Can The Obesity Curve Change?

Stanley Bassin  Ed.D.
Clinical Professor of Medicine
Exercise Physiologist
Heart Disease Prevention Program
Division of Cardiology
University of California, Irvine
Presentation Objectives

1) Cite our historical, community and national demographics on obesity and its related diseases.

2) Describe the health issues associated with obesity, such as diabetes, hypertension, cholesterol, etc.

3) Summarize strategies to effect obesity.
What % of our population is classified as overweight and/or obese?

- 40
- 50
- 60
- 70
- Don’t Know
- Not my problem
What is the number ONE Risk factor for Chronic Disease in the USA?

- Smoking
- Obesity
- Total Cholesterol
- Physical Inactivity
- Unknown
The big picture

Is there a biological predisposition?

Is there a genetic predisposition?

Which genes convey the risk?

Epigenetics as a potential contributor

Summary
Obesity is a Medical Condition:

• NIH have recognized obesity as the major modifiable risk as a core risk factor for chronic disease.

• Obesity is a risk factor for development of hypertension, diabetes, dyslipidemia and cancer. Obesity also linked to insulin resistance, particular intrabdominal fat estimated by waist circumference.

• Residents do not document in discharge notes obesity.

• No plans listed to address even severe obesity in discharge notes.
BACKGROUND AND RATIONALE
Foraging Range of Different Primates

* from Leonard and Robertson.  
Traditional Agriculture
Modern Agricultural Period
Changes In Search For Food
David, After His Visit to the U.S.
What are the genes associated with an increased risk for obesity?

The evidence is growing in support of the hypothesis of a polygenic risk profile, each with a relatively small contribution.
What can we expect from the observations on assortative mating for body size and mass?

A growing increase in the prevalence of obesity, particularly in the number of cases with a strong genetic predisposition.
What is the importance of the energy imbalance, the so-called energy gap?

The energy differential between obese and normal weight children is commonly grossly underestimated.
Complications of obesity in children and adolescents

Psychosocial
- Eating disorders
- Poor self-esteem
- Body image disorder
- Social isolation and stigmatisation
- Depression

Neurological
- Pseudotumour cerebri (idiopathic intracranial hypertension)

Pulmonary
- Exercise intolerance
- Obstructive sleep apnoea
- Asthma

Cardiovascular
- Hypertension
- Dyslipidaemia
- Coagulopathy
- Chronic inflammation
- Endothelial dysfunction

Gastrointestinal
- Gallstones
- Gastro-oesophageal reflux
- Non-alcoholic fatty liver disorder

Endocrine
- Insulin resistance
- Impaired fasting glucose or glucose intolerance
- Type 2 diabetes
- Precocious puberty
- Menstrual irregularities
- Polycystic ovary syndrome (females)

Renal
- Glomerulosclerosis

Musculoskeletal
- Ankle sprains
- Flat feet
- Tibia vara
- Slipped capital femoral epiphysis
- Forearm fracture

Source: Adapted from Lancet 2002
Ebbeling et al
Obesity Trends* Among U.S. Adults
(*BMI ≥ 30, or about 30 lbs. overweight for 5’ 4” person)
# Top 10 States - Adults

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Percentage of Adult Obesity (Based on 2008-2010 Combined Data, Including Confidence Intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mississippi</td>
<td>34.4% (+/- 0.9)</td>
</tr>
<tr>
<td>2</td>
<td>Alabama</td>
<td>32.3% (+/- 1.0)</td>
</tr>
<tr>
<td>3</td>
<td>West Virginia</td>
<td>32.2% (+/- 1.1)</td>
</tr>
<tr>
<td>4</td>
<td>Tennessee</td>
<td>31.9% (+/- 1.2)</td>
</tr>
<tr>
<td>5</td>
<td>Louisiana</td>
<td>31.6% (+/- 0.9)</td>
</tr>
<tr>
<td>6</td>
<td>Kentucky</td>
<td>31.5% (+/- 1.0)</td>
</tr>
<tr>
<td>7</td>
<td>Oklahoma</td>
<td>31.4% (+/- 0.8)</td>
</tr>
<tr>
<td>8</td>
<td>South Carolina</td>
<td>30.9% (+/- 1.0)</td>
</tr>
<tr>
<td>9</td>
<td>Arkansas</td>
<td>30.6% (+/- 1.2)</td>
</tr>
<tr>
<td>10</td>
<td>Michigan</td>
<td>30.5% (+/- 0.8)</td>
</tr>
</tbody>
</table>
## Bottom 10 States - Adults

