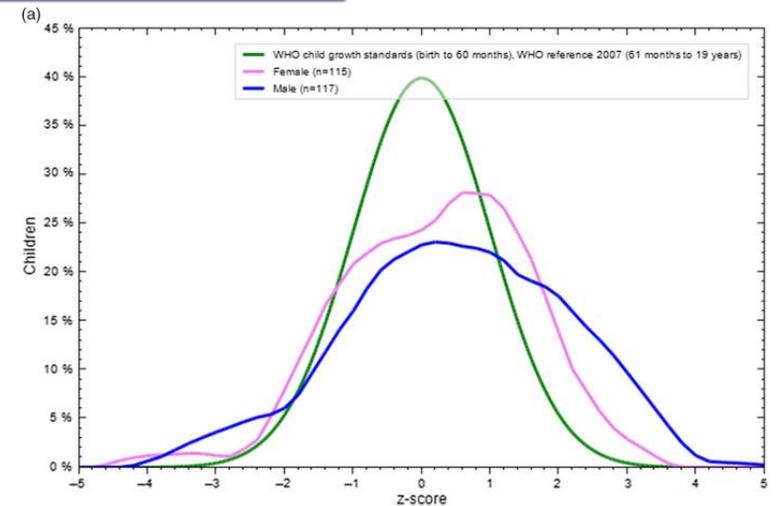
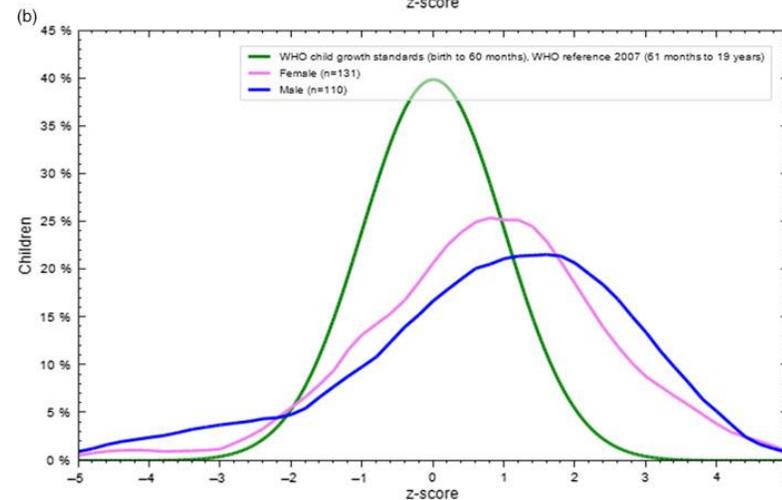
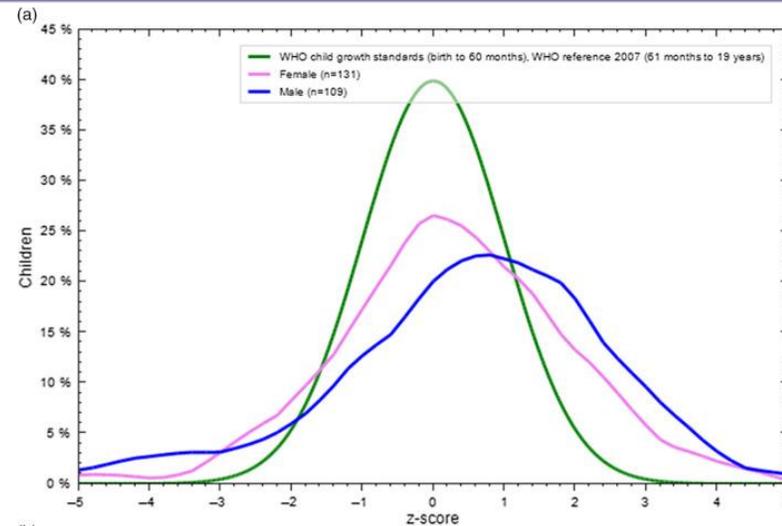
more in private schools as compared to public ones (18.7 % , 15.6 % , respectively, P-value = 0.047).



Impact of COVID-19 Lockdown on Body Weight, Eating Habits, and Physical Activity of Jordanian Children and Adolescents

Huda Al Hourani PhD¹ , Buthaina Alkhatib PhD² and Mai Abdullah PhD³

- A cross-sectional study
- 477 Jordanian children and adolescents aged 6-17 years.
- structured validated questionnaire



Definitions

Underweight – BMI <5th percentile for age and sex.

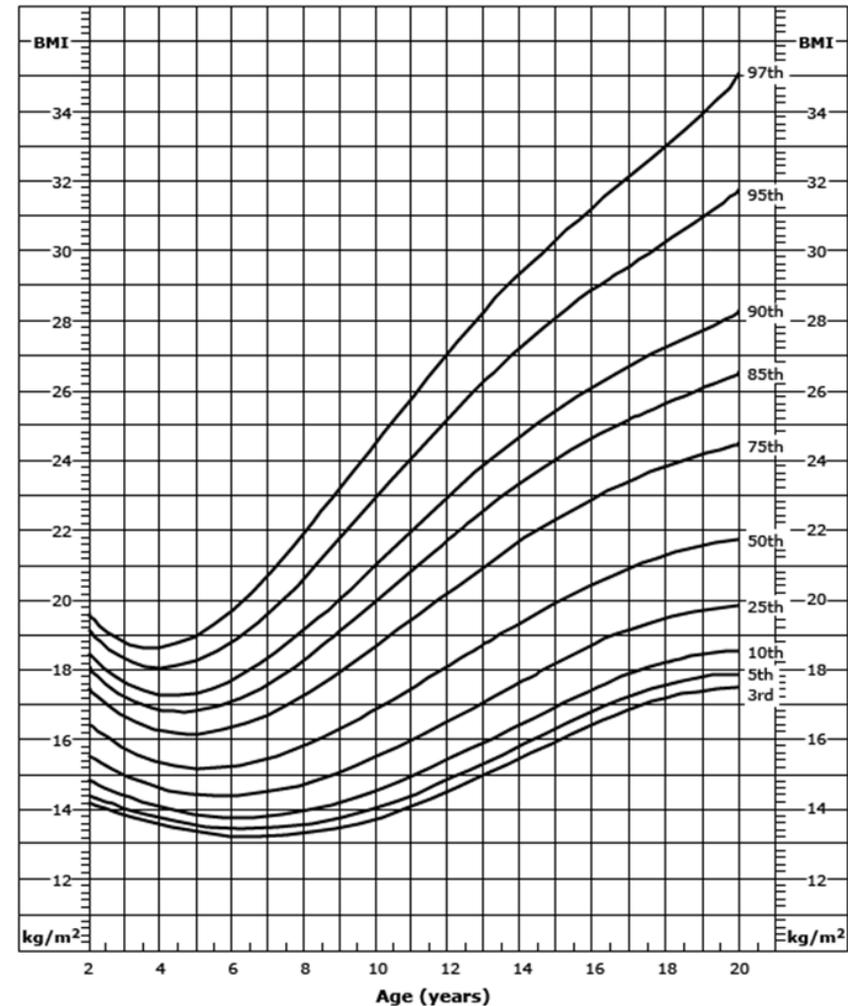
Normal weight – BMI between the 5th and <85th percentile for age and sex.

