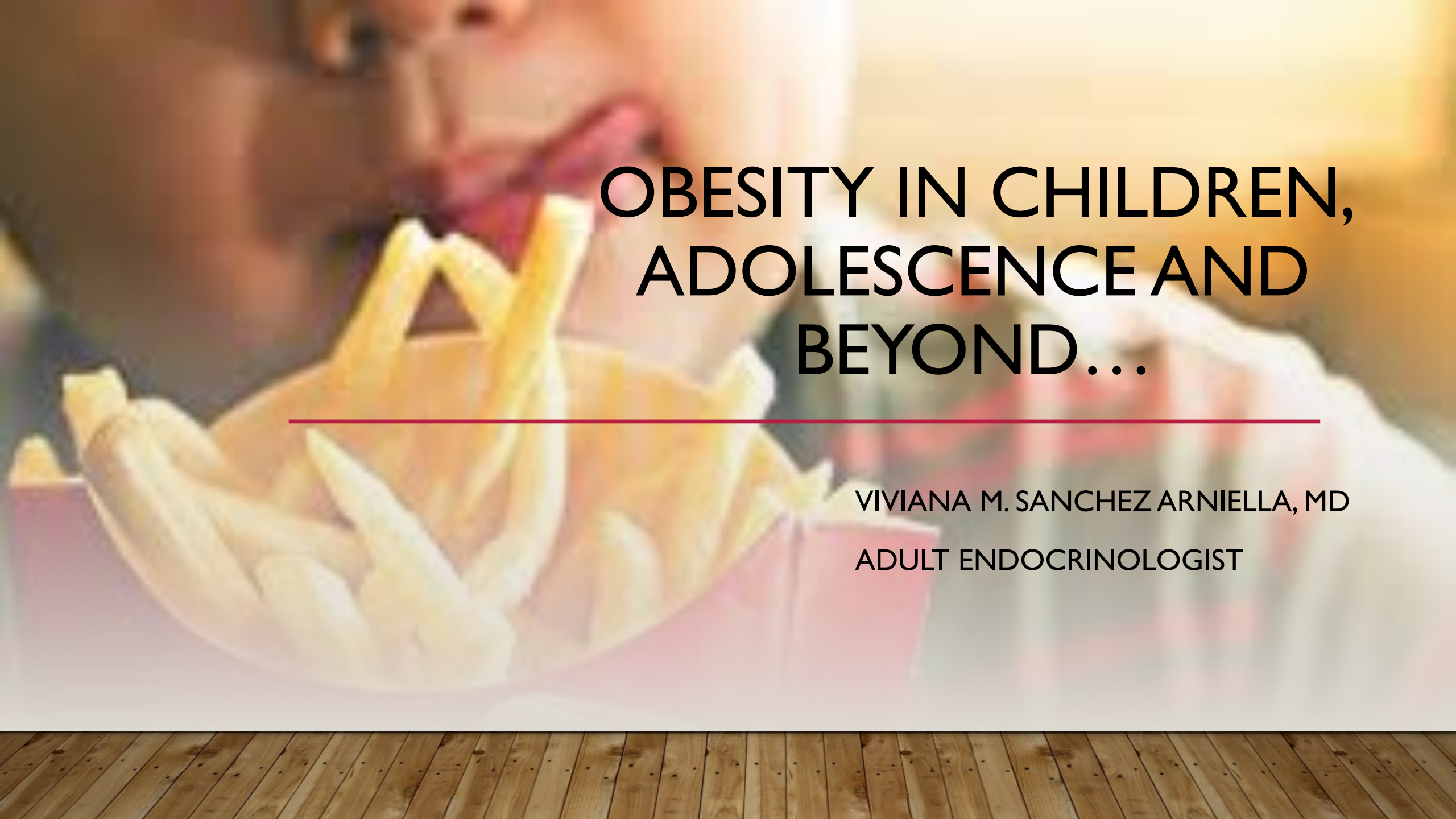


OBESITY IN CHILDREN, ADOLESCENCE AND BEYOND…

VIVIANA M. SANCHEZ ARNIELLA, MD

ADULT ENDOCRINOLOGIST

DISCLOSURE

- I have no actual or potential conflict of interest on relation to this presentation

OBJECTIVES

Discuss the prevalence of obesity in the youth and adults throughout the years.

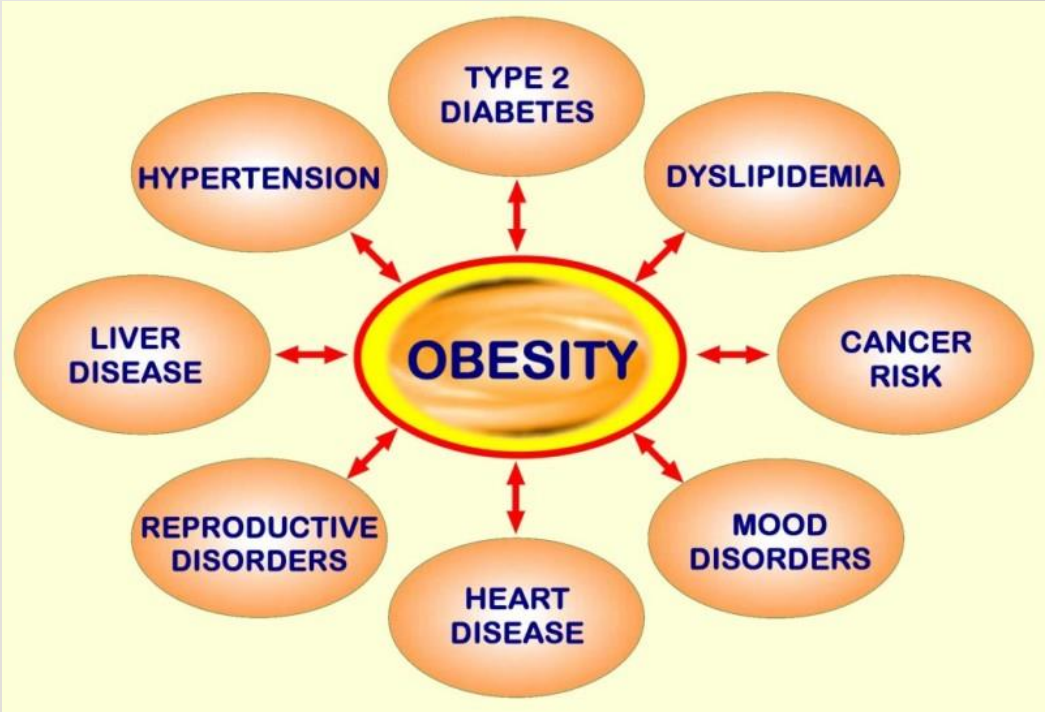
Identify preventive measures to decrease obesity in children, adolescents and adults.

Risk factors, appropriate screening and diagnosis of obesity.

Recognize comorbidities associated with obesity and appropriate management strategies.

INTRODUCTION

- Obesity has become one of the most important public health problems in the United States and other countries.
- As the prevalence of obesity increases, so does the prevalence of the comorbidities associated with obesity.
- It is imperative that health care providers identify overweight and obese children so that counseling and treatment can be provided.



DEFINITION

Weight categories for adults and youth

Category	Adults (18 years and older)[1]	Youth (2 to 18 yrs) CDC, AAP, IOM, ES, IOTF[2,3]
Underweight	BMI <18.5	BMI <5th percentile for age
Normal weight	BMI 18.5-24.9	BMI ≥5th to <85th percentile
Overweight	BMI 25-29.9	BMI ≥85th to <95th percentile
Obesity	BMI ≥30	BMI ≥95th percentile
Severe obesity	BMI ≥35 (class II obesity)	BMI ≥120 percent of the 95th percentile, or a BMI ≥35 (whichever is lower)*[4,5]
	BMI ≥40 (class III obesity)	BMI ≥140 percent of the 95th percentile, or a BMI ≥40 (whichever is lower)[5]

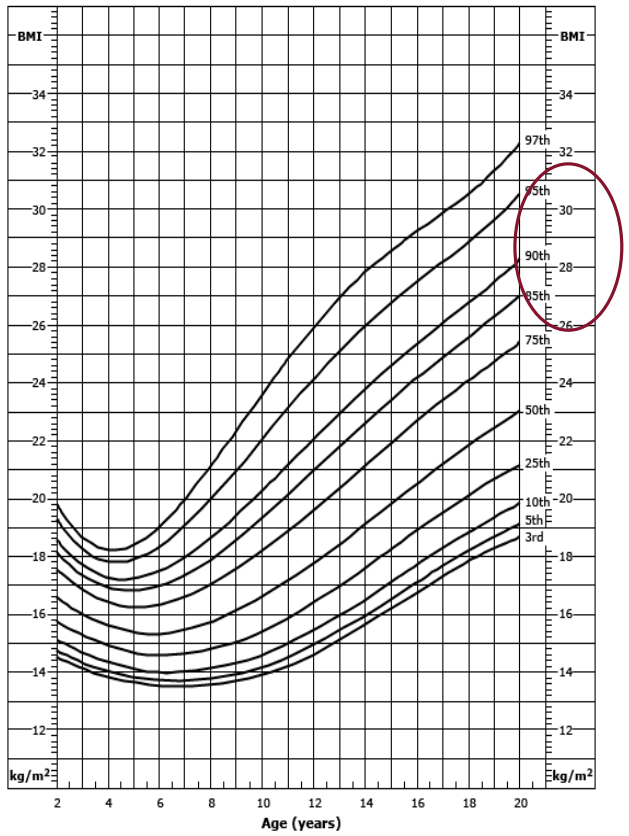
AAP: American Academy of Pediatrics; IOM: Institute of Medicine; ES: Endocrine society; CDC: Centers for Disease Control; IOTF: International obesity task force; BMI: body mass index.

* In children, several definitions of severe obesity have been used. The most widely accepted is BMI ≥120 percent of the 95th percentile, **or** a BMI ≥35 (whichever is lower).[3] This corresponds to approximately the 99th percentile, or BMI Z-score ≥2.33 (ie, 2.33 standard deviations above the mean).

- The body mass index [BMI= weight(kg)/height(m)^2] is the accepted standard measure of overweight and obesity for children two years of age and older.
- BMI categories in adults:
  - 25-30 kg/m^2 = overweight
  - ≥30 kg/m^2 = obese
  - Obesity
    - class I (BMI ≥30 to 35)
    - class II (BMI ≥35 to 40)
    - class III (BMI ≥40).

- In 2000, the National Center for Health Care Statistics (NCHS) and the Centers for Disease Control and Prevention (CDC) published BMI reference standards for children ages of 2- 20 years .
- As children approach adulthood, the 85th and 95th percentiles for BMI are approximately 25 and 30 kg/m2, the thresholds for overweight and obesity in adults.

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



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

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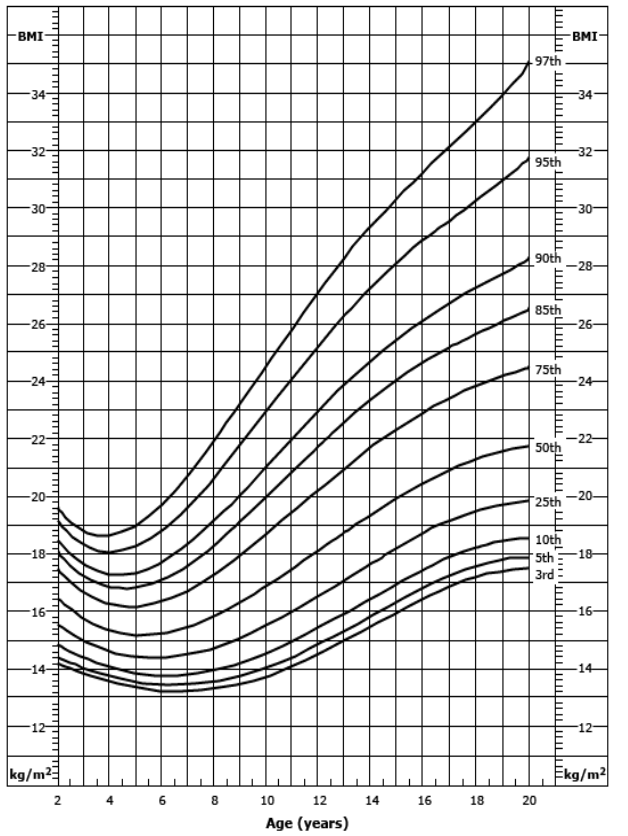
Body mass index-for-age percentiles, girls, 2 to 20 years, CDC growth charts: United States



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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PREVALENCE

- Approximately 33% of children and adolescents in the United States are either overweight or obese.
- Childhood obesity is more common among **American Indian, black, and Mexican Americans** than in non-Hispanic whites.
- Having one obese parent increases the risk of obesity by two- to threefold, and up to 15-fold if both parents are obese.
- Obesity is also more prevalent among **low-income, less educated, or rural populations**.