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Percentage of Adult Obesity (Based on 2008-2010 Combined Data, Including Confidence Intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Colorado</td>
<td>19.8% (+/-0.7)</td>
</tr>
<tr>
<td>50</td>
<td>D.C.</td>
<td>21.7% (+/-1.0)</td>
</tr>
<tr>
<td>49</td>
<td>Connecticut</td>
<td>21.8% (+/-0.9)</td>
</tr>
<tr>
<td>48</td>
<td>Massachusetts</td>
<td>22.3% (+/-0.6)</td>
</tr>
<tr>
<td>47</td>
<td>Hawaii</td>
<td>23.1% (+/-0.9)</td>
</tr>
<tr>
<td>46</td>
<td>Utah</td>
<td>23.4% (+/-0.8)</td>
</tr>
<tr>
<td>45</td>
<td>Vermont</td>
<td>23.5% (+/-0.8)</td>
</tr>
<tr>
<td>44</td>
<td>Montana</td>
<td>23.8% (+/-0.9)</td>
</tr>
<tr>
<td>43</td>
<td>New Jersey</td>
<td>24.1% (+/-0.7)</td>
</tr>
<tr>
<td>42</td>
<td>Rhode Island</td>
<td>24.3% (+/-1.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td><strong>18%</strong></td>
<td></td>
</tr>
<tr>
<td>[Canada Flag]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td><strong>31%</strong></td>
<td></td>
</tr>
<tr>
<td>[United States Flag]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mexico</strong></td>
<td><strong>24%</strong></td>
<td></td>
</tr>
<tr>
<td>[Mexico Flag]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Obesity and overweight prevalences in European children aged 7-11 yrs.

IOTF cut-off points with regional or nationally representative measured data sets.

IOTF data presented at EU Platform Launch, March 15th 2005
Scope of the USA Obesity Problem

Both overweight and obesity occur regardless of race/ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>33.6%</td>
<td>17.1%</td>
</tr>
<tr>
<td>White</td>
<td>33.5%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Black</td>
<td>35.1%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>37.0%</td>
<td>19.2%</td>
</tr>
</tbody>
</table>

Source: Ogden et al., JAMA 295:1549-1555, 2006
### States with the Highest Rates of Obese 10- to 17-year-olds

<table>
<thead>
<tr>
<th>Rank</th>
<th>States</th>
<th>Percentage of Obese 10- to 17-year-olds (95 percent Confidence Intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mississippi</td>
<td>21.9% (+/- 3.5)</td>
</tr>
<tr>
<td>2</td>
<td>Georgia</td>
<td>21.3% (+/- 5.1)</td>
</tr>
<tr>
<td>3</td>
<td>Kentucky</td>
<td>21.0% (+/- 3.5)</td>
</tr>
<tr>
<td>4 (tie)</td>
<td>Illinois</td>
<td>20.7% (+/- 3.6)</td>
</tr>
<tr>
<td>4 (tie)</td>
<td>Louisiana</td>
<td>20.7% (+/- 4.0)</td>
</tr>
<tr>
<td>6</td>
<td>Tennessee</td>
<td>20.6% (+/- 3.7)</td>
</tr>
<tr>
<td>7 (tie)</td>
<td>Arkansas</td>
<td>20.4% (+/- 3.6)</td>
</tr>
<tr>
<td>7 (tie)</td>
<td>Texas</td>
<td>20.4% (+/- 5.0)</td>
</tr>
<tr>
<td>9</td>
<td>D.C.</td>
<td>20.1% (+/- 3.9)</td>
</tr>
<tr>
<td>10</td>
<td>West Virginia</td>
<td>18.9% (+/- 3.2)</td>
</tr>
</tbody>
</table>
## Bottom 10 States - Children