Overweight – BMI between >85th and 95th percentile for age and sex.

Obese – BMI \geq 95th percentile for age and sex.

<2 years age: if weight/ length > 97.7th cent. WHO

Body mass index-for-age percentiles, females 2 to 20 years, CDC growth charts: United States

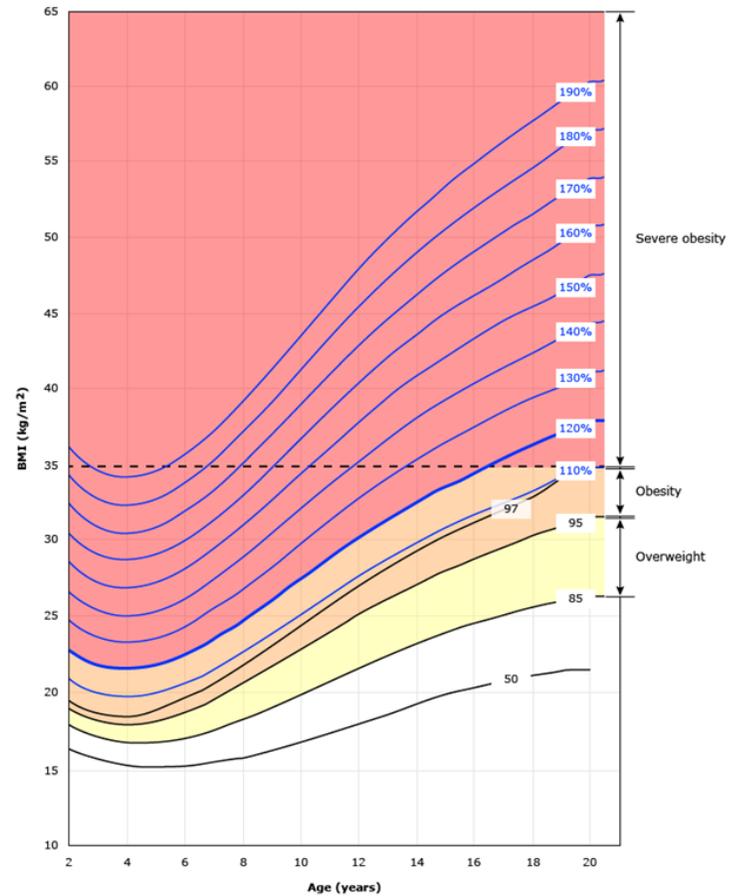


BMI: body mass index; CDC: Centers for Disease Control.

Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

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BMI curves for females 2 to 20 years with severe obesity



Severe obesity in pediatric patients is defined as a body mass index (BMI) that is either $\geq 120\%$ of the 95th percentile curve, or BMI ≥ 35 kg/m² (whichever is lower). The area defining severe obesity is shaded in red in the figure above. A BMI of 40 kg/m² is typically used as a threshold for weight loss surgery in adults and adolescents without major comorbidities. Note that this threshold is well above the curve representing 120% of the 95th percentile at all ages. The black curves (50 through 97) represent the standard BMI growth reference from the CDC, published in 2000. The blue curves (110% through 190%) are derived by multiplying the 95th percentile values by 1.1 through 1.9, respectively.

CDC: Centers for Disease Control and Prevention.

Adapted from: Kelly AS, Barlow SE, Rao G, et al. Severe obesity in children and adolescents: Identification, associated health risks, and treatment approaches. A scientific statement from the American Heart Association. *Circulation* 2013; 128:1689.

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COMPLICATIONS

Many areas of a teen's body and life are affected by obesity *physically and mentally*

