

# THE IMPOSSIBLE OBESITY EPIDEMIC IN CHILDREN AND YOUTH

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## Start with some questions

- Is overweight the new normal?
- Is obesity a disease?
- Is obesity a disability?
  - Does it warrant legal protection against discrimination?
- Is obesity a lifestyle choice?
- Is obesity an addiction?
- Whose fault is it?
- Why is losing weight so hard?
- Why are overweight and obesity so challenging and frustrating to treat?



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## Obesity IS a Disease

- As of 2013, the American Medical Association formally recognized obesity as a chronic disease requiring medical interventions
- Some consider it to be one of the most common chronic conditions of childhood
- Overweight and Obesity defined by the World Health Organization as "abnormal or excessive fat accumulation that may impair health" (2022)
- Overweight and Obesity are **labels** for ranges of weight that are greater than what is considered healthy and **have been shown to increase the likelihood of certain diseases and other health problems** (CDC)

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## Obesity Medicine Association: Definition of Obesity

- "a chronic, relapsing, multi-factorial, neurobehavioral disease, wherein an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences"

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## Body Mass Index (BMI)

- Index of weight for height commonly used to classify overweight and obesity
- NOT a direct measure of body fat, but rather an **estimate** of adiposity
  - A practical way to measure and describe
  - It underestimates obesity compared to more sensitive measures of fat volume
  - Only uses height and weight
- Used as a gatekeeper metric for treatment eligibility by insurance (medications and bariatric surgery).

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## BMI percentiles in children

- For children of the same gender and age,
  - Percents are used with children because body composition changes with age and therefore children are compared to others of same age and gender
    - Therefore, boys in the 95<sup>th</sup> percentile for age would have a BMI greater than 95% of boys his age
  - Underweight = <5<sup>th</sup> percentile
  - Normal = BMI as defined on the CDC growth charts between 5<sup>th</sup> and 84<sup>th</sup> percentile
  - Overweight = BMI between 85<sup>th</sup> and 94<sup>th</sup> percentile
  - Obesity = BMI at or above the 95<sup>th</sup> percentile

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## BMI for adults

- By age 18, the 95<sup>th</sup> percentile of BMI on CDC growth charts corresponds approximately to a BMI of **30 kg/m<sup>2</sup>**
  - Normal BMI = 18.8-<25 kg/m<sup>2</sup>
  - Overweight BMI = 25 - < 30 kg/m<sup>2</sup>
  - Obesity
    - Class 1 = BMI of 30-<35 kg/m<sup>2</sup>
    - Class 2 = BMI of 35-<40 kg/m<sup>2</sup>
    - Class 3 = BMI of 40 or higher kg/m<sup>2</sup>

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## Morbid Obesity

- Defined as > 80-100 pounds over ideal body weight or > 40 BMI
- Term was coined in 1963 to persuade health insurance companies that reimbursement for the cost of intestinal bypass surgery in **grossly** obese patients could be justified on health grounds

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### Problems with BMI

- **Does not take into account muscle mass**, bone density, and overall body composition
  - Inaccurate for athletes
  - Exaggerates thinness in short people, giving the impression that they are thinner than they are
  - Exaggerates adiposity in tall people, giving the impression of being larger than they actually are
  - Does not indicate where the fat is, an important determinant of the cardiometabolic consequences of fat

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### More sensitive measures to measure adiposity

- \*BMI should be used in conjunction with other valid measures of risk, such as, but not limited to measurements of visceral fat, body adiposity index, body composition, relative fat mass, waist circumference, and genetic/metabolic factors\* (AMA)
- *Visceral fat is stored in abdomen (liver, stomach, intestines) and arteries; active fat (subcutaneous fat) is under skin and easier to see)*
  - Bioelectrical impedance (uses electrical current to measure adiposity)
  - Densitometry (underwater measurement of weight)
  - Dual energy x-ray absorptiometry (DXA)
  - Possible: Tri-ponderal mass index (TMI)
    - Divide body weight by height cubed, especially for 8-11 year olds

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■ THEREFORE, BMI IS GOOD FOR ASSESSMENT OF POPULATIONS AT RISK FOR CARDIOVASCULAR DISEASE....BUT NOT HELPFUL AT THE INDIVIDUAL LEVEL.

