

# CHILDHOOD OBESITY

## Prevalence, Causes and Complications

California School Nurses Organization  
Bay Coast Section Fall Meeting  
October 15, 2016

Elizabeth Shepard, MD  
Center for Healthy Weight  
Lucile Packard Children's Hospital Stanford

# DEFINITION OF OBESITY

*Excess body fat*

Measured by body mass index or BMI

$$\frac{\text{Weight (kg)}}{\text{Height (m)}^2} \quad \text{or} \quad \frac{\text{Weight (lbs)}}{\text{Height (in)}^2} \times 703$$

# IDENTIFICATION OF OBESITY

## CHILDREN AND ADOLESCENTS

BMI 85th to < 95th percentile  
**OVERWEIGHT**

BMI  $\geq$  95th percentile  
**OBESITY**

BMI  $\geq$  99<sup>th</sup> percentile  
**EXTREME OBESITY**

or

BMI 1.2x the 95<sup>th</sup> percentile BMI for age  
**SEVERE OBESITY (CLASS 2)**

BMI 1.4x the 95<sup>th</sup> percentile BMI for age  
**VERY SEVERE OBESITY (CLASS 3)**

## ADULTS

BMI 25 to 29  
**OVERWEIGHT**

BMI 30 to 34  
**CLASS 1 OBESITY**

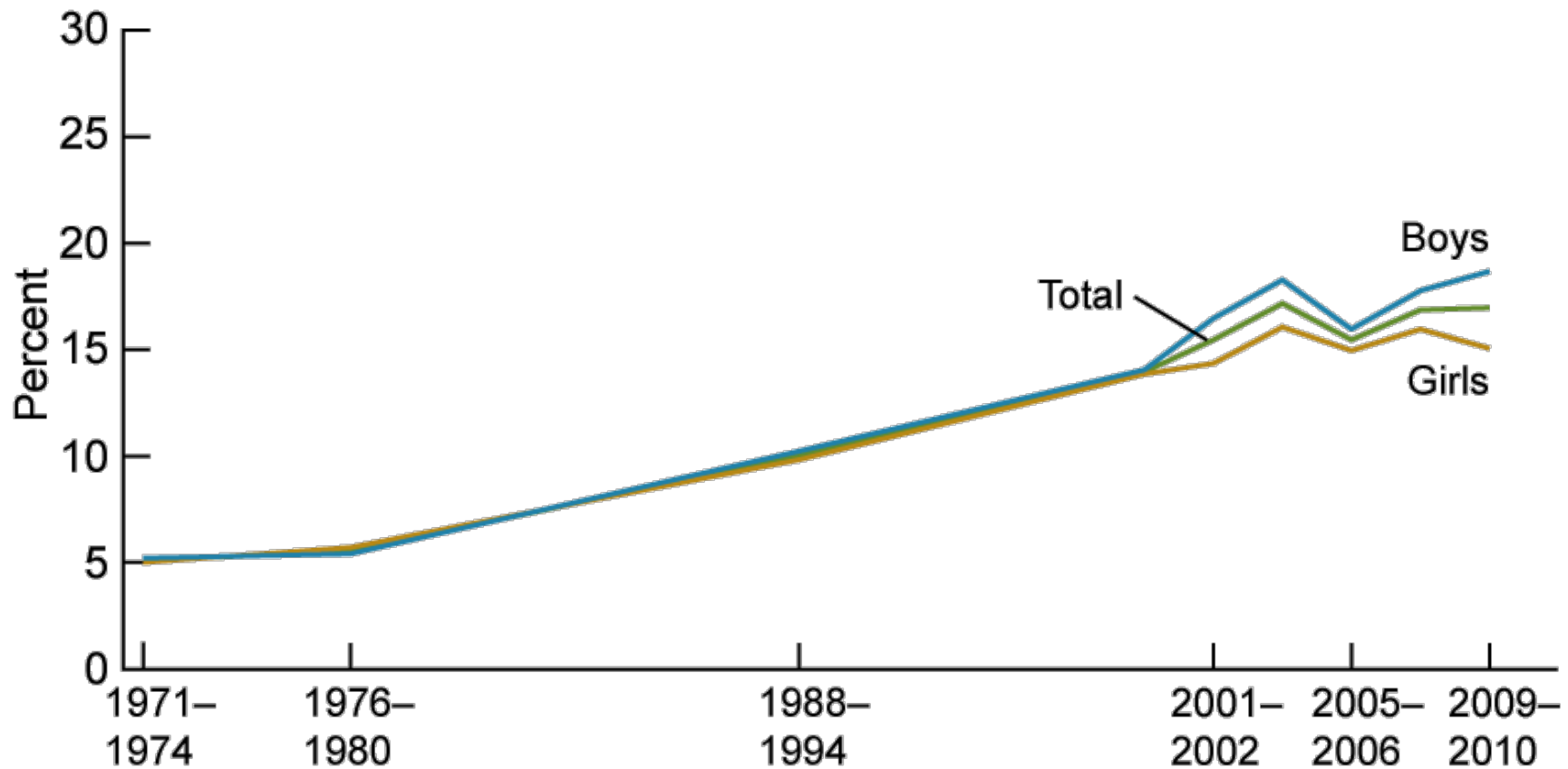
BMI 35 to 39  
**CLASS 2 OBESITY**

BMI  $\geq$  40  
**CLASS 3 OBESITY  
(EXTREME OBESITY)**





**Figure 1: Trends in obesity among children and adolescents aged 2–19 years, by sex: United States, 1971–1974 through 2009–2010**



NOTE: Obesity is body mass index greater than or equal to the 95th percentile of the sex- and age-specific 2000 CDC growth charts.  