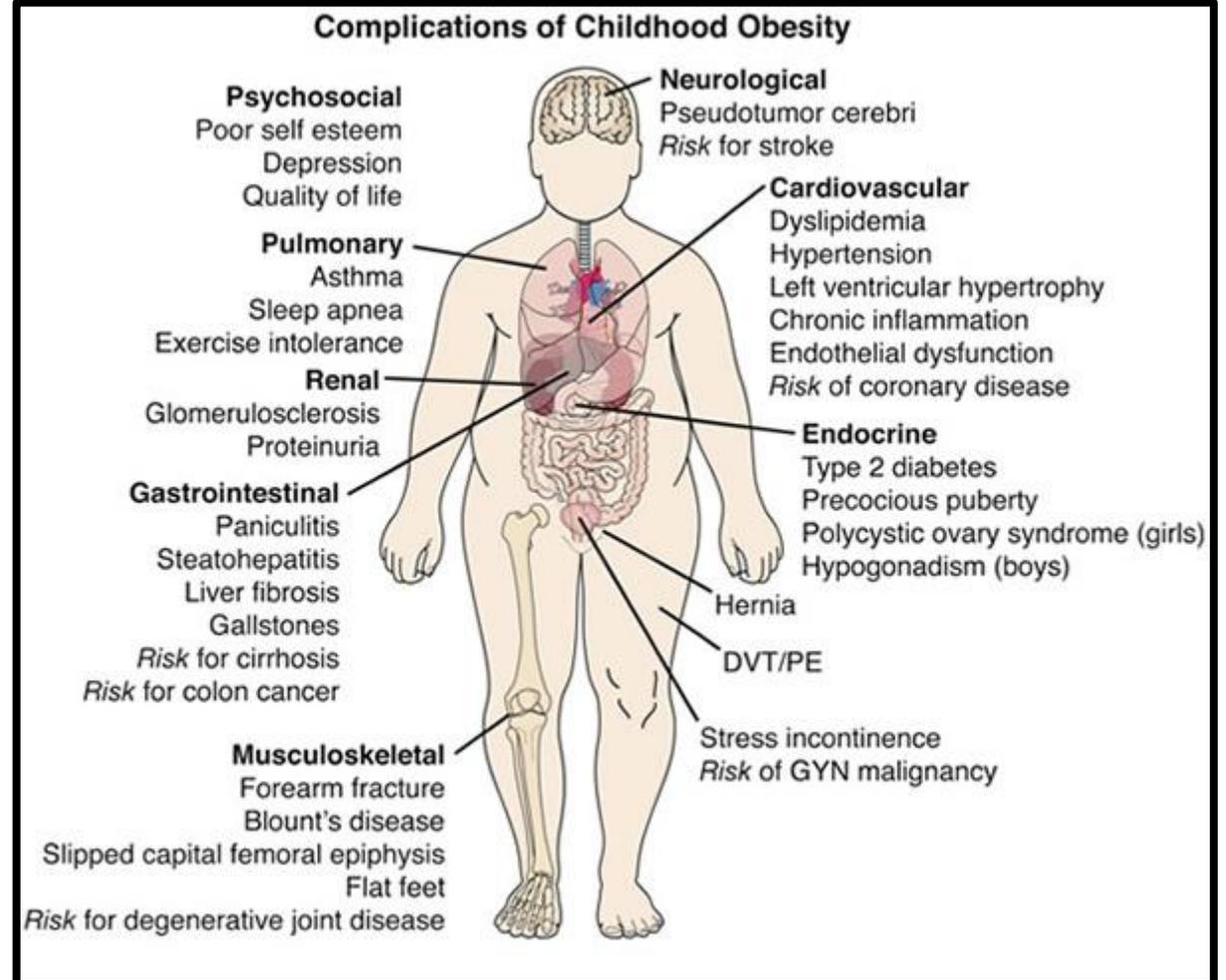


Image from: <http://foodexposed.co.za/child-obesity-a-huge-problem-in-the-us-and-has-tripled-over-the-last-25-years/> (Accessed November

Health related quality of life (HR-QoL)

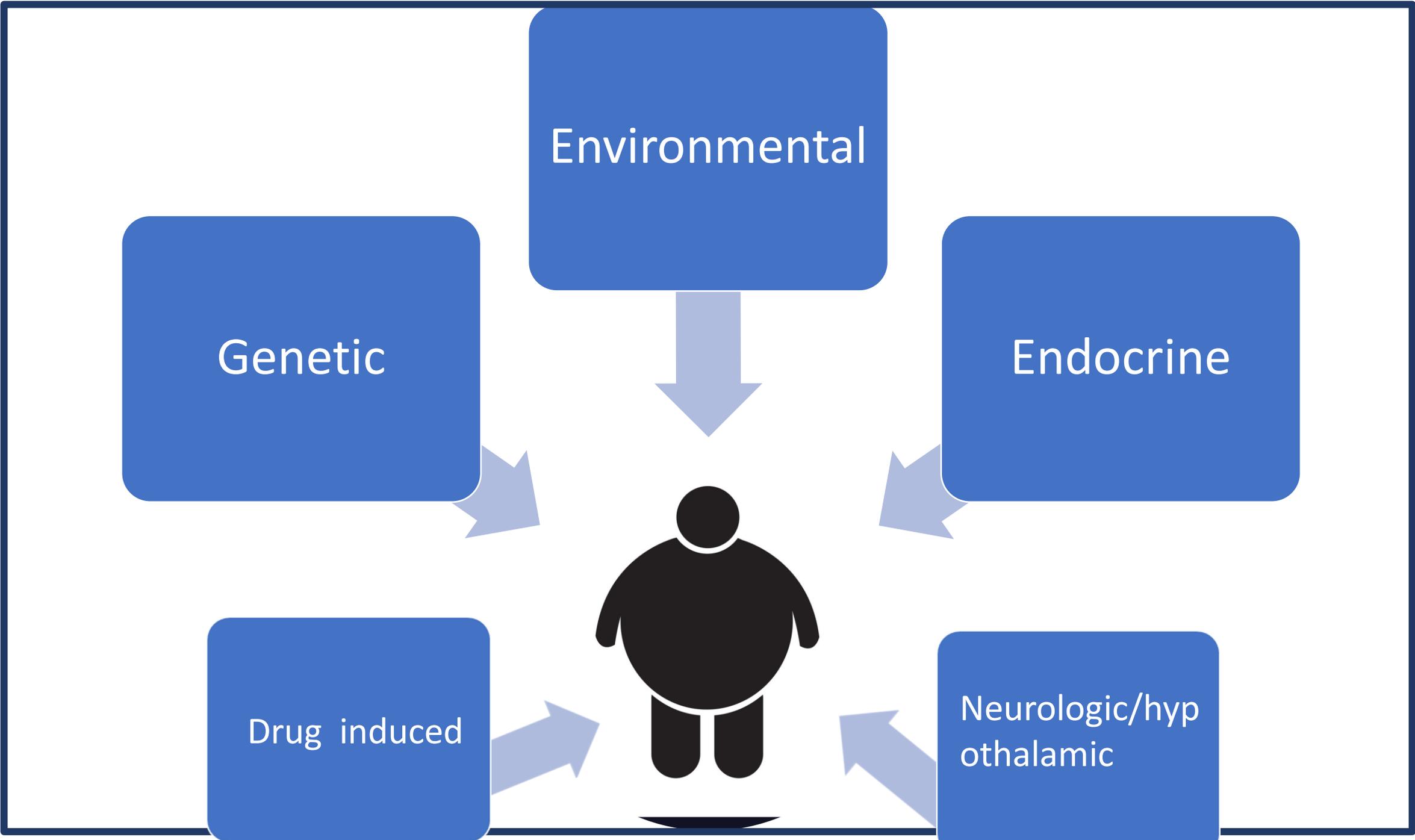
- HR-QoL involves physical, emotional, social and school functioning
- Historically, children diagnosed with cancer AND on chemotherapy have the lowest HR- QoL scores.