■ ONE SIZE DOES **NOT** FIT ALL

- June 2023 - American Medical Association
  - Pay less attention to BMI in determining if a patient is at a healthy weight
  - BMI does not predict disease risk equally well across racial and ethnic groups

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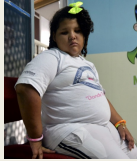
### Prevalence of Overweight and Obesity

- 1990s saw first reports of increase in overweight in society that started in the late 1970s
- Prior to 2012, NO states had >35% obesity
- 2022-obesity >35% in 22 states (2017-obesity >35% in 7 states)
- Obesity increased 70% in past 30 years for adults; 85% for children
  - More among minority and disadvantaged
- **Adults: 41.9% obese; 73.6% overweight and obese**
  - Obesity was 30.6% of population in 2000
  - Young adults = 33% (was 6% in 1976)

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### Prevalence in children and youth

- Adolescents **overweight**
  - 1999 = 28.8%; 2016 = 41.5%
- **Children 2-19**
  - **Obesity: Was 19.7% but increased to 22% during the pandemic**
  - **Overweight: 44.6%**
    - Severe obesity in teens = 7.6%
    - 57% predicted to be obese by age 35
- Emerging adults (18-25)
  - Obesity: 32.7% in 2018 (was 6.2% in 1980)



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### Causes of Obesity

- First law of thermodynamics: imbalance between calories in/calories out.
  - Plus appetite regulation, eating behavior, and physical activity patterns
- **Biological**
  - Increase in the number of fat cells or increase in the size of the fat cells
  - Harder to treat obesity caused by increased number of fat cells because fat cells can be reduced in size but not in number
  - With obesity, cells in adipose (fatty) tissues start to malfunction and **produce inflammatory** chemicals that cause illnesses

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### Causes of Obesity

- **Genetic/chromosomal**
  - Prader-Willi, Down Syndrome, Turner syndrome, MC4R mutation
  - Genes regulate how the body uses, stores, and releases energy from food
    - Adoption studies: BMI more strongly correlated with biological parent
- **Hormonal:** Hypothyroidism, Cushing syndrome, polycystic ovary syndrome (PCOS)
- **Medications:** Cortisone/corticosteroids, oral contraceptives, tricyclic antidepressants, Risperidone, Clozapine
- **Environmental:** food insecurity and only a high school education
- **Psychological/ sociocultural**
  - **Children as young as 4 eat 79% more calories when bored compared to when they are in a neutral mood**

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### Normal Hormone Regulation of Hunger and Satiety

- **Leptin** - regulates appetite by signaling hypothalamus that the body is full or satiated
  - Made by fat cells - so more fat cells, more leptin
- **Ghrelin** - signals hunger
  - Leptin and Ghrelin work opposite each other; leptin inhibits ghrelin
  - Ghrelin is made in the stomach
- **Insulin** - regulates satiety by allowing cells to use glucose for energy or stored as glycogen or fat; **insulin is proinflammatory**
  - Can interfere with signals sent by leptin
  - Can result in insulin resistance
- Increased intake results in increased insulin and interferes with signals for satiety; glucose is converted to fat and body stops responding to the insulin (insulin resistance) resulting in weight gain

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### Disruptions to physiologic appetite regulation that can cause weight gain

- Sleep disturbances
- Increased stress levels
- Diabetes
- Insulin resistance
- Polycystic ovary syndrome
- Menses and changing hormonal levels
- Gut microbiota (especially between ages 3.5 and 5)
- Altered neurotransmitters (especially dopamine and serotonin)
- Emotional: "Food gives me hugs" - (bypasses hunger/ satisfaction signals)

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### More questions and issues

- Do we eat because we are hungry or because it is time?
  - Are we aware of what satiety feels like?
- Do we eat what is the easiest to grab and go or take the time to make something healthy?
- How do the child's role models/ peers eat?
- Are meals eaten primarily in or out of the home?
  - Outside the home are usually larger portions and more calories
  - Do we eat the AMOUNT served or limit that amount
- Is food used as a reward in school/ home for good behavior and achievement? Is food used for comfort? Do we eat the meal in order to get dessert?
  - Makes foods and sweets desirable and associated with "positives"
- Do we primarily celebrate with food? (birthdays, holidays, achievements)
- Do you eat to live or live to eat?
  - Food should just be nourishment
- Do you have to clean your plate?