WERE THERE DIFFERENCES IN THE PREVALENCE OF OBESITY AMONG YOUTH AGED 2–19 YEARS BY RACE AND HISPANIC ORIGIN IN 2015–2016?

Figure 3. Prevalence of obesity among youth aged 2–19 years, by sex and age: United States, 2015–2016

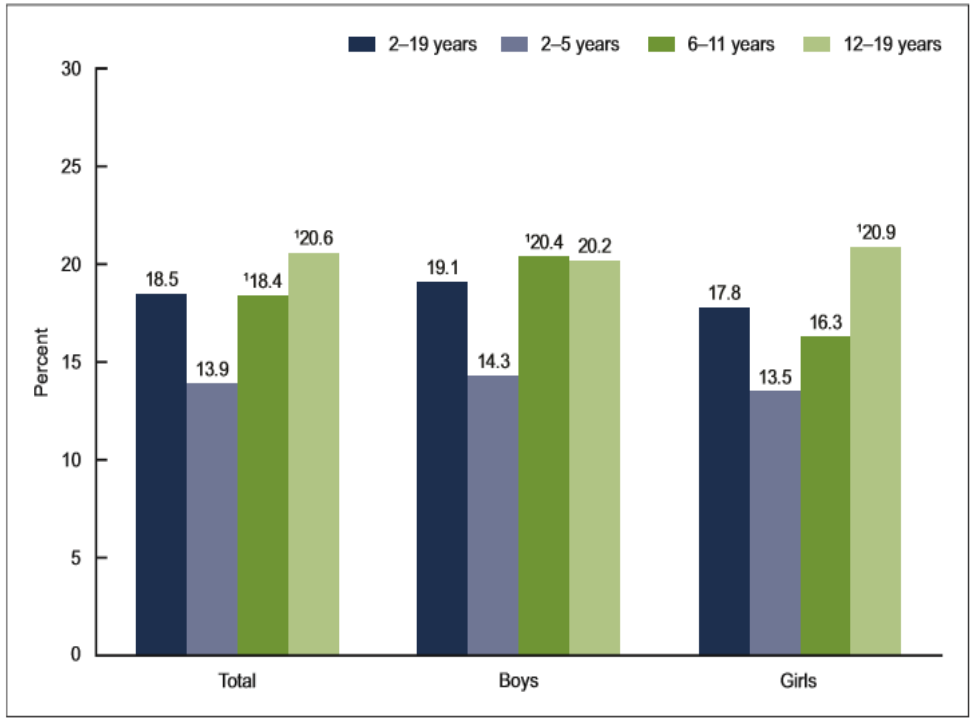
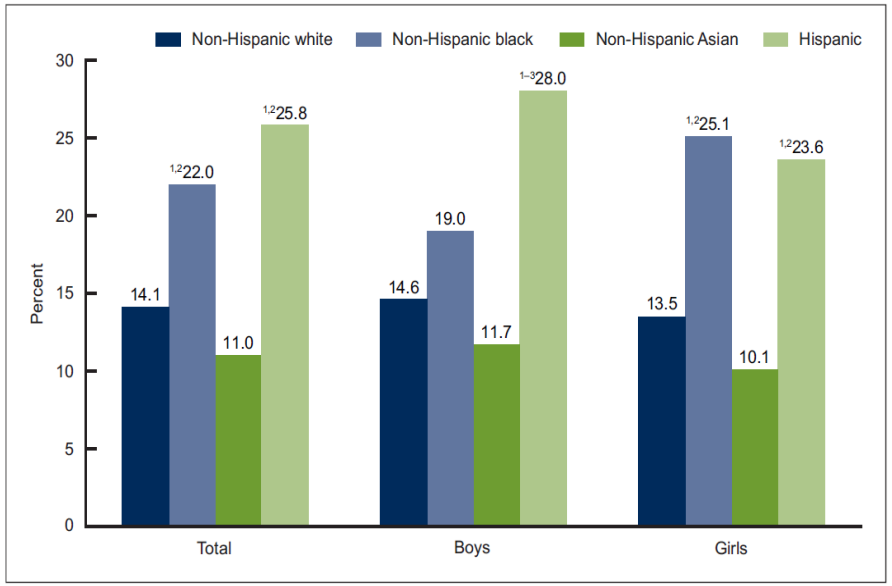
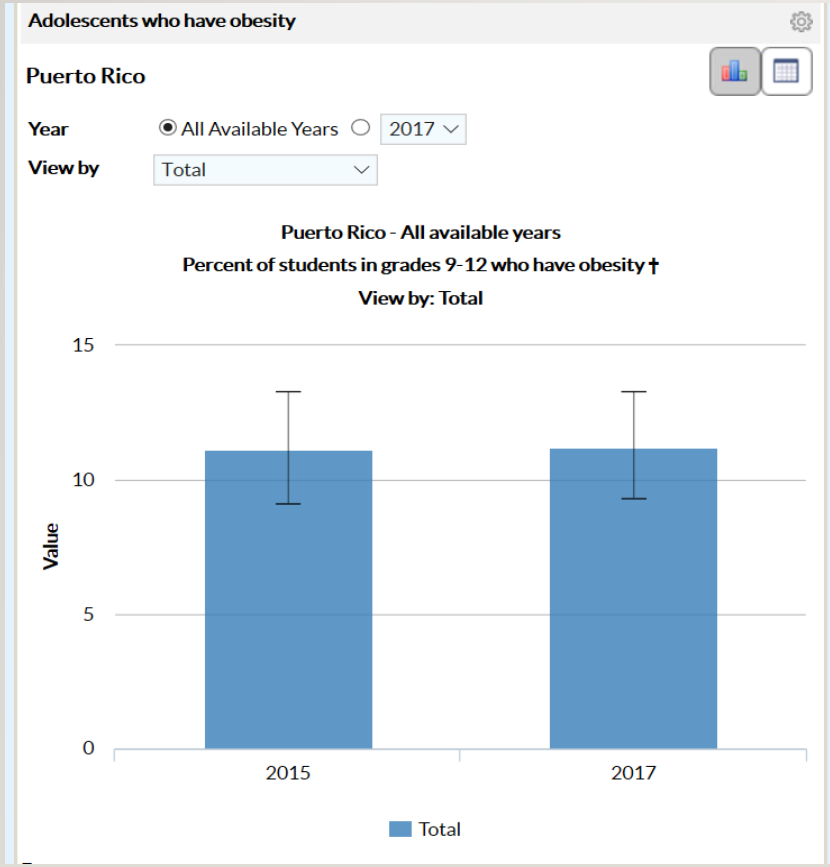


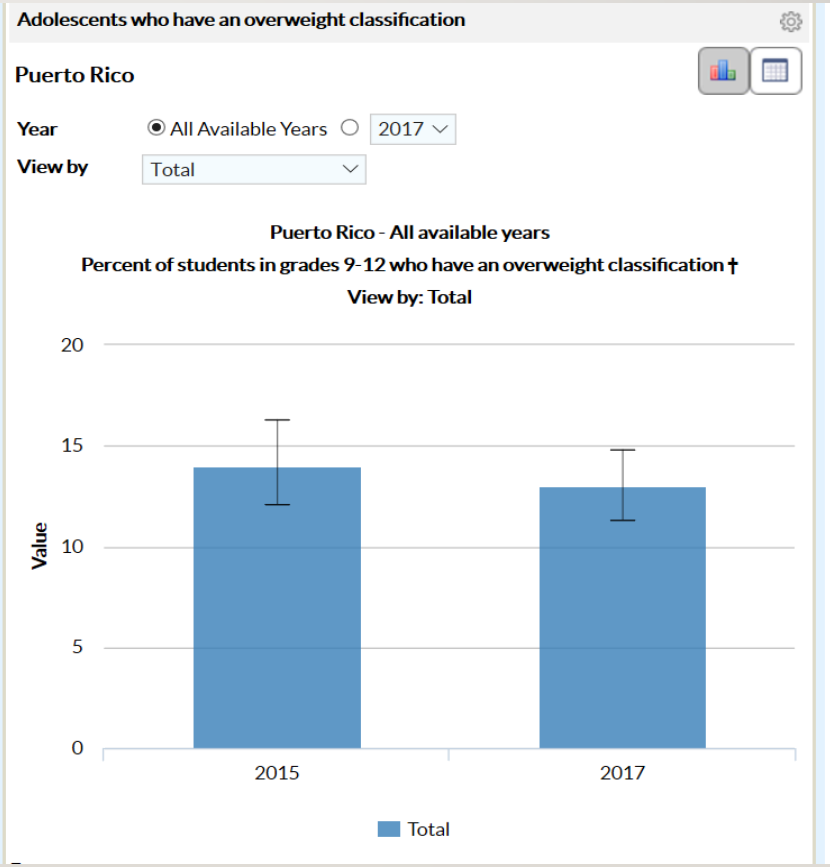
Figure 4. Prevalence of obesity among youth aged 2–19 years, by sex and race and Hispanic origin: United States, 2015–2016



[1]Significantly different from non-Hispanic Asian persons.
[2]Significantly different from non-Hispanic white persons.
[3]Significantly different from non-Hispanic black persons.
NOTE: Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#4.
SOURCE: NCHS, National Health and Nutrition Examination Survey, 2015–2016.