 SOURCES: CDC/NCHS, National Health and Nutrition Examination Surveys (NHANES) I–III; and NHANES, 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010.

# NATIONAL PREVALENCE OF OBESITY

<u>CHILDREN AND ADOLESCENTS (2-19 years old)</u>	<u>2011-2014 NHANES</u>
BMI $\geq$ 95 <sup>th</sup> % (obese)	17%
BMI $\geq$ 1.2 x 95 <sup>th</sup> percentile BMI (extreme obesity as defined in this sample)	5.8%

## Trends:

- Decrease in obesity in children 2-5 years old from from 13.9 % in 2003-2004 to 9.4% in 2013-2014
- No increase in obesity in children 6-11 years old since 2007-2008
- Increase in obesity in adolescents from 1988-1994 to 2013-2014
- Increase in extreme obesity in children 6-11 years and adolescents from 1988-1994 to 2013-2014

Ogden CL, et al, JAMA 6/7/16 – Trends in Obesity Prevalence Among Children and Adolescents, United States 1988-1994 Through 2013-2014

# HIGHEST RISK GROUPS

“Table 2. Weighted Prevalence of Obesity and Extreme Obesity in US Children and Adolescents Aged 2 to 19 Years by Sex, Age, and Race/Hispanic Origin: NHANES 2011-2014”

OBESITY (BMI  $\geq$  95<sup>th</sup> %):

- Non-Hispanic black females 12-19 years, 24.4%
- Hispanic males 6-11 years, 25.8%

EXTREME OBESITY (BMI  $\geq$  1.2 x 95<sup>th</sup>ile BMI):

- Non-Hispanic black females 12-19 years, 12.7%
- Hispanic males 6-11 years, 9.6%

Ogden CL, et al, JAMA 6/7/16 – Trends in Obesity Prevalence Among Children and Adolescents, United States 1988-1994 Through 2013-2014