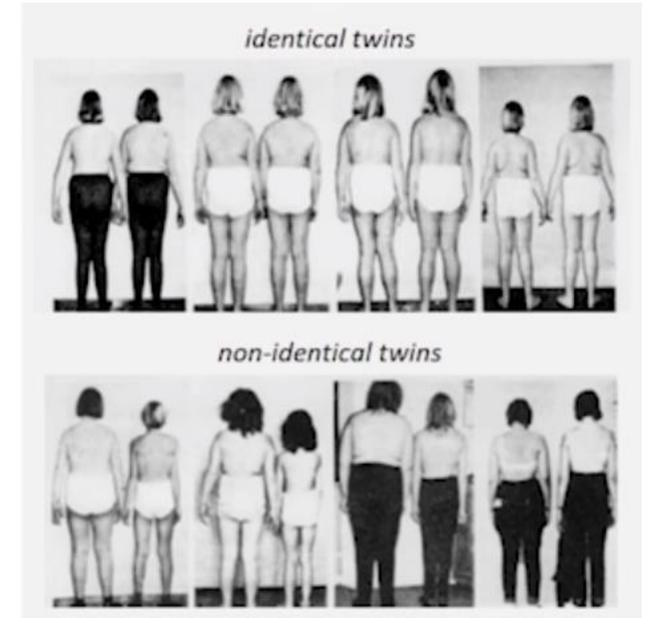
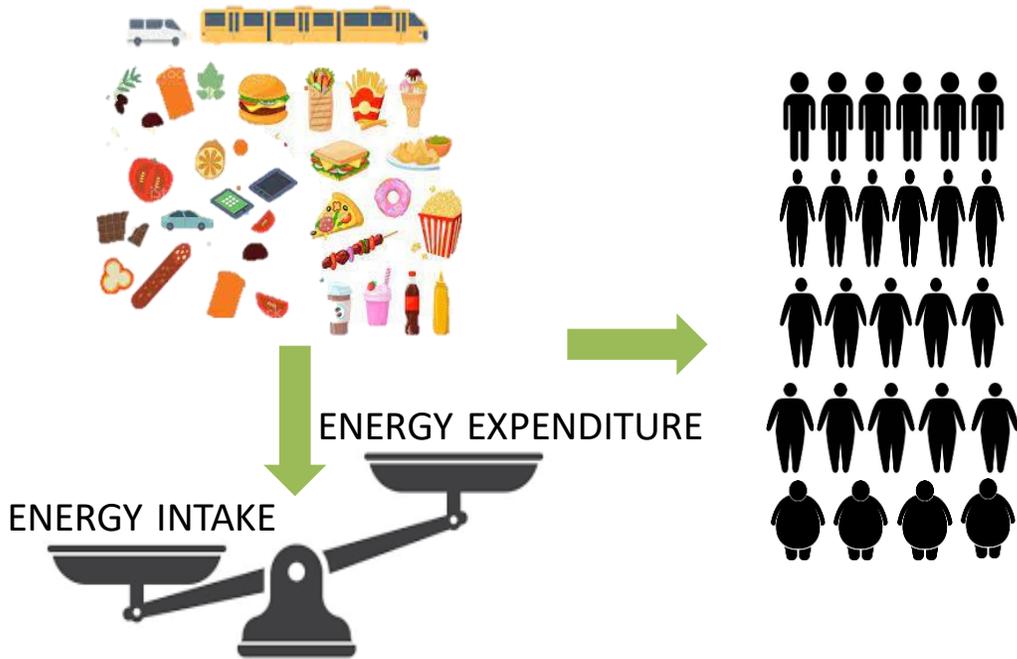