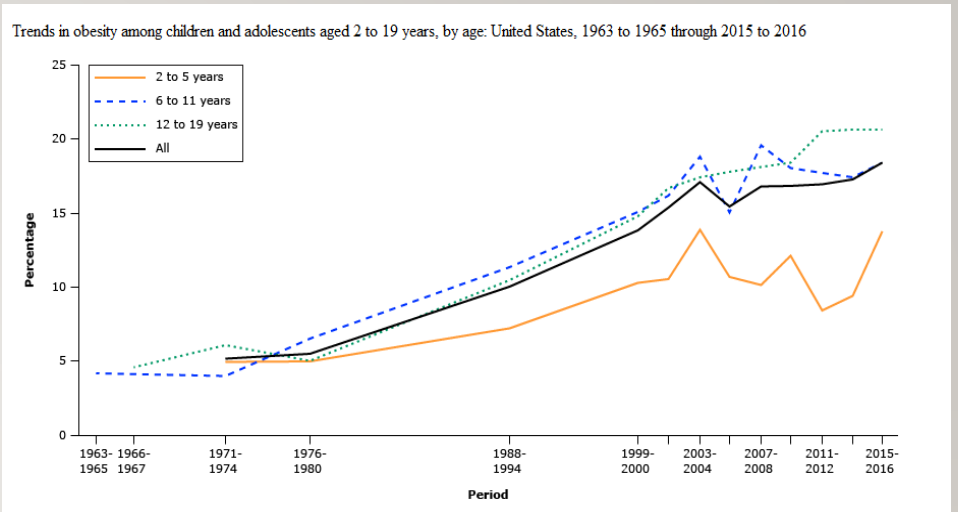
PREVALENCE IN PUERTO RICO ADOLESCENTS

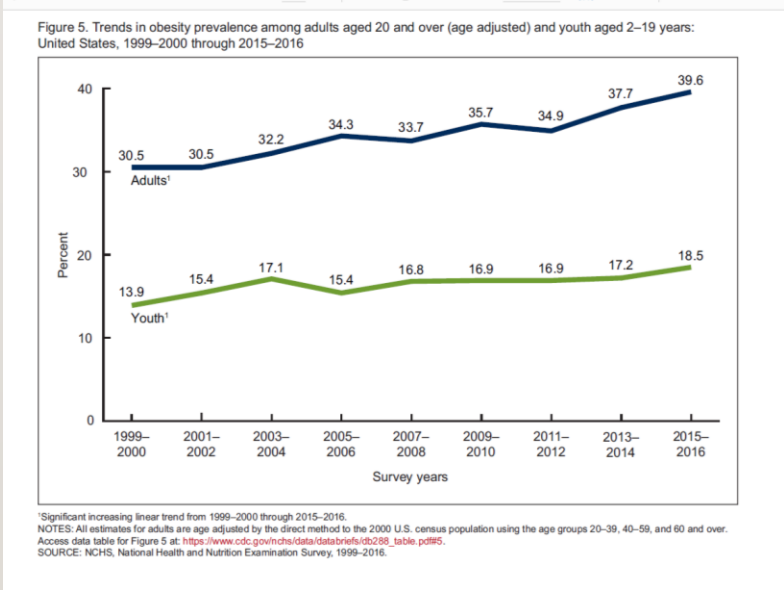




TRENDS

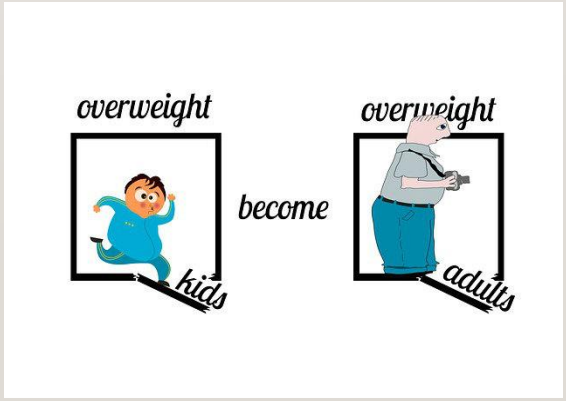
- Obesity among children 6-11 years and adolescents 12-19 years increased dramatically between 1976-1980 and 2013-2014 (6.5 to 19.6 % children, and 5.0 to 20.6% in adolescents).
- From 1999–2000 through 2015–2016, a significantly increasing trend in obesity was observed in both adults and youth.
- The observed change in prevalence between 2013–2014 and 2015–2016, was not significant among both adults and youth.

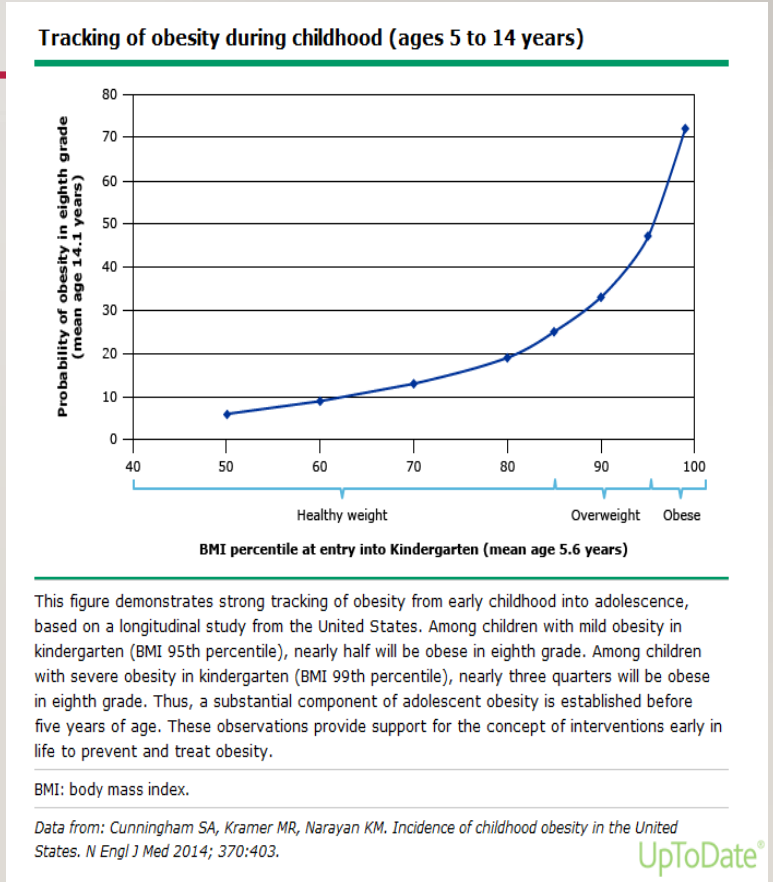




PERSISTANCE TO ADULTHOOD

- The likelihood of persistence of childhood obesity into adulthood ("tracking") is related to
  - age
  - parental obesity
  - severity of obesity
  - BMI trajectory during childhood





ETIOLOGY OF CHILDHOOD AND ADOLESCENCE OBESITY

- Environmental factors
  - Sugar-sweetened beverages
  - Television
  - Video games
  - Exergames
  - Sleep
  - Medications
    - Psychoactive drugs, antiepileptics and glucocorticoids

ETIOLOGY OF CHILDHOOD AND ADOLESCENCE OBESITY

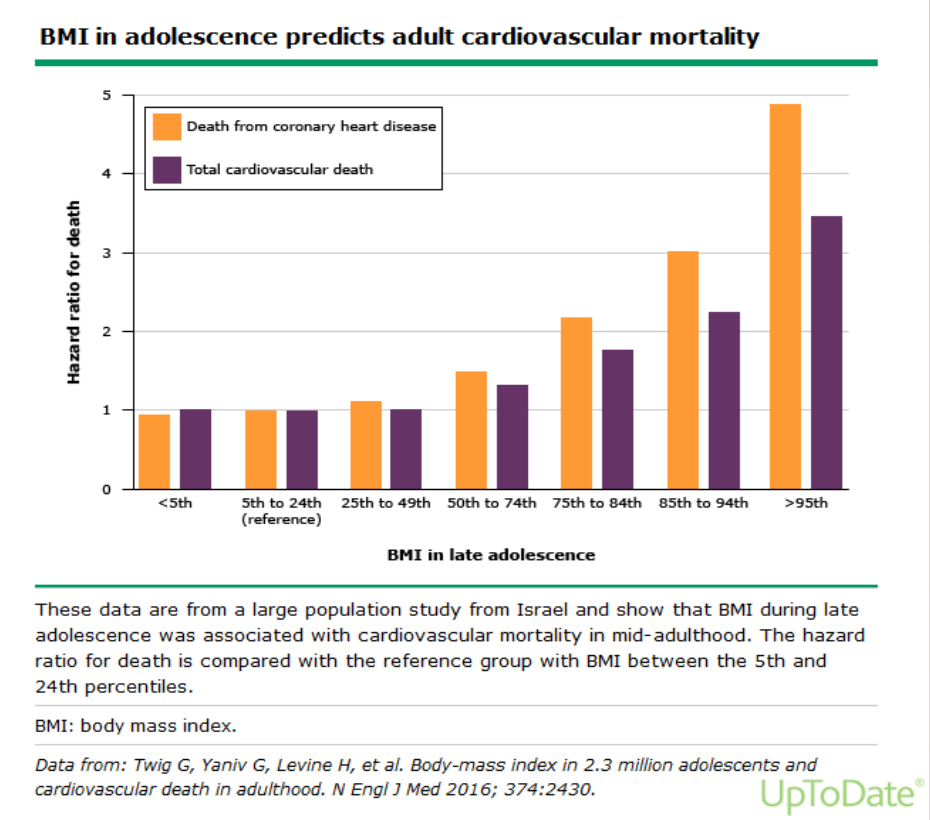
- Genetic factors (Prader-Willi and Bardet-Biedl syndromes)
- Endocrine disorders
  - Hypothyroidism
  - Hypercortisolism (Cushing's)
  - Growth hormone deficiency
  - Pseudohypoparathyroidism type 1a (Albright hereditary osteodystrophy)
- Hypothalamic obesity
- Metabolic programming
  - Gestation
  - Infancy and early childhood

COMORBIDITIES AND COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

- ENDOCRINE
  - Prediabetes
  - Diabetes Mellitus
  - Metabolic Syndrome
  - Hyperandrogenism = seen in girls, early onset polycystic ovary syndrome (PCOS)
  - Growth and puberty = accelerated linear growth and bone age ; early onset of puberty

COMORBIDITIES AND COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

- CARDIOVASCULAR
  - Hypertension
  - Dyslipidemia
  - Cardiac structure and function
  - Cardiovascular risks
  - Adult coronary heart disease



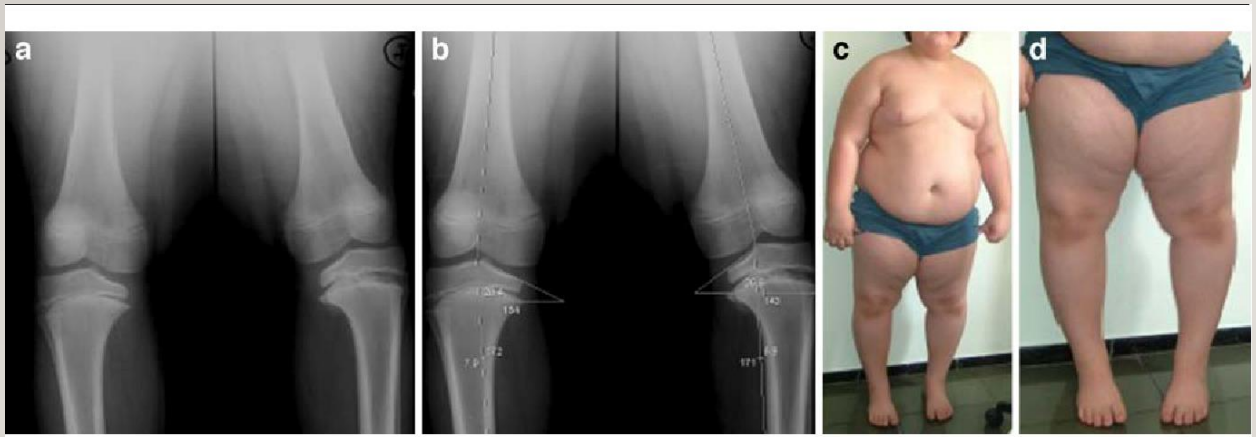
COMORBIDITIES AND COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

- GASTROINTESTINAL
  - Nonalcoholic fatty liver disease
  - Cholelithiasis
    - Hispanic ethnicity is an independent risk factor for non-hemolytic gallstone disease.

- PULMONARY
  - Obstructive sleep apnea
  - Obesity hypoventilation syndrome

COMORBIDITIES AND COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

- ORTHOPEDIC
  - Slipped capital femoral epiphysis
  - Tibia vara (Blount disease)
  - Fractures



- NEUROLOGIC
  - Idiopathic intracranial hypertension (pseudotumor cerebri)
    - Headache
    - Nausea, vomiting
    - retroocular eye pain
    - visual loss, diplopia
    - papilledema

COMORBIDITIES AND COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

- DERMATOLOGIC
  - intertrigo
  - furunculosis
  - hidradenitis suppurativa
  - acanthosis nigricans
  - stretch marks
- PSYCHOSOCIAL
  - alienation
  - distorted peer relationships
  - poor self-esteem
  - distorted body image
  - anxiety and depression
  - decreased health-related quality of life

Volume 102, Issue 3
1 March 2017

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

Dennis M. Styne, Silva A. Arslanian, Ellen L. Connor, Ismaa Sadaf Farooqi, M. Hassan Murad, Janet H. Silverstein, Jack A. Yanovski

The Journal of Clinical Endocrinology & Metabolism, Volume 102, Issue 3, 1 March 2017, Pages 709–757, https://doi.org/10.1210/jc.2016-2573
Published: 31 January 2017 **Article history**

Recommendations for treatment of childhood obesity

Stage	Staff and skills	Nutrition goals	Activity goals	Behavior intervention
1: Prevention plus	Primary care provider	▪ Encourage consumption of 5 or more servings of vegetables or fruit daily ▪ Minimize sugared beverages ▪ Eat breakfast every day ▪ Eat most meals at home and as a family	▪ Less than 2 hours of television or other screen time per day ▪ More than 1 hour of physical activity daily	▪ Reinforce goals at each health care visit, additional visits as tolerated ▪ Allow child to self-regulate, avoid overly strict eating regimens
2: Structured weight management	Primary care physician or provider with additional training in nutrition or behavioral counseling (eg, dietitian)	Stage 1 plus: ▪ Daily eating plan, with scheduled meals and snacks ▪ Emphasize foods with low energy density ▪ Reduce frequency and quantity of foods with high energy density (eg, fried foods, baked goods, fats) ▪ Limit portion size ▪ Set explicit behavior goals	Stage 1 plus: ▪ Less than 1 hour of television or other screen time daily ▪ More than 1 hour of physical activity daily, supervised and structured	▪ Monthly patient-provider contact ▪ Monitor eating and physical activities through logs ▪ Use positive reinforcement techniques (reward system) ▪ Strong parental involvement for school-aged children
3: Comprehensive multidisciplinary intervention	Multidisciplinary team with childhood obesity expertise OR primary care-based program with counselor, dietitian, and use of structured outside activity program	Stage 2 plus: ▪ Structured diet and physical activity designed for negative energy balance	Similar to stage 2, supported by behavioral interventions	▪ Weekly patient-provider contact (and/or phone) ▪ Similar, but with increased structure and accountability ▪ Parent training in behavioral techniques to improve home eating and activity environment
4: Tertiary care intervention	Multidisciplinary team with childhood obesity expertise, including obesity medicine physician to rigorously assess comorbidities	As guided by established protocols. Various modalities are available, including: highly structured diets, medications, or bariatric surgery.		