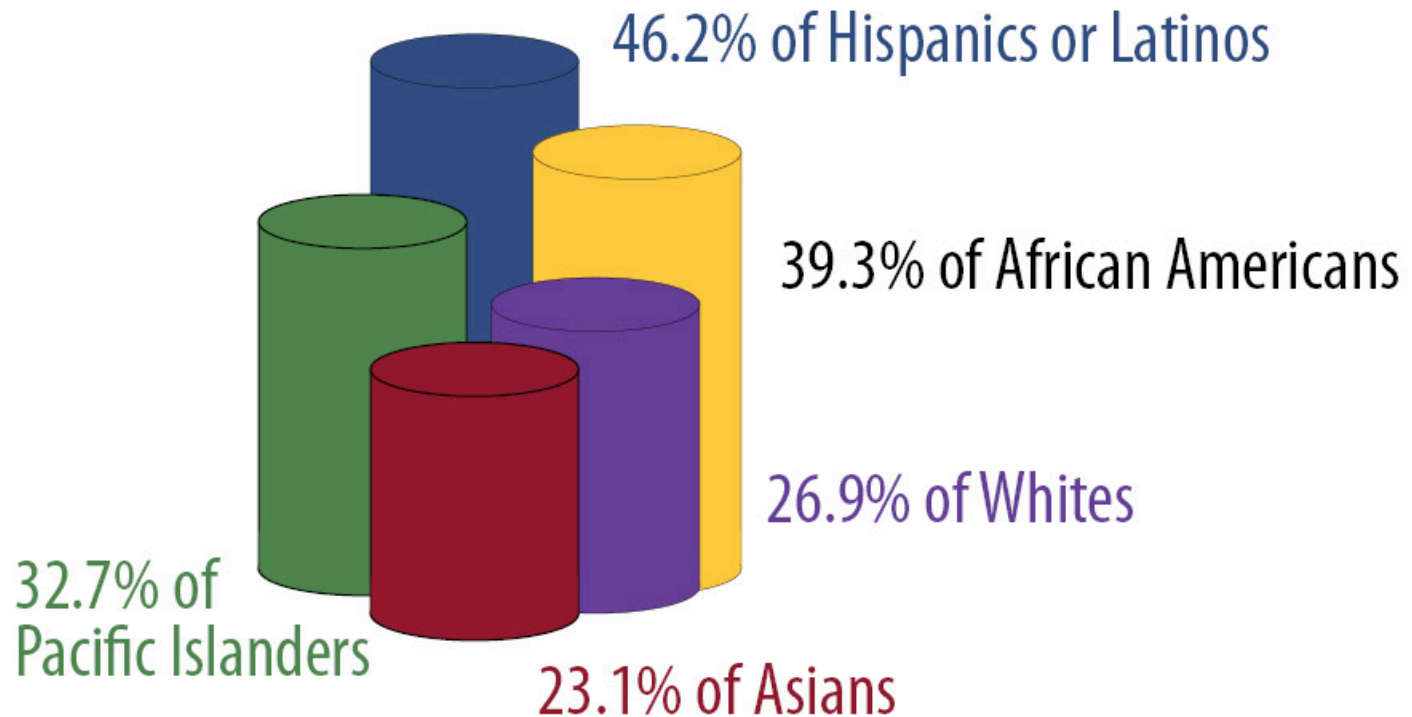
# CALIFORNIA

*FITNESSGRAM* in grades 5, 7 and 9 measures:

1. Aerobic capacity
2. Abdominal strength and endurance
3. Upper body strength and endurance
4. Body composition (including BMI)
5. Trunk extensor strength and flexibility
6. Flexibility

California Department of Education  
Physical Fitness Testing (PFT)

# CHILDHOOD OBESITY AND OVERWEIGHT BY ETHNICITY/RACE IN CALIFORNIA, 2010



Courtesy of the California Center for Public Health Advocacy

[www.publichealthadvocacy.org](http://www.publichealthadvocacy.org)

Note: Pacific Islander includes Filipino.

Source: Data analysis of 2005 and 2010 California Physical Fitness Test

November 2011

# CAUSES OF OBESITY

1. GENETIC and EPIGENETIC
2. ENVIRONMENTAL
3. MEDICAL

# ENVIRONMENTAL CAUSES OF OBESITY

- Diet
- Activity level
- Screen time
- Stress
- Sleep
- Gut microbiota
- Obesogenic chemicals
- Social networks

# NATURE or NUTURE?



NIDDK

Pima Indians

# DRUG-RELATED CAUSES OF OBESITY

- Steroids
- Anticonvulsants (valproic acid, gabapentin)
- Psychiatric drugs (antipsychotics, tricyclic antidepressants, lithium)
- Hormonal contraceptives

# ENDOCRINE/METABOLIC CAUSES OF OBESITY

- Hypothyroidism
- Cushing's syndrome
- Hypothalamic obesity (central) ex. brain tumor

Usually associated with short stature

# GENETIC SYNDROMES CAUSING OBESITY

- Prader-Willi
- Others (rare):
  - Bardet-Biedl
  - Borjeson- Forssman- Lehman
  - Carpenter
  - Cohen
  - Sotos