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Etiology of Obesity

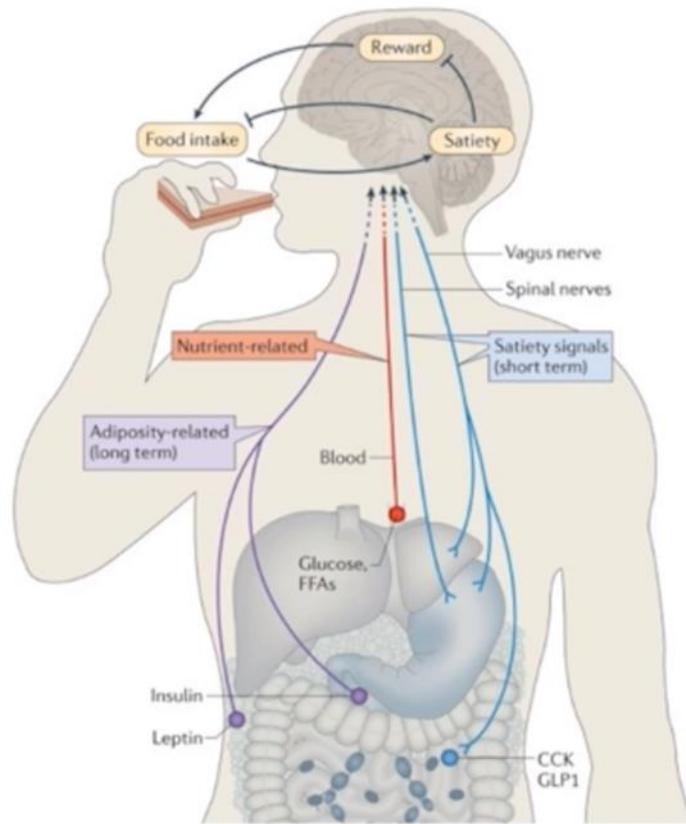




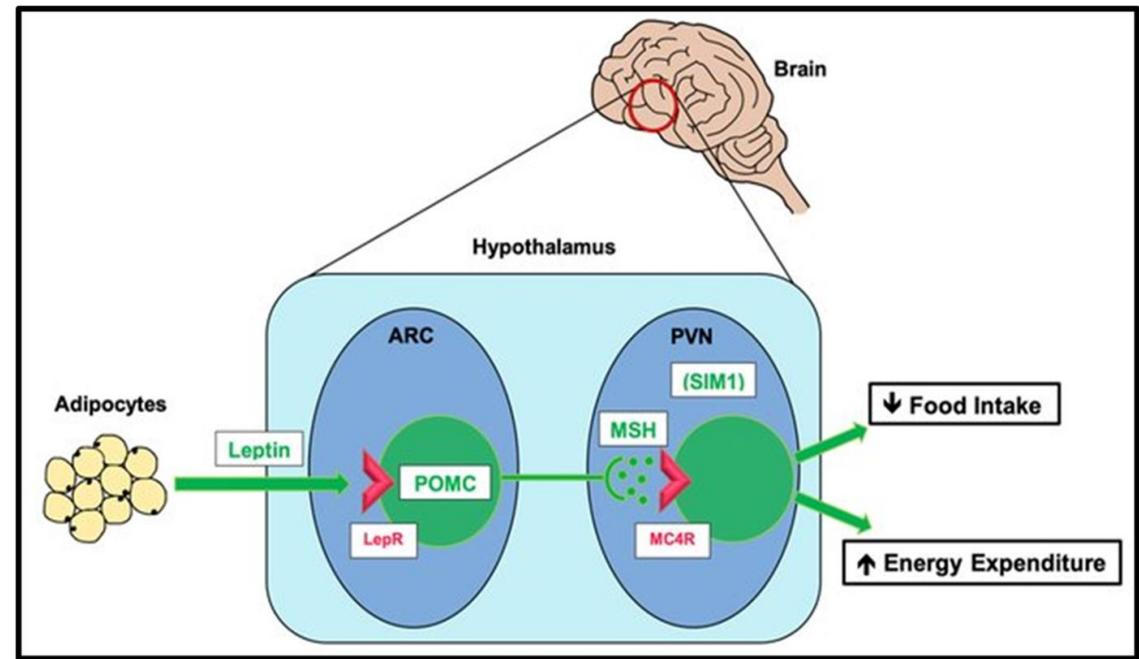
- Identical twins – identical weight even if separated at birth (Stunkard at el, NEJM 1990)
- Identical twins gain similar amount of weight with overeating (Bouchard at el, NEJM 1990)
- Weight of adopted children similar to biological parents (Stunkard, Sorenson at el, NEJM 1986)
- **40 – 70% of difference in weight between 2 people, is due to differences in their genes.**

Genetics of obesity

Hormonal system for regulating weight defends against starvation



(Nature 1997, NEJM 1998, JCI 2002, Science 2007, Nature Communications 2016)



3yr old weighing 42 kg

7yr old weighing 32 kg

Genes2020,11, 1378

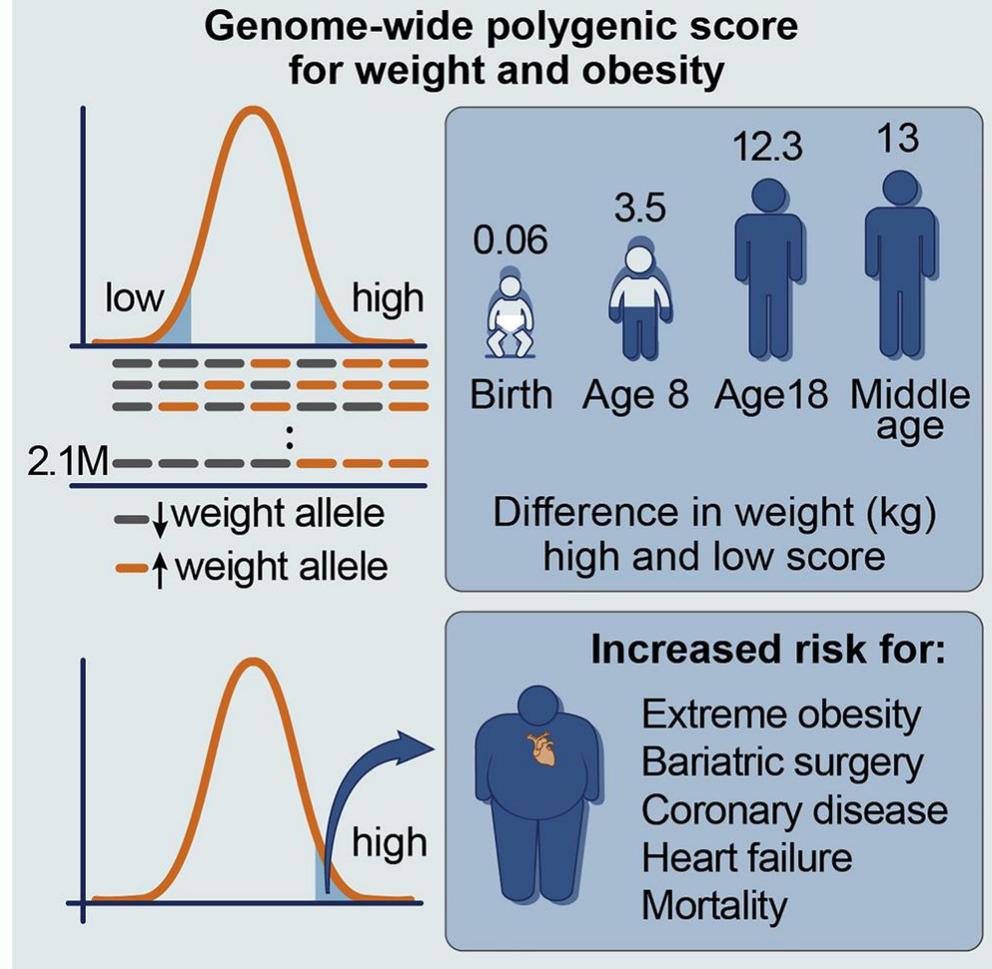
genetic testing in patients with extreme early onset obesity (before 5 years of age) and that have clinical features of genetic obesity syndromes (in particular extreme hyperphagia) and/or a family history of extreme obesity