TREATMENT OF CHILDHOOD OBESITY

- Lifestyle
  - intensive, age-appropriate, culturally sensitive, family-centered modifications to decrease BMI.
- Dietary
  - healthy eating habits in accordance with the American Academy of Pediatrics and the US Department of Agriculture guidelines (USDA) (http://www.choosemyplate.gov)

PHARMACOTHERAPY

FDA approved drugs

- Only if formal program of intensive lifestyle modification failed .
- Not recommended in children <16 years of age who are overweight (not obese).
- Drugs should be administered with a concomitant lifestyle modification program by clinicians who are experienced .
- Agents that have been recently approved for long-term obesity treatment in adults currently lack pediatric-specific data.
- Discontinue medication and re-evaluate the patient if the patient does not have a >4% BMI reduction after taking medication for 12 weeks at full dosage.

Not FDA approved for weight loss

- **Metformin**= reduces hepatic glucose production, increases peripheral insulin sensitivity may reduce appetite and decreases BMI
- Sibutramine (Meridia) = removed from the US in 2010 because of concerns for cardiovascular safety (available in other countries, i.e.Brazil)
- lisdexamfetamine dimesylate (Vyvanse)= treats binge eating in adults and short-term weight loss.
- GH treatment of children and adolescents with Prader-Willi syndrome
- Leptin = only if leptin-deficient, produces significant loss of fat mass

TREATMENT OF CHILDHOOD OBESITY

- Physical activity
  - reduction of inactivity
  - 20 minutes of moderate to vigorous physical activity daily, with a goal of 60 minutes.
  - all in the context of a calorie-controlled diet

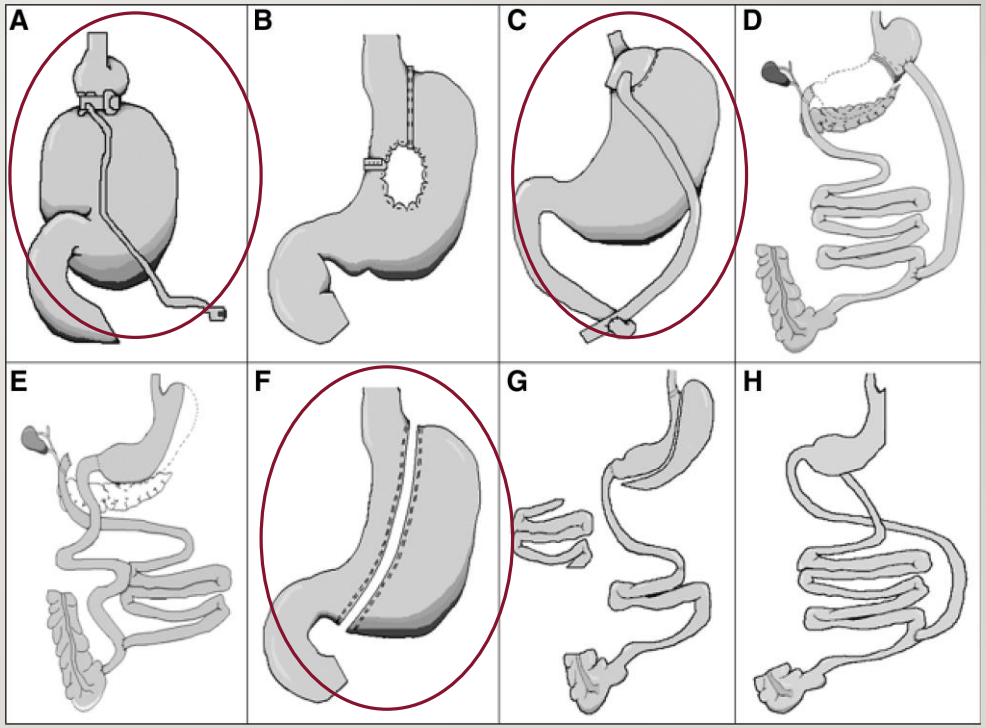
BARIATRIC SURGERY

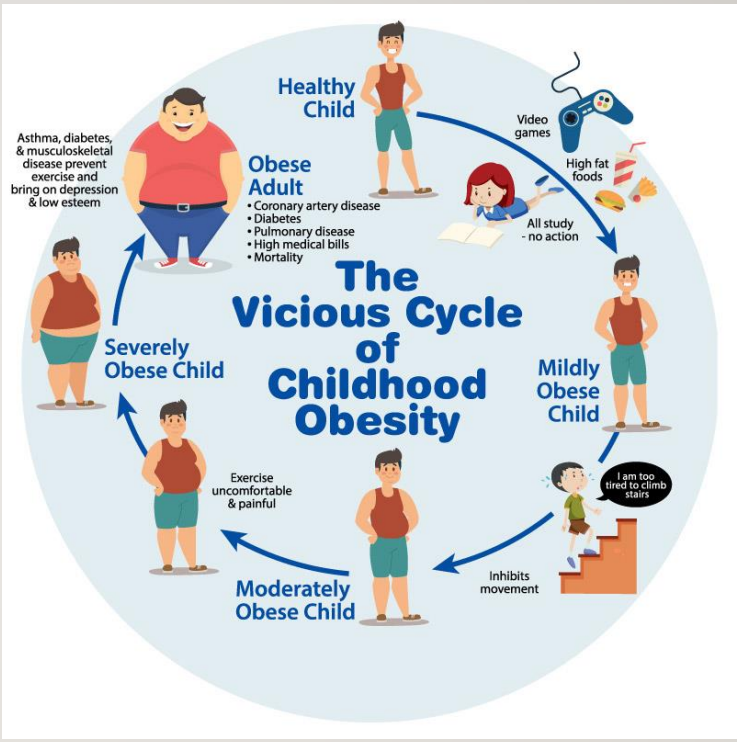
- Suggested if
  - Tanner 4-5 and final adult height
  - BMI of >40 kg/m^2 or BMI of >35 kg/m^2 and comorbidities
  - extreme obesity and comorbidities persist despite compliance with program of lifestyle modification.
  - psychological evaluation confirms the stability and competence of the family unit, psychological distress due to impaired QOL.
  - ability to adhere to healthy diet and activity habits.
  - access to an experienced surgeon in a pediatric bariatric surgery center of excellence providing the necessary infrastructure for patient care

- Not suggested if
  - preadolescent children
  - pregnant or breast-feeding adolescents (or planning to become pregnant within 2 years of surgery)
  - any patient who has not mastered the principles of healthy dietary and activity habits
  - unresolved substance abuse, eating disorder, or untreated psychiatric disorder.

BARIATRIC SURGICAL PROCEDURES

- Malabsorptive, restrictive, or combination procedures. (A,C and F are bariatric sx)
- A) adjustable gastric banding (LAGB) purely restrictive and has high complication rates, rarely used anymore.
- C) RYGB is a combination procedure, a small stomach pouch created and the remainder of the stomach is bypassed.
- F) Vertical sleeve gastrectomy (VSG), ~85% of the stomach resected, leaving a narrow gastric remnant .





OBESITY IN ADULTS

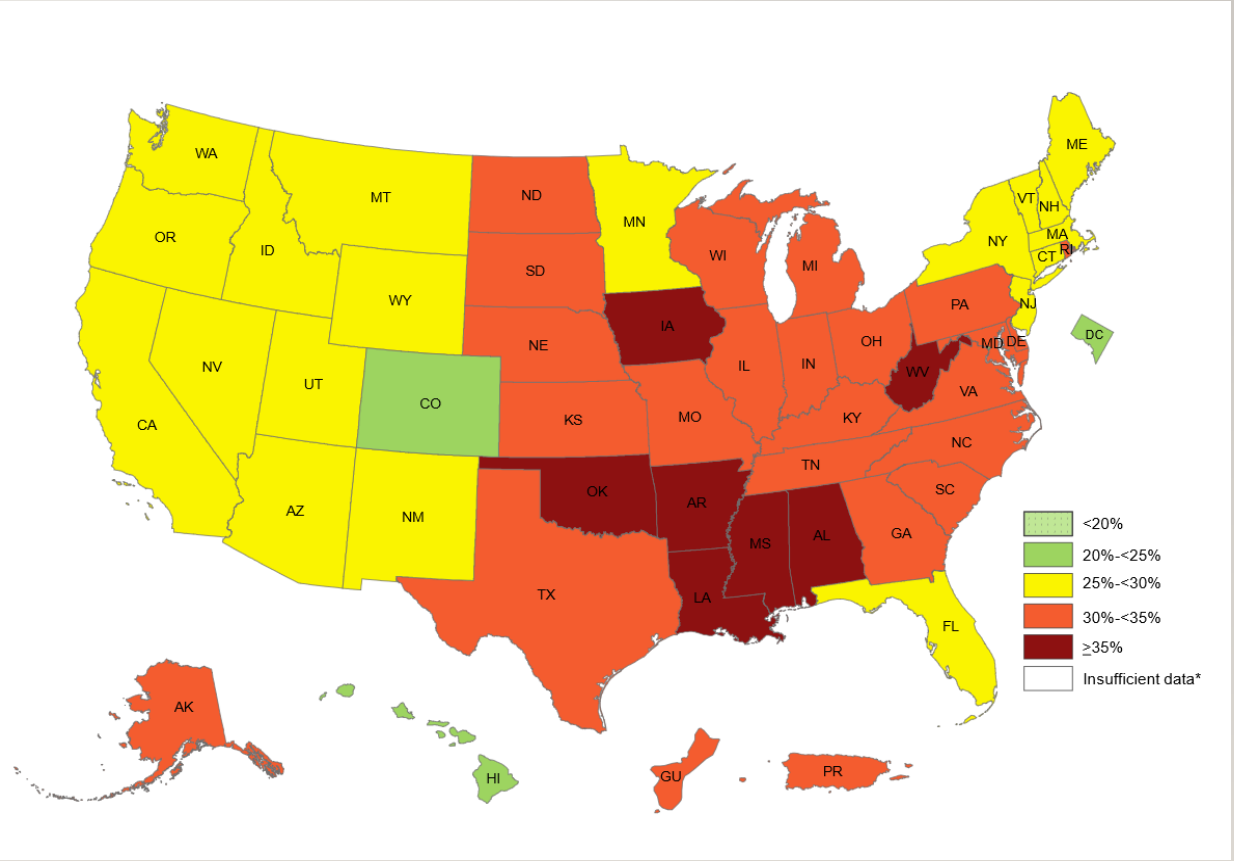
PREVALENCE

- **Behavioral Risk Factor Surveillance System**
  - self-reported prevalence of obesity by region
- **National Health and Nutrition Examination Survey**
  - Based upon data collected for NHANES

- 2015–2016, the prevalence of obesity was **39.8%** in adults
- Higher among middle-aged adults (42.8%) than among younger adults (35.7%).
- The overall prevalence of obesity was higher among **non-Hispanic black** and **Hispanic adults** than among non-Hispanic white and non-Hispanic Asian adults.
- The observed change in prevalence between 2013–2014 and 2015–2016 was not significant .
- The prevalence of obesity in the United States remains higher than the Healthy People 2020 goals of 14.5% among youth and 30.5% among adults.