Most associated with developmental delay



No matter what the cause of obesity,  
lifestyle change is helpful

# POTENTIAL CONSEQUENCES OF OBESITY IN CHILDREN

- Rapid growth and early puberty
- Bullying
- Depression
- Decreased quality of life
- Medical co-morbidities
  - Metabolic
  - Mechanical

# MAJOR COMORBIDITIES OF OBESITY IN CHILDHOOD

1. Sleep apnea (ENT, Pulmonology, or Sleep Clinic)
2. Diabetes (Endocrinology)
3. Lipid abnormalities (Cardiology or Endocrinology)
4. Hypertension (Nephrology)
5. Fatty liver (GI)
6. PCOS (Endocrinology, Ob-Gyn, or Adolescent Medicine)

For further reference see Children's Hospital Association Consensus Statements for Comorbidities of Childhood Obesity, *Childhood Obesity* August 2014

# LABORATORY STUDIES

## EXPERT COMMITTEE GUIDELINES

≥ 2 years old with BMI ≥ 95<sup>th</sup> %

Fasting lipid panel

≥ 10 years old with BMI ≥ 95<sup>th</sup> %

Fasting lipid panel

Fasting glucose

Hemoglobin A1c

AST, ALT

Repeat labs every 2 years (or sooner if abnormal)

*Pediatrics* 2007 and 2011

Pediatric Endocrine Society 2008

Consider additional labs based on clinical concerns:

- BUN, creatinine if hypertensive
- fT4, TSH
- Fasting insulin
- 25-OH Vitamin D
- PCOS labs with irregular menses or signs of hyperandrogenism: LH, FSH, DHEA-S, estradiol, SHBG, prolactin, free and total testosterone

# SLEEP APNEA

- History: snoring, pauses, daytime somnolence or hyperactivity
- Physical: enlarged tonsils, narrow airway, nasal congestion
- Assessment: polysomnogram - abnormal if apnea-hypopnea index (AHI)  $>1$
- Treatment: weight loss, nasal steroids, T&A, CPAP

# TYPE 2 DIABETES

	Normal	Prediabetes	Diabetes
Fasting glucose	<100	100-125	≥126
2-hour GTT	<140	140-199	≥200
Random glucose	<200		≥200 with symptoms
Hemoglobin A1c	<5.7	5.7-6.4	≥6.5

Usual 1<sup>st</sup> line of treatment: metformin

Diet: Low glycemic index

Reference: American Diabetes Association Clinical Practice Recommendations 2016

# HEALTHY KIDS ARE SWEET ENOUGH

Kids age 2-18 should have **LESS THAN 25 GRAMS** or **SIX TEASPOONS** of **ADDED SUGARS DAILY** for a healthy heart.



*less than six...*

tsp

tsp

tsp

tsp

tsp

tsp

Source: American Heart Association statement:  
Added Sugars and Cardiovascular Disease Risk in Children



# HYPERLIPIDEMIA

	Total cholesterol	LDL	TG 2-9 years	TG >9 years
Acceptable	<170	<110	<75	<90
Borderline	170-199	110-130	75-99	90-129
Abnormal	≥200	≥130	≥100	≥130

Consider pharmacologic treatment for children  $\geq 8$  years old with:

- Persistent elevation of LDL  $> 190$  after diet therapy, with no other risk factors
- Persistent elevation of LDL  $> 160$  after diet therapy, with risk factors
- LDL  $> 130$  in children with diabetes

References: Pediatrics 2011 and Childhood Obesity 2014



# HYPERTENSION

	BP	Follow-up	Drug tx
Prehypertension	90 to < 95 <sup>th</sup> %	6 months	
Stage 1 hypertension	95 <sup>th</sup> -99 <sup>th</sup> % + 5 mm Hg	1-2 weeks	Selectively treat
Stage 2 hypertension	> 99 <sup>th</sup> % + 5 mm Hg	1 week	Treat

2004 NHLBI Guidelines: Normative tables for age, sex, and height  
The fourth report on the diagnosis, evaluation and treatment of high  
blood pressure in children and adolescents