J Clin Endocrinol Metab, March 2017, 102(3):709–757

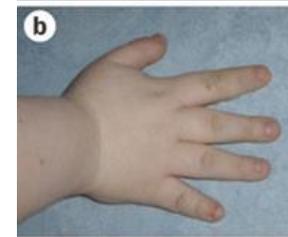
Polygenic Prediction of Weight and Obesity Trajectories from Birth to Adulthood

Amit V. Khera  ¹⁵  • Mark Chaffin ¹⁵ • Kaitlin H. Wade • ... Nicholas J. Timpson • Lee M. Kaplan • Sekar Kathiresan  ¹⁶  • [Show all authors](#) • [Show footnotes](#)

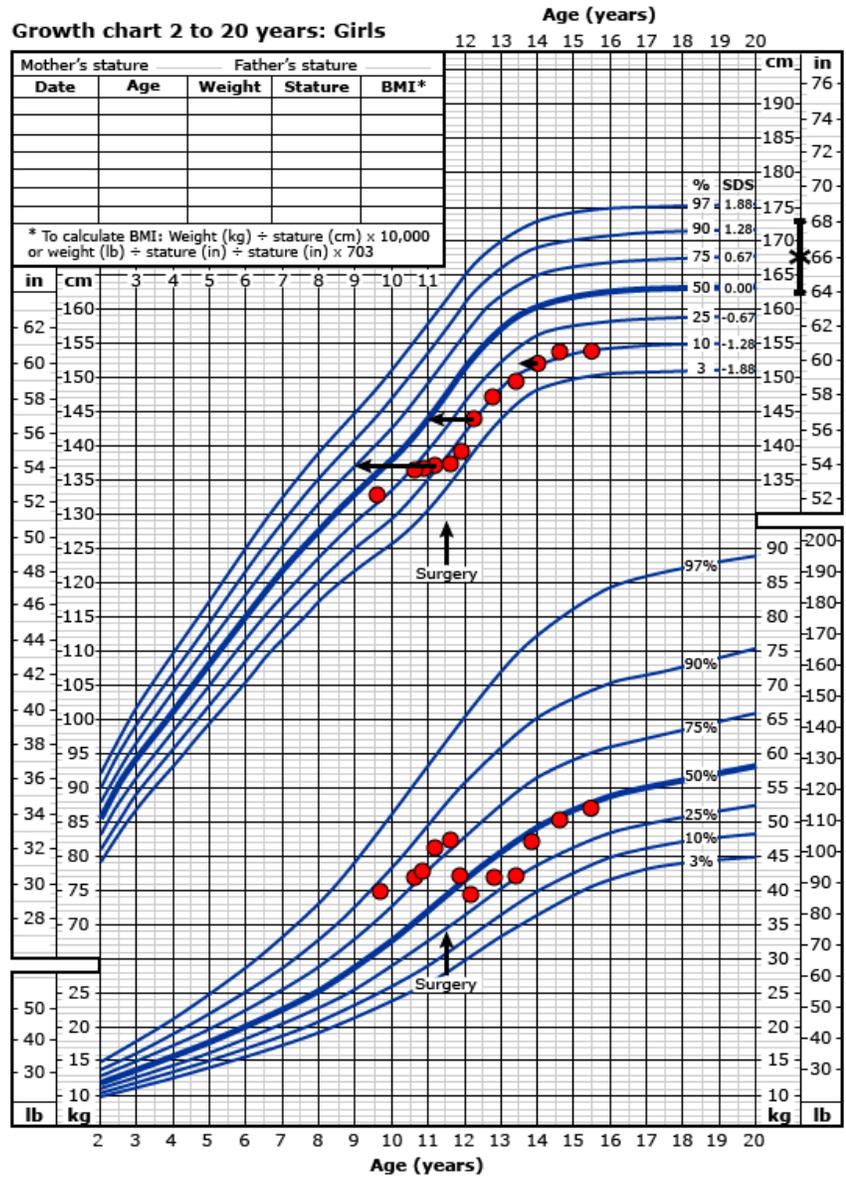
- A genome-wide polygenic score can quantify inherited susceptibility to obesity
- Polygenic score effect on weight emerges early in life and increases into adulthood
- Effect of polygenic score can be similar to a rare, monogenic obesity mutation
- High polygenic score is a strong risk factor for severe obesity and associated diseases