BRFSS

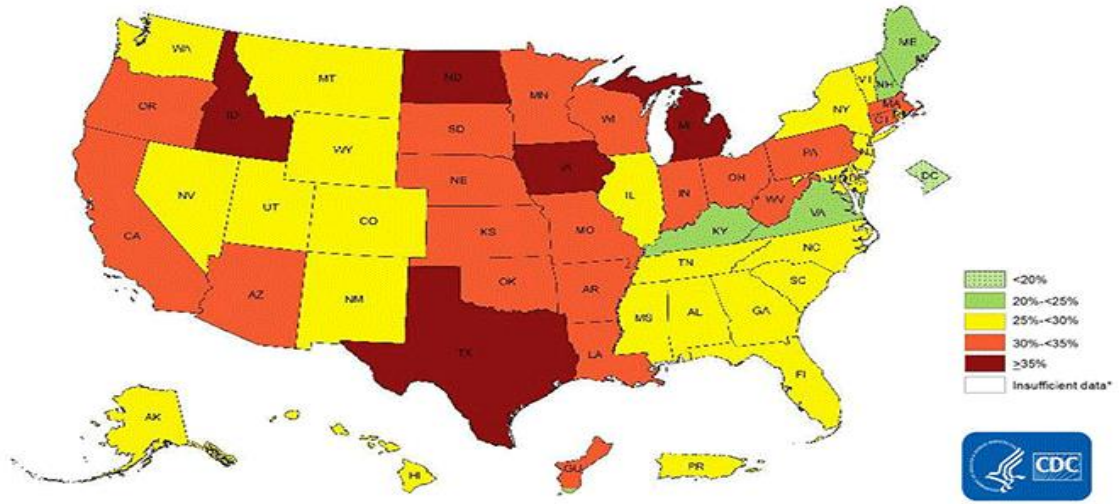
- Adult obesity prevalence in 2017 across states and territories
  - All states > 20% with obesity.
  - 20% to 25% in 2 states
  - 25% to 30% in 19 states.
  - **30% to 35%** in 22 states, Guam, and **Puerto Rico.**
  - 35% or more in 7 states



CENTERS FOR DISEASE CONTROL AND PREVENTION

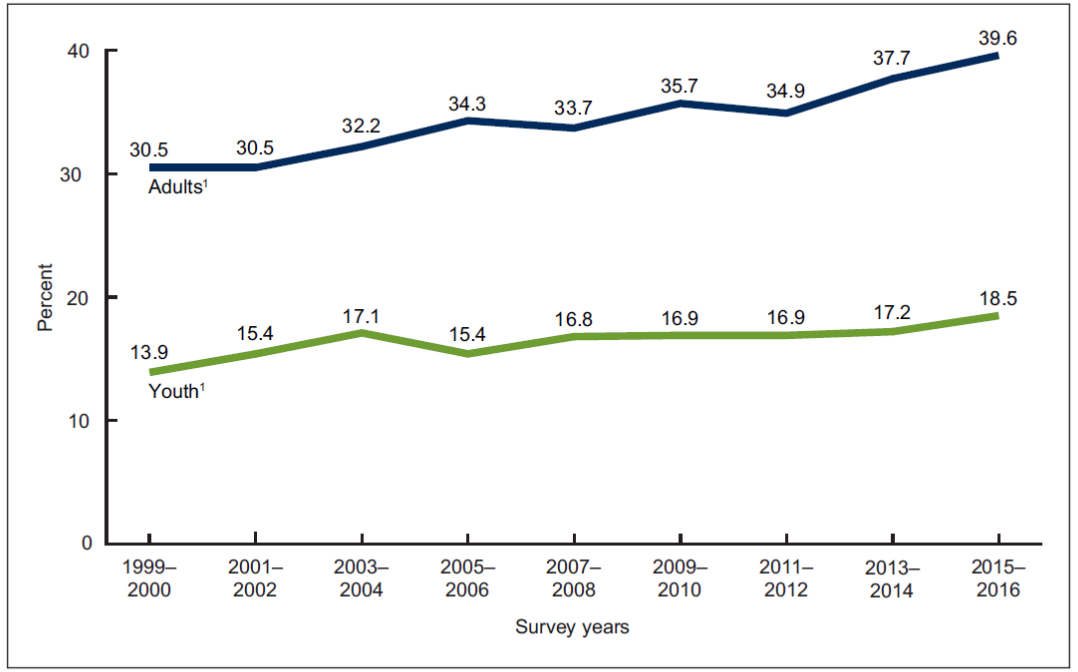
Prevalence of Self-Reported Obesity Among Hispanic Adults, by State and Territory, BRFSS

2011-2013 2012-2014 2013-2015 2014-2016 2015-2017



*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

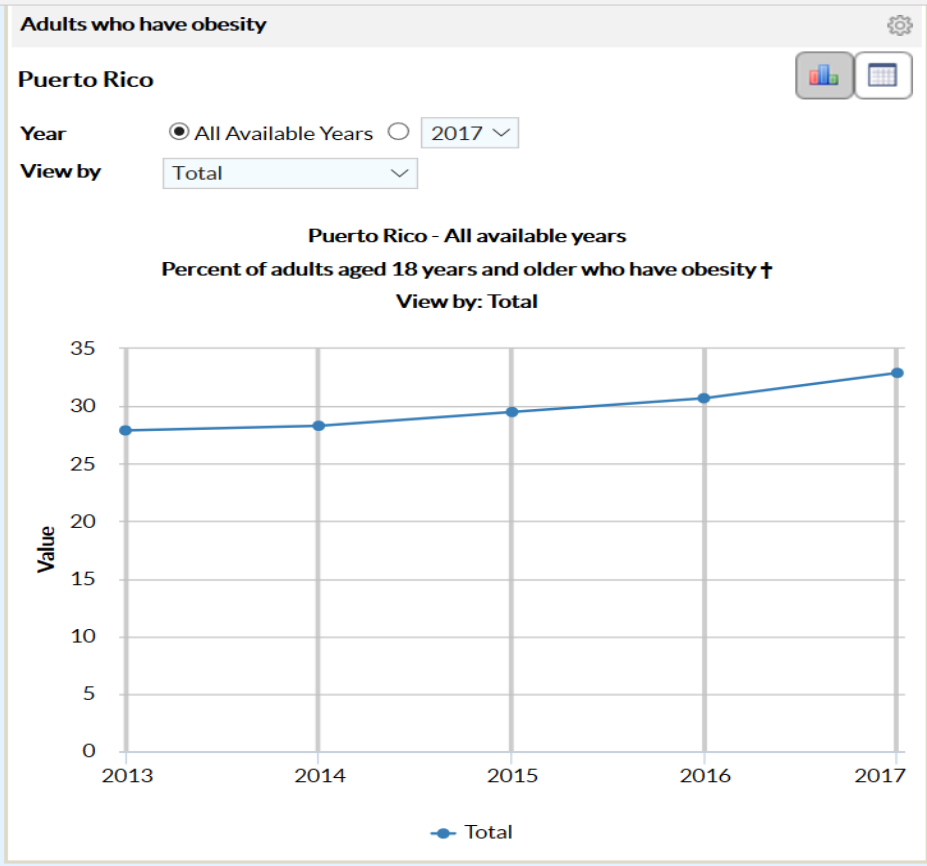
Figure 5. Trends in obesity prevalence among adults aged 20 and over (age adjusted) and youth aged 2–19 years: United States, 1999–2000 through 2015–2016

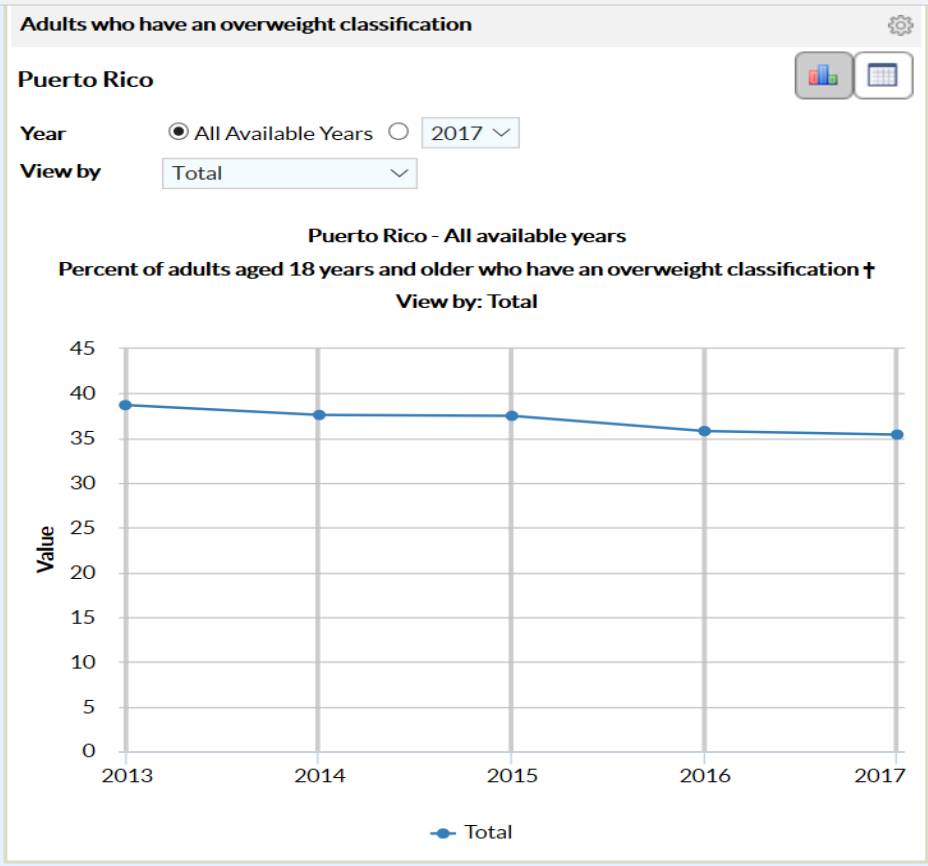


[1]Significant increasing linear trend from 1999–2000 through 2015–2016.
NOTES: All estimates for adults are age adjusted by the direct method to the 2000 U.S. census population using the age groups 20–39, 40–59, and 60 and over. Access data table for Figure 5 at: https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#5.
SOURCE: NCHS, National Health and Nutrition Examination Survey, 1999–2016.

OVERWEIGHT AND OBESITY IN PUERTO RICO

66.5% OF THE PUERTO RICAN POPULATION IS OVERWEIGHT (35.4%) AND OBESE (32.9%). MEN > WOMEN





El periódico #1 en Puerto Rico.

el Vocero de Puerto Rico
La verdad no tiene precio.

Reinan la obesidad y el sobrepeso

Estudio demostró que la mayoría de los adultos de 35 años en adelante descontroló su peso y que existe una preocupante tendencia de los jóvenes a engordar

- Yaritza Rivera Clemente, EL VOCERO, 13/2/2018

Dra. Loida Gonzalez, endocrinologa

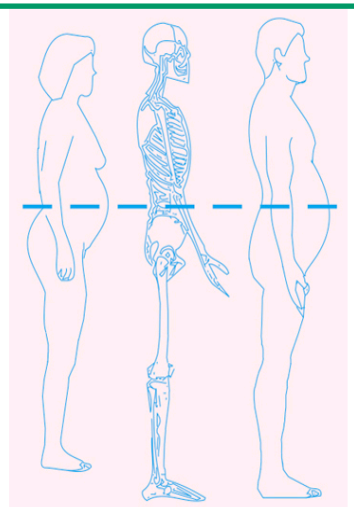
AACE/ACE Guidelines

AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS AND AMERICAN COLLEGE OF ENDOCRINOLOGY COMPREHENSIVE CLINICAL PRACTICE GUIDELINES FOR MEDICAL CARE OF PATIENTS WITH OBESITY

2016

- Screening for obesity
  - Yearly BMI and waist circumference
- Evaluation of a patient with overweight or obesity should include both clinical and laboratory studies.