<table>
<thead>
<tr>
<th>Rank</th>
<th>States</th>
<th>Percentage of Obese 10- to 17-year-olds (95 percent Confidence Intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Oregon</td>
<td>9.6% (+/- 2.7)</td>
</tr>
<tr>
<td>50</td>
<td>Wyoming</td>
<td>10.2% (+/- 2.7)</td>
</tr>
<tr>
<td>48 (tie)</td>
<td>Washington</td>
<td>11.1% (+/- 3.4)</td>
</tr>
<tr>
<td>48 (tie)</td>
<td>Minnesota</td>
<td>11.1% (+/- 3.0)</td>
</tr>
<tr>
<td>46 (tie)</td>
<td>Iowa</td>
<td>11.2% (+/- 2.7)</td>
</tr>
<tr>
<td>46 (tie)</td>
<td>Hawaii</td>
<td>11.2% (+/- 2.8)</td>
</tr>
<tr>
<td>44 (tie)</td>
<td>Utah</td>
<td>11.4% (+/- 3.5)</td>
</tr>
<tr>
<td>44 (tie)</td>
<td>North Dakota</td>
<td>11.4% (+/- 2.5)</td>
</tr>
<tr>
<td>42 (tie)</td>
<td>Montana</td>
<td>11.8% (+/- 2.8)</td>
</tr>
<tr>
<td>42 (tie)</td>
<td>Idaho</td>
<td>11.8% (+/- 2.7)</td>
</tr>
</tbody>
</table>
Percentage of U.S. Youth who are Obese by age

BMI Equal or greater than 95% age/sex CDC Growth Charts

- 6-11 years
- 12-19 years

Years of Survey

Sources: Medline, 2006; Ogden et al. JAMA;195:1549-55, Hedley et al. JAMA;291:2847-2850
32% are overweight or obese.

- Pacific Islanders (42%), Latinos (40%), American Indians (37%)

75% of overweight children will become overweight or obese adults.
OC Obesity: Low Income 2-4 Year Olds (2009)

Obesity prevalence among low income 2-4 year olds

<table>
<thead>
<tr>
<th>Year</th>
<th>Orange County</th>
<th>California</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>15.9</td>
<td>16.7</td>
<td>16.4</td>
</tr>
<tr>
<td>2000</td>
<td>16.7</td>
<td>16.4</td>
<td>16.4</td>
</tr>
<tr>
<td>2001</td>
<td>17</td>
<td>17.4</td>
<td>16.4</td>
</tr>
<tr>
<td>2002</td>
<td>17.4</td>
<td>19.6</td>
<td>16.4</td>
</tr>
<tr>
<td>2003</td>
<td>20.9</td>
<td>16.4</td>
<td>16.4</td>
</tr>
<tr>
<td>2004</td>
<td>20.9</td>
<td>16.4</td>
<td>16.4</td>
</tr>
<tr>
<td>2005</td>
<td>16.4</td>
<td>16.6</td>
<td>16.4</td>
</tr>
<tr>
<td>2006</td>
<td>16.4</td>
<td>16.6</td>
<td>16.4</td>
</tr>
<tr>
<td>2007</td>
<td>16.8</td>
<td>16.6</td>
<td>16.4</td>
</tr>
<tr>
<td>2008</td>
<td>16.4</td>
<td>16.6</td>
<td>16.6</td>
</tr>
<tr>
<td>2009</td>
<td>16.8</td>
<td>16.6</td>
<td>16.6</td>
</tr>
</tbody>
</table>
OC Obesity: Low Income 5-19 Year Olds (2009)

Obesity Prevalence (>= 95th Percentile)

Orange County
California

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

17.9 19.2 19.4 21.1 21.5 23.3 23.6 20.9 21.1 21.2 20.6

Pediatric Nutrition Surveillance System 2009
### Obesity: Adults (2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>Orange County</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>2001</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>2002</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>2003</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>2004</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>2005</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**California Health Interview Survey 2009**
# Prevalence in Orange County

<table>
<thead>
<tr>
<th>Population</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>40.0%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Children 5-19</td>
<td>18.5%</td>
<td>21.2%</td>
</tr>
<tr>
<td>Children 2-4</td>
<td>15.9%</td>
<td>16.6%</td>
</tr>
</tbody>
</table>

Behavioral Risk Factor Surveillance System (BRFSS) 2009  
Pediatric Nutrition Surveillance System  2008
Why Does it Matter?
Diabetes

• 80 – 90% of diabetics are overweight or obese
• Obese women are 7 times more likely to develop diabetes
• One in three Americans born in 2000 will likely develop diabetes in their lifetime
  – The rate is 2x for Latinos!
Healthcare Costs

$1,429 in avoidable cost per person per year.