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### Changes in U.S. Dietary Patterns

- Portion sizes have increased
- 27% of calories by children/teens is through snacks
- Sugarsweetened soda and fruit juices = 18.7% of total consumption
  - Decreased milk and calcium intake
- Only 60% have one fruit and one vegetable each day
- The average American consumes 640 calories of added fats per day
- 15% of kids do not eat breakfast

NOTE: Females need 17% body fat to start menses and 22% to maintain it

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### Consequences of Obesity

- Obesity is both a disease and a risk factor for other chronic conditions
- 70% of children who are obese have at least one risk factor for cardiovascular disease (dyslipidemia, hypertension, insulin resistance)
  - **Hypertension**
    - Affects 2%-12% of children and adolescents
      - Caused by obesity, stress, sedentary behaviors
      - Be sure to use a larger cuff
      - Prehypertension is BP>90<sup>th</sup> to <95<sup>th</sup> percentile for age, sex, and height
      - Hypertension is >95<sup>th</sup> percentile
  - **Hyperlipidemia, hypercholesterolemia, HEART DISEASE**
    - Results in atherosclerosis and left ventricular hypertrophy
    - Results in fatty liver disease
  - **Second leading cause of preventable death** - after smoking
    - Obese children are more than twice as likely to die before the age of 55 compared with healthy-weight children



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### Pre-diabetes

- Nearly 1:5 adolescents are pre-diabetic
  - Fasting glucose  $\geq 100$ mg/dL or random glucose  $\geq 150$ mg/dL
  - OR hemoglobin A1c  $\geq 5.9\%$
- Risk of T2DM increases substantially with A1c > 6%
- Worsening of obesity is strongly associated with T2DM progression

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### Consequences of Obesity

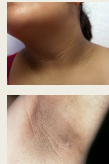
- **Diabetes mellitus, Type 2**
  - Rarely seen in youth before 1990
    - o Used to be 5% of children with diabetes had type 2; now it is 32%
  - 67/100,000 youth
  - At least half are obese
    - o Especially prevalent in Native Americans
  - Impacts glucose metabolism, resulting in hyperinsulinemia, insulin resistance, impaired glucose tolerance
  - Fasting blood glucose of  $\geq 126$  mg/dL or random plasma glucose of  $\geq 200$  mg/dL in a patient with symptoms

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### Consequences of Obesity

- **Diabetes mellitus, Type 2**

- **Acanthosis nigricans** seen in 90% of patients and strongly associated with obesity and hyperinsulinemia
  - o Patch of skin (neck, armpit, groin) that thickens, darkens and feels velvety; may itch or smell
  - o Does not necessarily predict the disease
- Associated with thickening of carotid artery



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### Consequences of Obesity

- **Exacerbation of asthma and other respiratory problems**

- Overweight children are 17% more likely to have an asthma diagnosis and obese children are 26% more likely
- 23%-27% of new asthma cases in children with obesity may be directly related to obesity
- The frequency and degree of bronchospasm in children with asthma are significantly greater in those who are obese, possibly due to the pro-inflammatory state of obesity.
- Larger body mass increases oxygen consumption

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### Consequences of Obesity


- **Sleep disorders**
  - Poor sleep quality: children who are overweight sleep less, have more disrupted sleep time
  - Sleep apnea occurs in 60% of children who are obese due to airway obstruction
- **Musculoskeletal disorders**
  - Increased risk of musculoskeletal injury
    - o More weight is on immature skeletons
    - o Slipped Capital Femoral Epiphysis, Blount's disease (tibia vara), and fractures
    - o Joint pain makes it harder to engage in activity

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### Consequences of obesity

- **Skin breakdown and altered ability to perform self hygiene**
  - Bathroom stalls are too small to close door or spread legs to wipe
  - Unable to reach rectum to wipe
  - Skin breakdown in intertriginous areas: between fat rolls, breasts, thighs; burning discomfort



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### Consequences of obesity

- **Early sexual maturation in females in females who are overweight (especially between ages 2 and 6)**
  - Fat cells have the ability to manufacture estrogen, initiating puberty
  - Ingestion of growth hormones, pesticides, PCBs that mimic estrogen
- **Psychosocial/Mental Health Issues**
  - Depression, anxiety, eating disorders
  - Social isolation, bullying, low self esteem
  - Can result in school avoidance and increased emotional eating
  - Desks and chairs may be too small to accommodate their bodies; uniforms may be inappropriate and unflattering