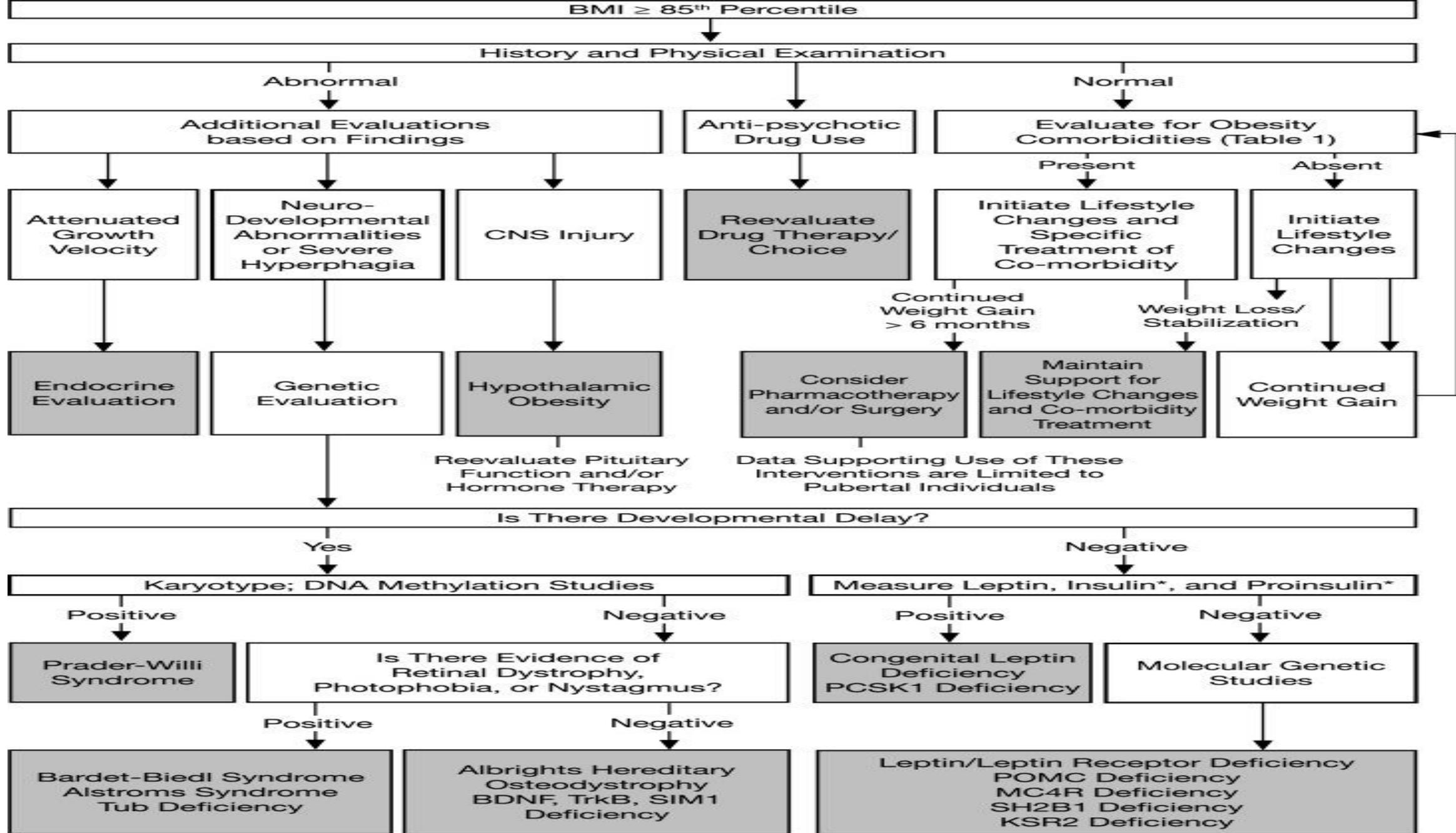


Genetic syndromes with obesity



Name: _____ ID#: _____ DOB: _____





comorbidity		
Prediabetes /Diabetes	HbA1C, OGTT	American Diabetes Association
Hypertension	Age specific normal values	Expert Panel Summary Report ; Mancia et al., 2013
Dyslipidemia	Age specific normal values	Expert Panel Summary Report
NAFLD	ALT > 25 U/L (boys) and >22 U/L (girls)	Schwimmer et al., 2010
PCOS	Per endocrine society guidelines	Legro et al., 2013
Obstructive sleep apnea	If positive history, refer to pulmonary for nocturnal polysomnography and if not available overnight oximetry	Wise et al., 2011
Psychiatric	If positive history, refer to mental health specialist	Zamethkin et al., 2004

Self directed lifestyle modifications

Professionally directed lifestyle modifications

Pharmacotherapy

Bariatric surgery

[J Clin Endocrinol Metab.](#) 2017 Mar 1; 102(3): 709–757.
Published online 2017 Jan 31. doi: [10.1210/jc.2016-2573](https://doi.org/10.1210/jc.2016-2573)

PMCID: [PMC6283429](https://pubmed.ncbi.nlm.nih.gov/PMC6283429/)
PMID: [28359099](https://pubmed.ncbi.nlm.nih.gov/28359099/)

Pediatric Obesity—Assessment, Treatment, and Prevention: An Endocrine Society Clinical Practice Guideline

[Dennis M. Styne](#),¹ [Silva A. Arslanian](#),² [Ellen L. Connor](#),³ [Ismaa Sadaf Farooqi](#),⁴ [M. Hassan Murad](#),⁵ [Janet H. Silverstein](#),⁶ and [Jack A. Yanovski](#)⁷

- Pharmacotherapy only after formal **intensive lifestyle program**
- FDA-approved pharmacotherapy with **concomitant lifestyle** and only by **clinicians who are experienced in the use of anti-obesity medications** and are aware of potential side effects

We recommend against using obesity medications in children and adolescents <16 years of age who are overweight but not obese.

We suggest that clinicians should discontinue medication and reevaluate the patient if the patient does not have a >4% BMI/BMI z score reduction after taking antiobesity medication for 12 weeks at the medication's full dosage.

J Clin Endocrinol Metab. 2017 Mar 1; 102(3): 709–757

Which anti-obesity medications are being used to treat adolescents with obesity?