Over $800 million in Orange County!
Farm Subsidies USA Obesity: Apples to Soda

1995-2010 Farm Subsidies $16.9 Billion to producers of Corn Syrup products.

Taxpayers given $7.36 to buy Corn Syrup products (Soda etc)

$11 cts to buy APPLES !!!!
Cost of Obesity

• Overweight and obese individuals are more likely to:
  – Develop chronic disease risk factors, such as high blood pressure and dyslipidemia.
  – Develop chronic diseases, such as type 2 diabetes, heart disease, osteoarthritis, and some cancers.
  – Experience complications during pregnancy.
  – Die at an earlier age.

• Health-related costs:
  – $1,429 per person annually
  – $671 million in avoidable cost in Orange County

US Centers for Disease Control and Prevention 2010
How did we get here?
What can we expect from the observations on assortative mating for body size and mass?

A growing increase in the prevalence of obesity, particularly in the number of cases with a strong genetic predisposition.
Family Patterns

“Thanks for almost everything dad and mom”

- 7-8% of obese adults are born to parents both lean
- 40% of obese adults have one parent who is obese
- 66% of obese adults have two obese parents

Comment: Genetics predicts obesity but the environment causes it.
A Balancing Act
The 7 deadly environmental sins of obesity

1. The "commodified" environment: an obsession with consumption
2. The harried environment: time pressures
3. The pressurised parent environment: excess demands
4. The technological environment
5. The car-reliant environment
6. The marketed environment
7. The environment of competing authorities

The seven deadly sins of obesity: how the modern world is making us fat Dixon J & Broom DH Eds. UNSW Press 2007
Why Are We More Sedentary?

• How Our Society Discourages Physical Activity

• Behavior is shaped, in large measure, by one's environment. Our young people live in a social and physical environment that makes it easy to be sedentary and inconvenient to be active.
Transportation
New technology has conditioned our young people to be less active, while new electronic media (e.g., video and computer games, cable and satellite television) have made sedentary activities more appealing.
What do Children think of Play?

Real Play

Simulated Play
"You don't double-click it, dear. It's a ball."
Community Design

- Community design centered around the automobile has discouraged walking and bicycling and has made it more difficult for children to get together to play.
Increased concerns about safety have limited the time and areas in which children are allowed to play outside.
Communities have failed to invest adequately in close-to-home physical activity facilities (e.g., parks, recreation centers).
States and school districts have reduced the amount of time students are required to spend in physical education classes, and many of those classes have so many students that teachers cannot give students the individual attention they need.
Trends in Physical Inactivity

- Among American Youth 12-21 years of age, enrollment among physical activity classes declined from 42% in 1991 to 27% in 1997. Decline continues to 22% 2009.
- Vigorous physical activity participation declined from 66% in girls and 79% in boys in grade 9 to 44% in girls and 68% in boys by grade 2009.
- From 1988 to 1992, doubling in prevalence of white males reporting no physical activity from 13% to 25%.2009 33%.
Primary Prevention
- Health Screening -

• Height
• Weight
• BMI
• Waist circumference
• Blood pressure
• Fasting blood draw
  – insulin and glucose
  – lipids (total cholesterol, HDL, LDL, triglycerides)
  – other laboratory indicators of diabetes and obesity risk, such as HbA1c
What Is BMI?

Body mass index (BMI) = weight (kg)/height (m)^2

BMI is an effective SCREENING tool; it is not a diagnostic tool.

For children, BMI is age and gender specific, so BMI-for-age is the measure used.
Body Mass Index (BMI) describes relative weight for height: weight (kg)/height (m^2)

- **Overweight = 25–29.9 BMI**
- **Obesity = ≥ 30 BMI**
Intra-abdominal (Visceral) Fat

*The dangerous inner fat!*

**Front**

**Back**

Visceral AT

Subcutaneous AT
How to Measure Waist Circumference

- Locate upper hip bone and top of right iliac crest
- Place measuring tape in horizontal plane around abdomen at iliac crest
- Ensure tape is snug, but does not compress the skin
- Tape should be parallel to floor
- Record measurement at the end of a normal expiration

Women
>35 inches increased risk*

Men
>40 inches increased risk*

*Ethnic/age-related differences in body fat distribution may affect validity of waist circumference as surrogate for abdominal fat

FIG. 1A: Women

Cumulative Incidence of Heart Failure (%)