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### 13 Obesity-Related Cancers in Adults

■ Pancreatic	■ Ovarian
■ Adenocarcinoma of the esophagus	■ Kidney
■ Gall bladder	■ Gastric cardia (near sphincter)
■ Colorectal	■ Liver
■ Breast cancer in post menopausal women	■ Thyroid
■ Uterine	■ Meningioma (benign)
	■ Multiple myeloma

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### The stigma of obesity


- Long stigmatized as a reversible consequence of personal choices (seen as lazy, lacking will power and self control, dull, and slovenly)
- Results in weight stigma, victimization, shaming, teasing and bullying which contribute to binge eating, social isolation, avoidance of healthcare services, and decreased physical activity.
  - Results in decreased mental health, embarrassment, shame, sadness
- Avoid label by using 'person-first' language
  - Youth prefer term: healthy weight
  - Dislike: obese, fat, large

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### Obesity: Interventions

- Obesity is a disability; what accommodations do they need?
- We treat the consequences of obesity...rather than managing the underlying condition
- Part of the blame is insurance companies; part of the blame is on healthcare providers



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### Interventions

- Start with a conversation: Do they want to lose weight?
  - Ask what they eat (bored, angry, lonely, hungry, social), their weekly activity, the barriers they face, their wishes, do they blame anyone, do they believe it will affect their health, are they embarrassed to ask for help?
- Is the goal weight loss or improved health?
  - Make the goal realistic in time and amount
  - What would motivate you?

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### Obesity: Interventions

- How much do I need/want to lose?
  - Normalizing body weight is NOT required
  - Think percent of weight rather than pounds???
- With 5% weight loss (10 pounds for someone 200 pounds)
  - Visceral fat is reduced by 9%
  - Insulin sensitivity in the liver and adipose tissue is greatly improved
  - Blood pressure improvement can be seen

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Goal for young children is not to lose weight; just not to gain weight

- Approach it as a disease.
- There is no failure – just an oops
  - *If you fall down, get up; don't stay on the ground*
- Don't start tomorrow, Monday, next month; **start now**

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When to start

- US Preventive Services Task Force recommends age 6 to teach about diet and exercise (but no research)
- Another study indicated that teaching about healthy eating and activity can safely start between ages 4 and 6

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**Clinical Practice Guidelines for the Evaluation and Treatment of Children and Adolescents with Obesity**  
American Academy of Pediatrics, January 9, 2023

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**Pediatric Guidelines on Obesity (AAP)**

- Look at the whole picture
- See children with obesity regularly
- Comprehensive intensive health behavior lifestyle treatment
  - Face to face, family-based, multidisciplinary counseling on
    - Nutrition (what we eat)
    - Physical activity (what we do)
    - Behavioral therapy (what we think)
      - 26 hours over at least 3-12 months
    - Medication
    - Bariatric surgery



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- Lifestyle interventions are the foundation of management

BUT

- They have limited effectiveness and durability
- They result in the least weight loss but they are the safest

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### Food/ Nutrition

- Have children and youth select the meals or look at menus, and help shop for and prepare the meal
- Put fork down between bites
- Have low calorie, colorful foods available easy to grab (washed and in front of the refrigerator or in small bags) (fruit, vegetables cut up, yogurt, trail mix)
- Serve EVERYONE correct portion size; use smaller plates
- Dessert does not have to be part of a meal; perhaps for special occasions
- No specific diet recommended for children

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### Prevention via School Nurses

- Promote a healthful diet, activity and environment
- Messages about nutrition and activity should be on bulletin boards, school websites, columns in school or community paper, health information sent home to parents
- Science projects on the amount of sugar in sodas.
- Be a role model, even if you are overweight; you know how hard it is
- Praise families who are initiating preventive and healthy measures

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### Prevention for families

- Avoid skipping breakfast
  - *Time-restricted eating is not for children (8-10 hours of eating; 5% weight loss)*
- Don't force completion of meal; limit between-meal snacks
- Do not focus on foods and how one looks; talk health
- Have water or milk with meals; no juices or sugared beverages

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### Activity recommendations for children (Do NOT call it exercise)