## Evaluation of confirmed hypertension:

Labs: BUN, creatinine, electrolytes, UA, UC, CBC

Studies:  
renal ultrasound  
echocardiogram (for LVH)

## Treatment of hypertension:

Therapeutic Lifestyle Change  
(consider the DASH eating plan)

Drug therapy for:  
symptomatic hypertension  
secondary hypertension  
hypertensive target organ damage  
diabetes,  
persistent hypertension

# Obesity treatment starts with prevention!

- Prenatal environment:
  - Avoid gestational diabetes
- Infant feeding:
  - Promote breastfeeding and appropriate introduction of solids
  - Watch for rapid weight gain infancy
- Preschool years:
  - Healthy feeding habits
  - Promote self esteem
- Secondary prevention:
  - Arrest rapid weight gain

# TREATMENT

## 1. Lifestyle modification

- Assess readiness for change
- Use motivational interviewing

## 2. Medication

- Only orlistat approved for use in children

## 3. Surgery

- Completion of growth (generally  $\geq 13$  years old in girls and  $\geq 15$  years old in boys)
- BMI  $\geq 35$  with major comorbidities of obesity (type 2 diabetes mellitus, moderate to severe OSA, pseudotumor cerebri, severe NASH)
- BMI  $\geq 40$  with lesser comorbidities of obesity
- Psychiatric clearance

# BARRIERS TO TREATMENT

- Patients and families
  - Parental or child resistance
  - Cultural norms
  - Cost of high quality food
  - Lack of access to safe play areas
- Medical providers
  - Lack of time [67%, not enough time]\*
  - Lack of resources [53%, lack of referral resources]\*
  - Perceived lack of efficacy [39%, counseling not effective]\*

\* Klein 2010

# DO NO HARM

## Risks of obesity treatment

- Eating disorder symptoms
- Mental health issues

## Risks of not treating

- Medical complications
- Mental health issues
- Social stigma
- Shortened life span

# OBESITY AND MEDICAL NEGLECT

Varness T, Allen DB, Carrel AL, Fost N. Childhood obesity and medical neglect. *Pediatrics*. 2009 Jan;123(1):399-406. Review.

*3 conditions to justify state intervention:*

- high likelihood of serious imminent harm from comorbid conditions (notably diabetes, sleep apnea, and fatty liver disease)
- reasonable likelihood that coercive intervention will result in effective treatment
- absence of alternative options

# CALORIE NEEDS

- Roughly 1000 calories per day at age 1
- Additional 100 calories per day per year of age from 2 to 11 years old
- 2000 calories per day adult females (average)
- 2500 calories per day adults males (average)

See 2002 DRI's from IOM, NAS for further reference.

Roughly estimate portion size by the palm of the hand.

One pound of weight loss=  
3500 calories

Equivalent to a deficit of 500 calories per  
day to lose one pound per week

Maximum safe weight loss for children 6-18  
years of age per AAP guidelines in 2007:  
2 pounds per week



# 2008 PHYSICAL ACTIVITY GUIDELINES FOR AMERICANS

## Children and adolescents (aged 6-17)

- 1 hour or more of physical activity daily
- Most of the 1 hour should be moderate or vigorous intensity aerobic activity
- Include vigorous intensity activity at least 3 days per week (ex. running, jumping, swimming, dancing)
- Include muscle strengthening activity at least 3 days per week (ex. using playground equipment , climbing trees, playing tug of war)
- Include bone strengthening activity at least 3 days per week (ex. running, jump rope, tennis, basketball)

[www.health.gov/paguidelines](http://www.health.gov/paguidelines)

# TIPS FOR TREATMENT

- Develop a healthy gut flora with prebiotics (foods with fiber) and probiotics (fermented foods such as yogurt)
- Increase satiety by including some fat and protein in the diet
- Increase metabolism with green tea
- Calm inflammation with foods such as walnuts and fish and spices such as tumeric
- Promote social eating

# SCHOOL NURSES

National Association of School Nurses (NASN)

2013 position statement:

Overweight and Obesity in Youth in Schools

The Role of the School Nurse

- Promote healthy weight
- Identify overweight and obese youth at risk for health problems
- Refer and follow up students who need to see a health care provider
- Educate and advocate for changes in school and district policies that promote a healthy lifestyle