Waist circumference measurement



Measuring-tape position for waist (abdominal) circumference in adults. To measure waist circumference, locate the upper hip bone and the top of the right iliac crest. Place a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest. Before reading the tape measure, ensure that the tape is snug, but does not compress the skin, and is parallel to the floor. The measurement is made at the end of a normal expiration.

Reproduced from: National Heart, Lung, and Blood Institute. The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart Lung and Blood Institute, Bethesda, MD, October 2000.

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Table 6. Classification of Overweight and Obesity by BMI and Waist Circumference (31 [EL 4; NE])

Classification	BMI		Waist	
	BMI (kg/m²)	Comorbidity Risk	Waist Circumference and Comorbidity Risk	
			Men ≤40 in (102 cm) Women ≤35 in (88 cm)	Men >40 in (102 cm) Women >35 in (88 cm)
Underweight	<18.5	Low but other problems		
Normal weight	18.5–24.9	Average		
Overweight	25–29.9	Increased	Increased	High
Obese class I	30–34.9	Moderate	High	Very high
Obese class II	35–39.9	Severe	Very high	Very high
Obese class III	≥40	Very severe	Extremely high	Extremely high

Abbreviations: BMI = body mass index; in = inches.

INVESTIGATING THE CAUSE

Etiologic classification of obesity

Iatrogenic causes
Drugs that cause weight gain
Hypothalamic surgery
Dietary obesity
Infant feeding practices
Progressive hyperplastic obesity
Frequency of eating
High-fat diets
Overeating
Neuroendocrine obesities
Hypothalamic obesity
Hypothyroidism
Seasonal affective disorder
Cushing's syndrome
Polycystic ovary syndrome
Hypogonadism
Growth hormone deficiency
Pseudohypoparathyroidism
Social and behavioral factors
Socioeconomic status
Ethnicity
Psychological factors
Restrained eaters
Night eating syndrome
Binge eating
Sedentary lifestyle
Enforced inactivity (postoperative)
Aging
Genetic (dysmorphic) obesities
Autosomal recessive traits
Autosomal dominant traits
X-linked traits
Chromosomal abnormalities
Other
Low birth weight

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OBESITY AS A CHRONIC DISEASE

- In 2012, AACE published a position statement in favor of obesity as an disease
- Obesity has surpassed smoking as the number one cause of preventable disease and disability.
- Weight loss will improve most of the morbidities associated with it.

Table 5. Definitions, Goals, and Methods for Phases of Prevention in Chronic Disease: General Practices in Chronic Disease and Specific Practices in Obesity

Phase of Intervention	Definition and Goals	Methods of Prevention
Primary Prevention	GENERAL: • Prevent a disease from occurring	GENERAL: • Eliminate risk factors, remove causes, or increase resistance to disease
	OBESITY: • Prevent the development of overweight and obesity	OBESITY: • Educate the public • Built environment • Promote healthy eating and regular physical activity
Secondary Prevention	GENERAL: • Halt the progression of disease from its early stage prior to complications to a more severe stage • Arrest the disease process to prevent complications or sequelae	GENERAL: • Use a screening test and follow-up diagnosis, followed by treatment
	OBESITY: • Prevent future weight gain and the development of weight-related complications in patients with overweight or obesity	OBESITY: • Screen using BMI • Diagnose using BMI and evaluation for complications • Treat with lifestyle/behavioral intervention ± weight-loss medications
Tertiary Prevention	GENERAL: • Use clinical activities that reduce complications and prevent further deterioration	GENERAL: • Use treatment strategies that limit adverse consequences of a disease on health
	OBESITY: • Treat with weight-loss therapy to eliminate or ameliorate weight-related complications and prevent disease progression	OBESITY: • Treat with lifestyle/behavioral intervention plus weight-loss medications • Consider bariatric surgery

Abbreviation: BMI = body mass index.

COMORBIDITIES AND COMPLICATIONS

- Metabolic risks
  - Diabetes mellitus
  - Dyslipidemia
- Cardiovascular
  - Hypertension
  - Heart disease
  - Coronary heart disease
  - Heart failure
  - Myocardial steatosis
  - Electrocardiogram findings
  - Atrial fibrillation
  - Stroke
  - Venous thrombosis
- Cancer
  - Overweight and obesity were estimated to cause 40 % of all cancers in the United States in 2014.
  - obesity and overweight may increase the likelihood of dying from cancer.
- Musculoskeletal
  - Osteoarthritis
  - Gout

COMORBIDITIES AND COMPLICATIONS

- Gastrointestinal
  - Hepatobiliary disease
  - GERD/gastrointestinal cancer
- Reproductive effects

- Psychosocial function
  - Stigma of obesity
    - Obese subjects are often exposed to public disapproval because of their fatness.
    - Seen in education, employment, and health care, among other areas.
- Depression
- Dementia

COMORBIDITIES AND COMPLICATIONS

- Genitourinary
  - Chronic kidney disease
  - Kidney stones
  - Urinary incontinence
- Respiratory system
  - Sleep apnea and Asthma
- Infections
- Skin changes
  - Stretch marks (striae)
  - Acanthosis nigricans
  - Hirsutism

- **HEALTH CARE COSTS OF OBESITY**
  - $3,559 more than nonobese patients in annual medical expenses, per patient.
  - Lost work productivity and lower household income.

WHO IS A CANDIDATE FOR WEIGHT LOSS THERAPY?

- Phycisians must asses the anthropometric component (BMI) or the weight related complications, yearly.

Figure 3. Clinical Component of the Medical Diagnosis of Obesity

Candidates for weight-loss therapy can present with either excess adiposity (ie, the anthropometric component) or weight-related complications (ie, the clinical component)

Patients Present With Overweight or Obesity	Candidates for Weight-Loss Therapy	Patients Present With Weight-Related Disease or Complications	
Patients with BMI ≥25 kg/m² or ≥23 kg/m² in certain ethnicities and excess adiposity	Evaluate for weight-related complications: R9–R29 →	R9, R10	Prediabetes
		R9, R10	Metabolic syndrome
		R11	Type 2 diabetes
		R12	Dyslipidemia
		R13	Hypertension
		R14, R15	Cardiovascular disease
		R16	Nonalcoholic fatty liver disease
		R17	Polycystic ovary syndrome
		R18	Female infertility
	Evaluate for overweight or obesity: R9–R29 ←	R19, R20	Male hypogonadism
		R21	Obstructive sleep apnea
		R22	Asthma/reactive airway disease
		R23	Osteoarthritis
		R24	Urinary stress incontinence
		R25, R26	Gastroesophageal reflux disease
		R28	Depression

PREVENTION AND TREATMENT GOALS

Table 8: Treatment Goals Based on Diagnosis in the Medical Management of Patients With Obesity

	DIAGNOSIS		TREATMENT GOALS		
	Anthropometric Component	Clinical Component	Intervention/ Weight-Loss Goal	Clinical Goals	Qs & Rs
PRIMARY PREVENTION					
Primordial Prevention	BMI ≤25 (≤23 in certain ethnicities)	Obesogenic environment	• Public education • Built environment • Access to healthy foods	Decreased incidence of overweight/ obesity in populations	Q1,R2
Primary Prevention	BMI ≤25 (≤23 in certain ethnicities)	High-risk individuals or subgroups based on individual or cultural behaviors, ethnicity, family history, biomarkers, or genetics	• Annual BMI screening • Healthy meal plan • Increased physical activity	Decreased incidence of overweight/ obesity in high-risk individuals or identifiable subgroups	Q1,R2 Q2,R3
SECONDARY PREVENTION					
Overweight	BMI 25–29.9	No clinically significant or detectable weight-related complications	• Prevent progressive weight gain or • Weight loss	• Prevent progression to obesity • Prevent the development of weight-related complications	Q1,R2 Q4,R29
Obesity	BMI ≥30 (≥23 in certain ethnicities)	No clinically significant or detectable weight-related complications	• Weight loss or • Prevent progressive weight gain	Prevent the development of weight-related complications	Q1,R2 Q4,R29

weight gain

TERTIARY PREVENTION					
Overweight or Obesity	BMI ≥25 (≥23 in certain ethnicities)	Metabolic syndrome	10%	Prevention of T2DM	Q3.1,R9,R10 Q5.1,R30,R31
		Prediabetes	10%	Prevention of T2DM	Q3.1,R9,R10 Q5.1,R30,R31
		T2DM	5% to ≥15%	• Reduction in A1C • Reduction in number and/or doses of glucose lowering medications	Q3.2,R11 Q5.2,R33,R34
		Dyslipidemia	5% to ≥15%	• Lower triglycerides • Higher HDL-c • Lower non-HDL-c	Q3.3,R12 Q5.3,R37,R38
		Hypertension	5% to ≥15%	• Lower systolic and diastolic BP • Reductions in number and/or doses of antihypertensive medications	Q3.4,R13 Q5.4,R39,R40
		Nonalcoholic fatty liver disease – Steatosis	5% or more	Reduction in intrahepatocellular lipid	Q3.6,R16 Q5.6,R45,R46
		Nonalcoholic fatty liver disease – Steatohepatitis	10% to 40%	Reduction in inflammation and fibrosis	Q3.6,R16 Q5.6,R45,R46
		Polycystic ovary syndrome	5% to 15% or more	• Ovulation • Regularization of menses • Reduced hirsutism • Enhanced insulin sensitivity • Reduced serum androgen levels	Q3.7,R17 Q5.7,R48,R49
		Female infertility	10% or more	• Ovulation • Pregnancy	Q3.8,R18 Q5.8,R51
		Male hypogonadism	5% to 10% or more	Increase in serum testosterone	Q3.9,R19,R20 Q5.9,R52
		Obstructive sleep apnea	7% to 11% or more	• Improved symptomatology • Decreased apnea-hypopnea index	Q3.10,R21 Q5.10,R55
		Asthma/reactive airway disease	7% to 8% or more	• Improvement in forced expiratory volume at 1 second • Improved symptomatology	Q3.11,R22 Q5.11,R56
		Osteoarthritis	• ≥10% • 5% to 10% or more when coupled with exercise	• Improvement in symptomatology • Increased function	Q3.12,R23 Q5.12,R57, R58
		Urinary stress incontinence	5% to 10% or more	Reduced frequency of incontinence episodes	Q3.13,R24 Q5.13,R59
		Gastroesophageal reflux disease	10% or more	Reduced symptom frequency and severity	Q3.14,R25, Q15.5,R60
		Depression	Uncertain	• Reduction in depression symptomatology • Improvement in depression scores	Q3.15,R28 Q5.15,R63

Abbreviations: A1C = hemoglobin A1c; BMI = body mass index; BP = blood pressure; HDL-c = high-density lipoprotein cholesterol; T2DM = type 2 diabetes mellitus.