- For ages 3-5: they should be active throughout the day
  - Children 6-17 should engage in 60 minutes of moderate to vigorous aerobic physical activity every day (CDC) [a 7-8 out of 10 for 1-10 activity intensity]
    - **Aerobic activity** to increase heart rate (*brisk walking at least 3/week*)
    - **Muscle strengthening** (*climbing monkey bars, push ups, gymnastics*) 3/week
    - **Bone strength** (*running, jumping, jump rope*) 3/week
      - 33%-43% of total bone mass is acquired in adolescent years; therefore bone health is important
      - Peak bone mass is age 30; therefore the more you have then, the later the development of osteoporosis
- (Only 35% of male teens and 17% of female teens met this criteria)

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### Activity

- Exercise is key component of lifestyle change for kids
- Issue: Decreased physical education and recess in schools
  - 17 states require physical education in elementary schools; 4 states mandate recess
  - Excuse is to improve performance on standardized tests
    - increased or maintained their grades and scores on standardized tests, increased their attention in the classroom and decreased off-task behaviors (fidgeting)
    - Exercise confers many benefits (improves insulin sensitivity, reduces blood pressure, redistributes fat)
    - Improves mood and well being??
- Do NOT assume that exercise makes you feel "better" afterwards; some feel miserable and have no endorphin release

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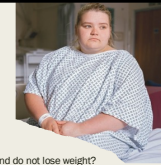
### Activity

- Studies show 'screen time' interferes with activity
  - 2/3 of children have a TV or tablet in their bedroom
  - AAP recommends 1 hour/day for those 2-5, no screen time in the bedroom or during family meals
- Good sleep habits are tied to healthier weight
- Issue: Is the community safe for activity?
  - Children are kept indoors due to crime and abductions
- Avoid body image issues
- Avoid associating activity/exercise with weight or weight loss
- Do not say the exercise "is not long enough" or "not hard enough"
- Talk about the benefits of exercise: better sleep, better concentration, being stronger, being healthier
- Remember that Exercise Is Medicine

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### Exercise/Activity

- Understand that one mile of walking uses 100 calories, which equals 2 oreo cookies
- Parental support and modeling is essential
- What if you severely limit food and exercise vigorously and do not lose weight?
  - Starvation response
- For adults, British study showed 8 minutes/d of vigorous activity improves health
  - Vigorous is increasing metabolic rate 6x the resting rate



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## Programs

- Traffic light diet:
  - *red light* (high calorie foods that should be eaten rarely)
  - *yellow light* (moderate calorie foods that can be eaten occasionally)
  - *green light* (low calorie that can be eaten freely)
- 5-2-1-0
  - 5 fruits and vegetables a day
  - 2 hours or less of screen time
  - 1 hour or more of vigorous activity
  - 0 or nearly 0 sugar-sweetened beverages
- Recommendations at [myplate.gov](http://myplate.gov)

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## Bottom line...

- Multicomponent behavior-changing interventions may be beneficial in achieving small, short-term reduction in BMI but the quality of evidence is low.
- Behavior modification often fails
- AAP does not support "watchful waiting" to see if children outgrow obesity; aggressive treatment is recommended
- Ages 2-6 is the ideal time to make the most profound and effective changes in lifestyle
- Treat obesity as a chronic condition
- If you fall down.....get up. Don't stay there
  - Acknowledge slips



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## American Gastroenterological Association

- In those obese or overweight with weight-related complications who have an inadequate response to lifestyle interventions – add pharmacologic agents
- Meds result in better risk-to-benefit ratio
  - Do not use in pregnancy or with bulimia
  - Caution in those with T2DM who take insulin or sulfonylureas
    - Can result in hypoglycemia
  - Caution in those taking medications to lower blood pressure
    - Can result in increased risk of pancreatitis and gallbladder disease

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## Consider Medications

- Medications approved as ADJUNCTS to a reduced calorie diet and increased exercise for chronic weight management
  - NOT recommended for those under age 12 (although some say OK for 8-11)
  - Different doses and different names than used for Type 2 diabetes
- Agents approved for management (**Incretin hormones**)
  - **Glucagon-like peptide agonists (GLP-1)** – for type 2 diabetes
    - GLP-1 receptors are concentrated in the pancreas, G.I. system, CNS, heart, lungs, kidneys, blood vessels, and peripheral nervous system
    - o Results in increased insulin secretion and a **delay in gastric emptying, decreased appetite and prolongs satiety**
- Not covered by insurance if no diabetes
  - Considered "vanity drugs" for obesity (although not when used for T2DM)