<table>
<thead>
<tr>
<th>Years</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1729</td>
<td>955</td>
<td>493</td>
</tr>
<tr>
<td>3</td>
<td>1688</td>
<td>929</td>
<td>477</td>
</tr>
<tr>
<td>6</td>
<td>1634</td>
<td>880</td>
<td>448</td>
</tr>
<tr>
<td>9</td>
<td>1588</td>
<td>815</td>
<td>408</td>
</tr>
<tr>
<td>12</td>
<td>1477</td>
<td>757</td>
<td>372</td>
</tr>
<tr>
<td>15</td>
<td>1227</td>
<td>634</td>
<td>286</td>
</tr>
<tr>
<td>18</td>
<td>295</td>
<td>248</td>
<td>104</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Effect of Moderate Weight Loss On Cardiometabolic Risk Factors

- Weight (lbs): Initial change 15.1%, 4 weeks change 15.0%, Final (avg. 16.7 weeks) change 11.7%
- BMI (kg/m²): Initial change 10.5%
- Systolic BP (mm Hg): Initial change 9.3%
- Diastolic BP (mm Hg): Initial change 16.5%
- Glucose (mg/dL): Initial change 44.8%
- TG (mg/dL): Initial change 11.7%
- Cholesterol (mg/dL): Initial change

Percent changes are initial visit to final visit.

Determining a Healthy Body Weight

- Assess your body composition by waist circumference.
- Choose a target value for BMI or percent body fat that is realistic for you and will ensure good health.
- Determine the recommended body weight based on your BMI or percent body fat goal.
- Examine the body weight that the formulas generate for you and allow for individual genetic, cultural, and lifestyle factors.
A Balancing Act
Conceptual Model of How Childhood Exercise Habits May Affect Health Throughout Life
Exercise & Weight Control

“To induce weight loss in youth we need to increase total energy expenditure by about 8-12%”

D. Cooper, @ NIDDK 2/2003
Exercise Benefit Zone

Estimated maximum heart rate (MHR) (beats per minute)

Upper threshold EBZ (85 percent level)

Exercise Benefit Zone

Lower threshold EBZ (60 percent level)

Age in years
Effect of 5 Exercise Sessions per Week on Total Energy Expenditure (TEE)

Expect ≥ 8-10% increase in fitness

Amount of Exercise Needed to Improved Fitness

Mean HR During Exercise Session (bpm)
INSULIN CHANGE RELATED TO THE INTENSITY OF EXERCISE

**Percent of Maximal Capacity**

![Graph showing the relationship between insulin levels and exercise intensity](image-url)
Physical Activity Recommendations

- Aerobic exercise a minimum of 30 minutes, 5 times weekly
- Optimal physical activity is at least 30 minutes daily
- Resistance exercise training using free weights or machines 2 days a week in the absence of contraindications
"What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?"
<table>
<thead>
<tr>
<th>Steps</th>
<th>Silhouette</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10,000 steps</td>
<td>Thin figure</td>
</tr>
<tr>
<td>8,000 steps</td>
<td>Slightly thicker</td>
</tr>
<tr>
<td>6,000 steps</td>
<td>Thicker figure</td>
</tr>
<tr>
<td>4,000 steps</td>
<td>Obese figure</td>
</tr>
<tr>
<td>&lt;2,000 steps</td>
<td>Obese figure</td>
</tr>
</tbody>
</table>
The Activity Pyramid

SEDENTARY ACTIVITIES
Do infrequently
- Watching television
- Surfing the Internet
- Talking on the telephone

STRENGTH TRAINING
2–3 days per week
(all major muscle groups)
- Biceps curls, push-ups, abdominal curls, bench press, calf raises

FLEXIBILITY TRAINING
2 or more days per week (all major joints)
- Calf stretch, side lunge, step stretch, hurdler stretch

CARDIORESPIRATORY ENDURANCE EXERCISE
3–5 days per week (20–60 minutes)
- Walking, jogging, bicycling, swimming, aerobic dancing, in-line skating, cross-country skiing, dancing, basketball

MODERATE-INTENSITY PHYSICAL ACTIVITY
Most days—preferably every day
(about 30 minutes)
- Walking to the store or bank
- Washing windows or your car
- Climbing stairs
- Working in your yard
- Walking your dog
- Cleaning your room