TREATMENT OF OBESITY IN THE ADULT

- Identify candidates
  - **Little/no risk** – BMI of 20 to 25 kg/m^2
  - **Low risk** – BMI of 25 to 29.9 kg/m^2, without risk factors for CVD
  - **Moderate risk** – BMI between 25 and 29.9 kg/m^2 and with >1 risk factors for CVD or with a BMI of 30 to 34.9 kg/m^2.
  - **High risk** – BMI of 35 to 40 kg/m^2
  - **Very high risk** - BMI > 40 kg/m^2

Figure 5. Diagnosis and Medical Management of Obesity

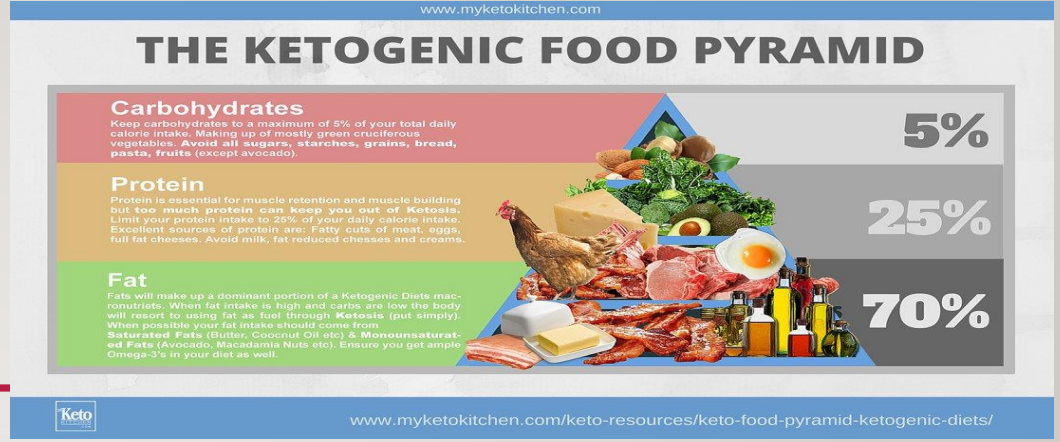
DIAGNOSIS		COMPLICATION-SPECIFIC STAGING AND TREATMENT		
Anthropometric Component (BMI kg/m^2)	Clinical Component	Disease Stage	Chronic Disease Phase of Prevention	Suggested Therapy (based on clinical judgment)
<25 <23 in certain ethnicities waist circumference below regional/ ethnic cutoffs		Normal weight (no obesity)	Primary	• **Healthy lifestyle:** healthy meal plan/ physical activity
25–29.9 23–24.9 in certain ethnicities	Evaluate for presence or absence of adiposity-related complications and severity of complications • Metabolic syndrome • Prediabetes • Type 2 diabetes • Dyslipidemia • Hypertension • Cardiovascular disease • Nonalcoholic fatty liver disease • Polycystic ovary syndrome • Female infertility • Male hypogonadism • Obstructive sleep apnea • Asthma/reactive airway disease • Osteoarthritis • Urinary stress incontinence • Gastroesophageal reflux disease • Depression	Overweight stage 0 (no complications)	Secondary	• **Lifestyle therapy:** Reduced-calorie healthy meal plan/physical activity/ behavioral interventions
≥30 ≥25 in certain ethnicities		Obesity stage 0 (no complications)	Secondary	• **Lifestyle therapy:** Reduced-calorie healthy meal plan/physical activity/ behavioral interventions • **Weight-loss medications:** Consider after lifestyle therapy fails to prevent progressive weight gain. (BMI ≥27)
≥25 ≥23 in certain ethnicties		Obesity stage 1 (1 or more mild-moderate complications)	Tertiary	• **Lifestyle therapy:** Reduced-calorie healthy meal plan/physical activity/ behavioral interventions • **Weight-loss medications:** Consider after lifestyle therapy fails to achieve therapeutic target or initiate concurrent with lifestyle therapy. (BMI ≥27)
≥25 ≥23 in certain ethnicties		Obesity stage 2 (at least 1 severe complication)	Tertiary	• **Lifestyle therapy:** Reduced-calorie healthy meal plan/physical activity/ behavioral interventions • **Add weight-loss medications:** Initiate concurrent with lifestyle therapy. (BMI ≥27) • **Consider bariatric surgery:** (BMI ≥35)

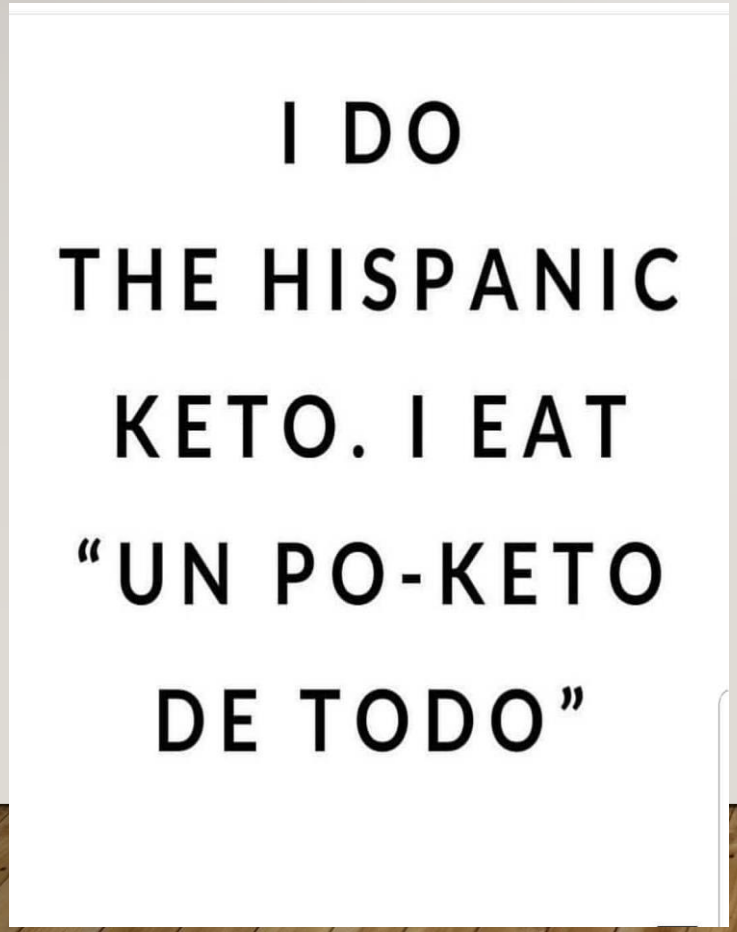
INITIAL TREATMENT

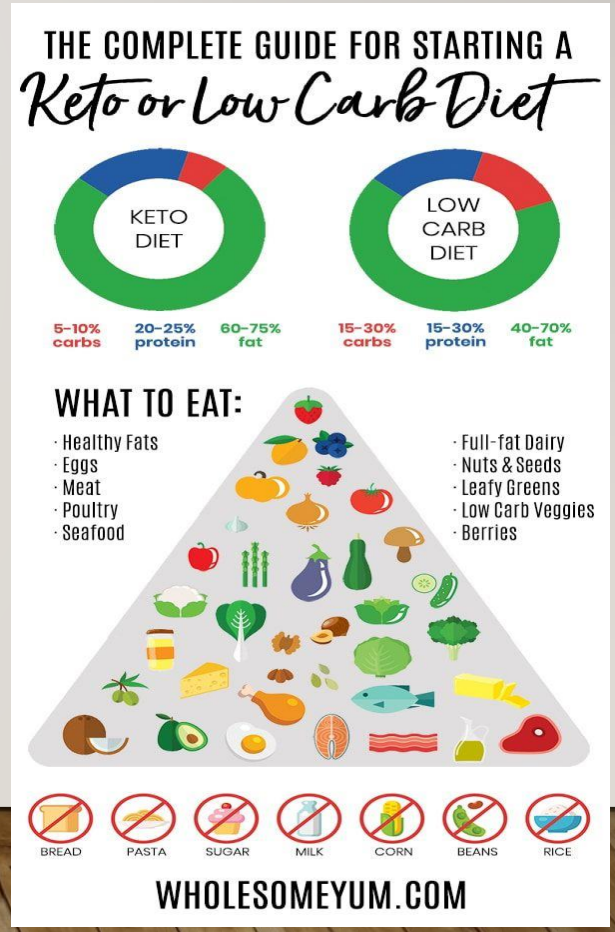
- Comprehensive lifestyle intervention
  - A minimum of 7% weight loss and a minimum of 150 min of exercise per week
  - More effective for preventing diabetes than a pharmacologic intervention.

- Dietary therapy = adherence is an important predictor of weight loss.
  - low-calorie
  - low-fat/low-calorie
  - moderate-fat/low-calorie
  - low-carbohydrate
  - Mediterranean diet
- Reducing energy intake below energy expenditure, rather than focusing on the macronutrient composition.
- Metabolic studies have shown all adults will lose weight when fed <1000 kcal/day.

DIETARY THERAPY





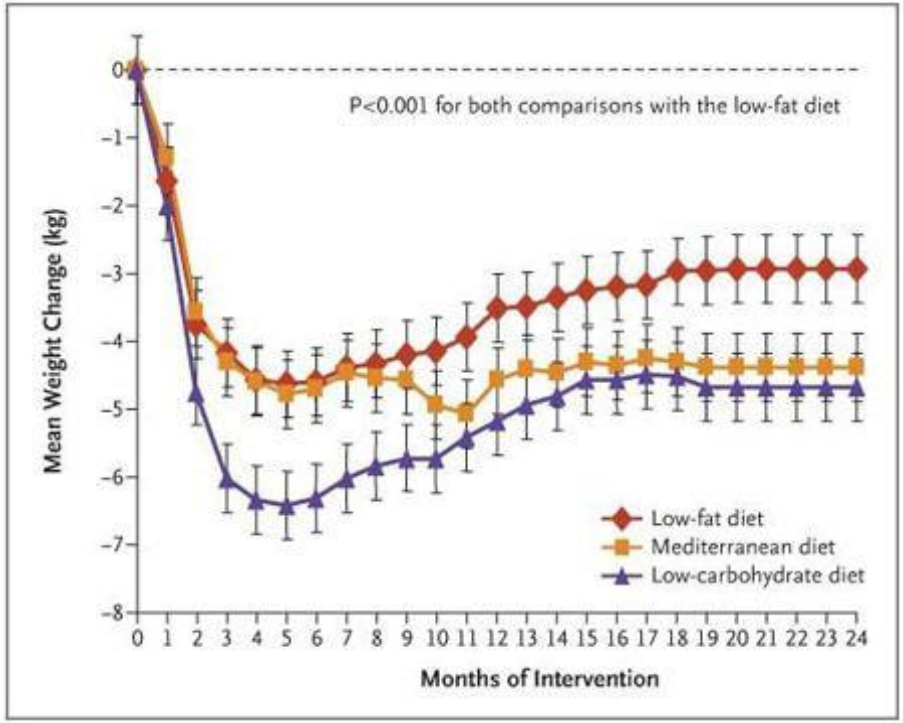


BREAKING DOWN THE KETO DIET

- Ketogenic diet has been around since 1920's
- It gained a foothold when proven to reduce seizures in pediatric patients with epilepsy.
- The keto diet is all about cutting carbs and eating more fat.
  - 5 % of calories from carbohydrates
  - 20 % of calories from protein
  - 75 % of calories from fat, such as oils, unprocessed nuts, butter and avocado.
- When you cut carbs from your diet, you switch to burning fatty acids, and use ketones for energy.