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### Medications

- **Semaglutide (Ozempic/Wegovy)** – approved 2015/2021
  - Initial dose 0.25 mg weekly sq; increase in 4 weeks intervals to 2.4 mg
  - \$1500/month
  - Gastroesophageal reflux, nausea, vomiting, diarrhea, constipation, abdominal pain, headache, fatigue
  - Efficacy – 17% at one year, depending on dose
  - Rybelsus (for T2DM) – oral tablet/\$31
- Tirzepatide (Mounjaro/Zepbound)
  - Semaglutide + glucose-dependent insulinotropic peptide analogue
  - 10-15 mg/week sq
  - → 22% weight loss
- **Liraglutide (Victoza/ Saxenda)**– approved 2015 and 2020 for teens
  - Initial dose 0.6mg PER DAY sq for 1 week and increase weekly to 3 mg/d
  - Efficacy – 7.8% at one year

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### Less Commonly Used/ Less Effective Medications

- Phentermine/topiramate (8%-10% loss)(Qsymia/Vivus)
  - 12 and up; only for short term use
  - Lots of possible side effects, including suicidal thoughts
  - Cleft lip and palate risk in fetus
  - Suppresses appetite by increasing norepinephrine production
- Naltrexone/bupropion (5% loss) [Contrave]
  - No longer recommended
    - o Orlistat [Alli/Xenical]
    - o Blocks fat absorption by inhibiting pancreatic and gastric lipase
    - o Fen-Phen (resulted in heart valve lesions)

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### Bariatric Surgery

- ONLY for those (10-18 ) who have a BMI of 35/ Class II Obesity (120% of the 95<sup>th</sup> percentile) and a co-morbidity, or >40
  - Roux-en-Y gastric bypass
  - Vertical (sleeve) gastrectomy
  - Laparoscopic adjustable gastric banding (not approved for <18)
- Many insurance companies will not pay for <18
- Impressive 3-year outcomes for those <19
  - Bypass: 29%
  - Sleeve: 27%
- Greatest loss – but greatest risk

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### Issues

- How should BMI results be communicated to families?
- How do you approach interventions when the rest of the extended family are also overweight?
- How to deal with weight stigma by peers, teachers, health professionals
- Consider culture: if food is love, what does with-holding it mean? If my child does not look well-fed, will that make me look like a bad mother?
- Is taking medication for weight loss a form of 'self-harm'?
- What messages do healthcare providers give or do that are not helpful

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### Other Interventions

- **For ages 6-11:** No one intervention is best. WHO guidelines promote multi-component behavior changing interventions
  - *Include the family (or should the parents be the target)?*
- **For teens:**
  - *Use multidisciplinary team (pediatrician, registered dietitian, exercise physiologist, and/or psychologist)*
  - *Address quality and quantity of food*
    - Consuming less ultra-processed foods, sugar-sweetened beverages, and other added sugar (read labels for sugar)
    - Eat regular meals; decrease portions, eat more fruits, vegetables and fiber
  - *Limit amount of non-academic screen time*
  - *Try different approaches – everyone learns differently and at a different rate*
    - (food logs, pedometers, pre-packaged meals)

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### Other Interventions

- Communicate in a respectful, empathetic, and compassionate manner using appropriate terms
- Cheer them on
- Help them find clothing that is flattering and makes them feel good
- Talk about toileting hygiene and skin care issues specific to those who are obese

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### Other Interventions

- What accommodations do they need?
- What is hardest for you (PE, bathroom, shaming, etc.)
- Use person-first language
- Support groups – not for everyone
- **Find their strengths – what makes them normal or above normal?**

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### Prevention


- Make it harder to advertise unhealthy foods and drinks
- Fully fund physical education in the schools
- Fund "Safe Routes to Schools" and other programs to walk and bike to school

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In Conclusion...

- Obesity is not a choice; it is not a lack of will power
- It is a chronic condition; treatment should be implemented on a long-term basis (short term treatments may be associated with relapses)
- There is no quick fix
- Advocate for yourself
- Just keep trying; it is not all or none - be realistic

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