Medication	Approval for adolescent obesity	RCT	Summary of trials
Orlistat	Approved for <u>obesity</u> ≥12 years old	Yes	<ul style="list-style-type: none"> Several RCTs completed. Patients' ages range from 10 to 18 years old, and treatment duration up to 54 weeks
Liraglutide 3 mg	Approved for <u>obesity</u> ≥12 years old Approved for <u>T2DM</u> ≥10 years old (1.8mg)	Yes	<ul style="list-style-type: none"> RCTs, patients' ages 12-17 years old; treatment duration: 56 weeks One RCT recruiting age 6-11 years; completion anticipated 2024
Phentermine	Approved for <u>obesity</u> >16 years old	No	<ul style="list-style-type: none"> Retrospective chart review
Metformin	Approved for <u>T2DM</u> ≥10 years old	Yes	<ul style="list-style-type: none"> Multiple RCTs completed. Patients' ages range from 6 to 17 years old, and treatment duration up to 2 years; typically, 6–12 months
Topiramate	Approved for <u>seizure</u> ≥2 years old Approved for <u>migraine</u> ≥12 years old	Yes	<ul style="list-style-type: none"> Two completed RCTs. Patients' ages range from 9 to 17 years old, and treatment duration up to 36 weeks
Setmelanotide	Approved for <u>obesity due to POMC, PCSK1, & LEPR def</u> ≥ 6 years old	No	<ul style="list-style-type: none"> Phase 3 trials completed (POMC PCSK1, and LEPR Def) Phase 3 underway for Bardet-Biedl and Alström syndrome

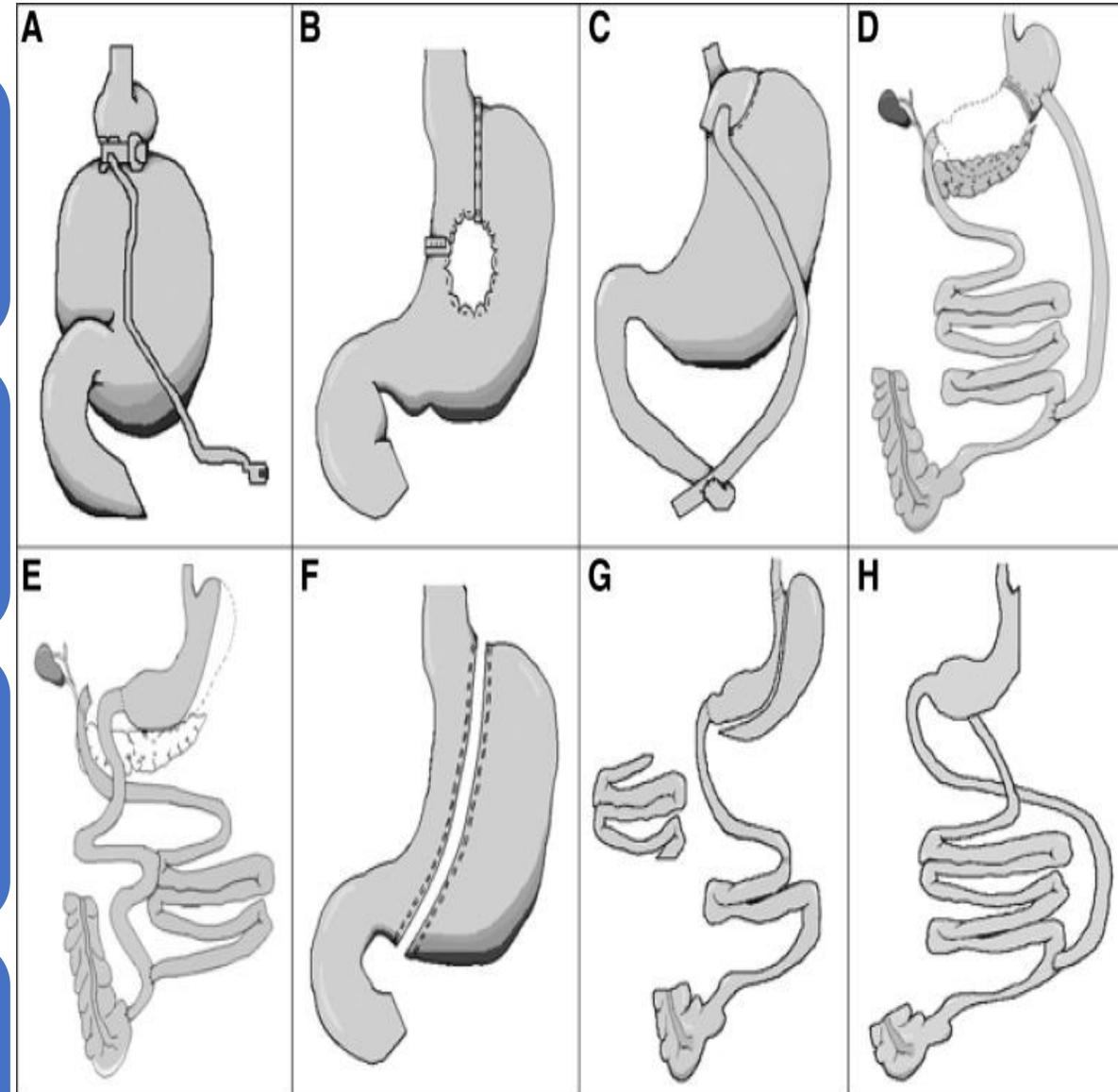
Bariatric Surgery

We suggest bariatric surgery only under the following conditions:

- attained Tanner 4 or 5 and final or near-final adult height, has a BMI of >40 kg/m² or has a BMI of >35 kg/m² and significant, extreme comorbidities not responding to conventional ways +/- pharmacotherapy

- psychological evaluation confirms the stability and competence of the family unit and the ability to adhere to the principles of healthy dietary and activity habits

- there is access to an experienced surgeon in a pediatric bariatric surgery center of excellence





DIETARY HABBITTS



EXERCISE



SCREEN TIME



Thank you