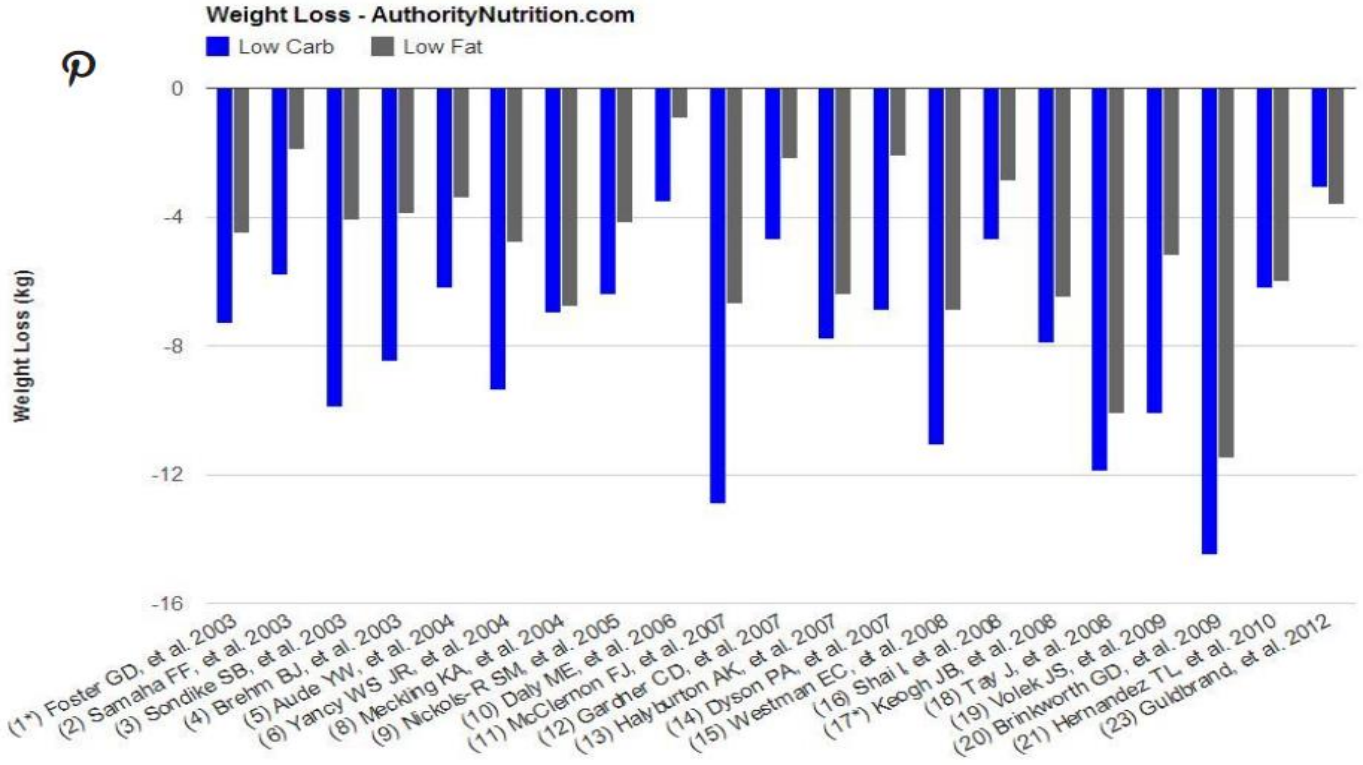
LOW CARB VS. LOW FAT, LOW CALORIE DIETS

HEALTHLINE.COM
AUTHORITYNUTRITION.COM



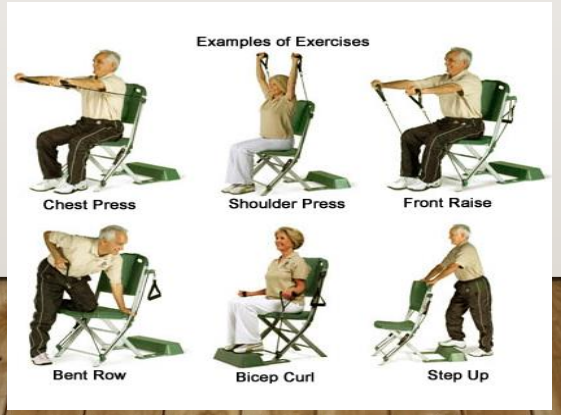
New England Journal of Medicine, 2008.

Here is a graph that shows the difference in weight loss between studies. 21 of 23 studies reported weight loss numbers:



INITIAL TREATMENT

- Exercise
  - increasing energy expenditure through physical activity is a strong predictor of weight loss maintenance.
  - 30 minutes or more, 5-7 days a week
  - A multicomponent program that includes aerobic and resistance training is preferred.
- Behavior modification
  - modifying and monitoring their food intake
  - modifying their physical activity
  - controlling cues and stimuli in the environment that trigger eating.



SUBSEQUENT TREATMENT

- Drug therapy
  - BMI greater than 30 kg/m^2
  - BMI of 27 to 29.9 kg/m^2 with comorbidities, who have not met weight loss goals with a comprehensive lifestyle intervention.

XENICAL® orlistat

Qsymia® (phentermine and topiramate extended-release) capsules CIV

NEW Contrave® (naltrexone HCl/bupropion HCl) 8 mg/90 mg • Extended-Release Tablets

BELVIQ® (lorcaserin HCl) CIV

Table 10. Weight-Loss Medications: Key Clinical Trials, Baseline Characteristics, and Weight-Loss Efficacy (67 [EL 1; RCT]; 68 [EL 1; RCT]; 69 [EL 1; RCT]; 70 [EL 1; RCT]; 71 [EL 1; RCT]) *

Generic Name	Naltrexone ER/ Bupropion ER		Liraglutide 3 mg		Locaserin		Orlistat		Phentermine/ Topiramte ER		
Brand Name	Contrave		Saxenda		Belviq		Xenical		Qsymia		
Frequency	Oral, BID		subQ, QD		Oral, BID		Oral, TID		Oral, QD		
Total Daily Dose	32 mg/360 mg		3 mg		20 mg		360 mg		7.5 mg / 46 mg	15 mg / 92 mg	
	Drug	Control	Drug	Control	Drug	Control	Drug	Control	Drug	Drug	Control
Age (years)	44.4	43.7	45.2	45.0	43.8	43.7	43.2	41.6	51.1	51.0	51.2
Gender (% female)	85	85	78.7	78.1	80.5	78.0	79	78	70.0	70.0	70.0
Baseline Weight (kg)	99.7	99.5	106.2	106.2	100.3	100.5	100.5	101.8	102.6	103.0	103.3
Baseline Waist (cm)	108.8	110.0	115.0	114.5	108.9	110.2	n/a	n/a	112.6	113.2	113.4
Baseline BMI	36.1	36.2	38.3	38.3	36.0	35.9	36.0	36.1	36.2	36.6	36.7
Weight-Loss (%) Completers	-8.1	-1.8	-9.2	-3.5	-7.9	-4.0	-8.78	-4.26	-9.6	-12.4	-1.6
Weight Loss (%) ITT LOCF	-6.1	-1.3	-8.0	-2.6	-5.8	-2.8	-7.94	-4.14	-7.8	-9.8	-1.2
5% Weight Loss (in %) ITT LOCF	48	16	63.2	27.1	47.2	25.0	50.5	30.7	62	70	21
10% Weight Loss (in %) ITT LOCF	25	7	33.1	10.6	22.6	9.7	28.6	11.3	37	48	7

PHARMACOLOGIC THERAPY SHORT TERM

Noradrenergic sympathomimetic drugs approved for short-term use			
Benzphetamine	Initial: 25 mg once daily; may titrate up to 25 to 50 mg one to 3 times daily. Maximum dose: 50 mg 3 times daily.	C-III	Applies to all sympathomimetic agents: Due to their side effects and potential for abuse, we suggest **not** prescribing sympathomimetics for weight loss. If prescribed, limit to short-term (≤12 weeks) use. Adverse effects include increase in heart rate, blood pressure, insomnia, dry mouth, constipation, nervousness. Abuse potential due to amphetamine-like effects. May counteract effect of blood pressure medications. Avoid in patients with heart disease, poorly controlled hypertension, pulmonary hypertension, or history of addiction or drug abuse. Contraindicated in patients with a history of CVD, hyperthyroidism, glaucoma, MAO inhibitor-therapy, agitated states, pregnancy, or breast feeding.
Diethylpropion	Immediate release: 25 mg 3 times daily before meals. Controlled release: 75 mg every morning.	C-IV	
Phentermine	Immediate release: 15 to 37.5 mg daily or divided twice daily. Orally disintegrating tablet (ODT): 15 to 37.5 mg once daily in the morning.	C-IV	
Phendimetrazine	Immediate release: 17.5 to 35 mg 2 or 3 times daily, 1 hour before meals. Maximum dose: 70 mg 3 times daily. Sustained release: 105 mg daily in the morning.	C-III	

THERAPIES NOT RECOMMENDED

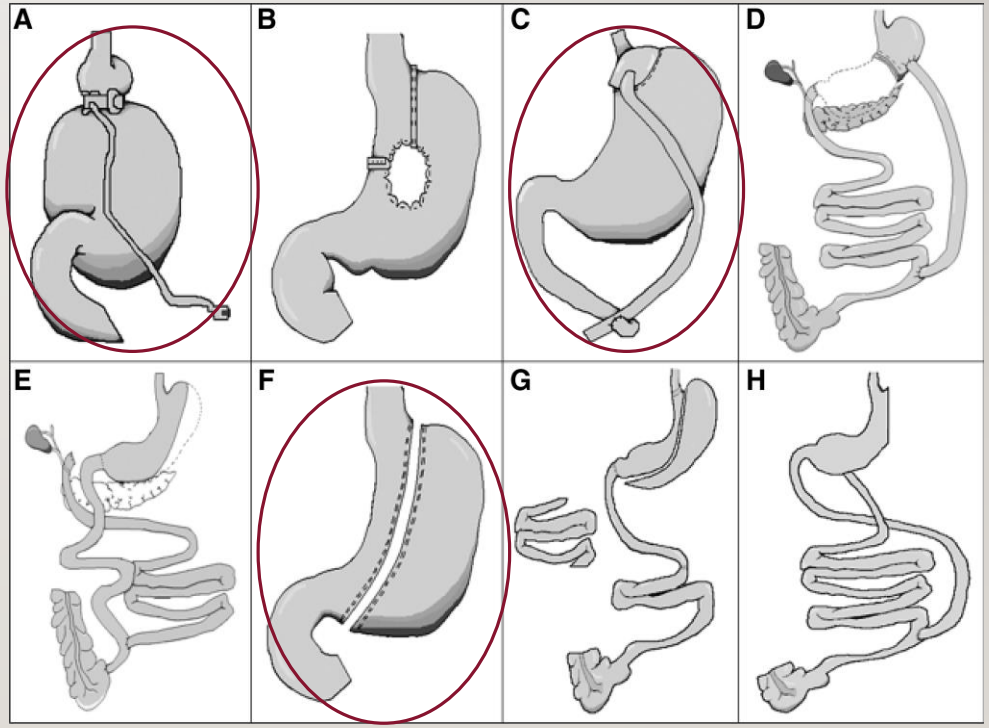
- Dietary supplements
  - evidence to support their efficacy and safety is limited.
- Human chorionic gonadotropin (hCG)
  - loss of 1-2 pounds daily
  - absence of hunger
  - maintenance of muscle tone.
  - An integral component of the hCG diet is adherence to a very-low-calorie diet (500 kcal/day), which has been recognized to result in short-term weight loss simply from caloric restriction, with no added benefit from hCG.
- Calcium

SUBSEQUENT TREATMENT

- Surgery Indications:
  - BMI ≥40 kg/m^2
  - BMI of 35 to 39.9 kg/m^2 with
    - >1 serious comorbidity
    - have not met weight loss goals with diet, exercise, and drug therapy.
- Systemic reviews showed there was greater weight loss and higher remission rates of type 2 diabetes in the bariatric surgery group.

BARIATRIC SURGICAL PROCEDURES

- Malabsorptive, restrictive, or combination procedures. (A,C and F are bariatric sx)
- A) adjustable gastric banding (LAGB) purely restrictive and has high complication rates, rarely used anymore.
- C) RYGB is a combination procedure, a small stomach pouch created and the remainder of the stomach is bypassed.
- F) Vertical sleeve gastrectomy (VSG), ~85% of the stomach resected, leaving a narrow gastric remnant .



MAINTENANCE OF WEIGHT LOSS

- Characteristics of those who are likely to succeed in maintaining weight loss:
  - include frequent self-monitoring
  - a weight loss of > 2 kg in four weeks
  - frequent and regular attendance at a weight loss program, and
  - the person's belief that his or her weight can be controlled
- The body appears to have a "set point" of adipose tissue mass, and after weight loss, counter-regulatory hormones are secreted to re-establish the higher body weight.
- **Diet and exercise remain the foundation of any long-term weight management plan.**

THE END…

REFERENCES

1. National Institutes of Health. National Heart, Lung, and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults—The evidence report. Obes Res 6(Suppl 2):51S–209S. 1998.
2. https://www.cdc.gov/nchs/products/databriefs.htm.
3. AACE/ACE Obesity CPG, Endocr Pract. 2016;22(Suppl 3)
4. www.uptodate.com/contents/overweight-and-obesity-in-adults-health-consequences
5. Pediatric Obesity—Assessment, Treatment, and Prevention: An Endocrine Society Clinical Practice Guideline Dennis M. Styne Silva A. Arslanian Ellen L. Connor Ismaa Sadaf Farooqi M. Hassan Murad Janet H. Silverstein Jack A. Yanovski *The Journal of Clinical Endocrinology & Metabolism*, Volume 102, Issue 3, 1 March 2017,