Obesity

The Good, the Bad, and . . .

What is Obesity?

- Obesity is a higher percentage of body fat than deemed desirable by some standard
- Overweight is more weight for a given height than is desirable according to some standard

Why Standards?

- Physiology/health
  - Is weight or fatness the physiological cause of problems
  - Is some percent fat consistently associated with illness?
- Natural Selection
  - Is weight or fatness associated with obtaining a mate?
  - Is it better to be fat or thin?
- Culture
  - What is desirable body build?

What Standard?

Cross-cultural Standards of Female Beauty
(based on 38 of 325 cultures in HRAF with data to estimate favored body habitus (Brown and Konner, 1987)

Body Image Through History

120 BC
- Venus de Milo: Greek goddess

1400’s
- Botticelli’s Birth of Venus

Art depicted beauty as soft and curvaceous
1500’s
Leonardo da Vinci’s Mona Lisa
Rubens’ Garden of Love

1600’s
Rubens women described as “zaftig”

1880’s
- Plump body, pale complexion
- Representing wealth, abundance of food, and a refined lifestyle

Early 1900s
- A plump body, corseted, hour-glass “Gibson Girl” look, pale complexion
- Representing wealth, an abundance of food and a refined indoor lifestyle

1920s
- Era of the flat-chested, slim-hipped flapper
- Smoking, drinking, enjoying a new era of permissiveness freed from Victorian era mores

WW II
- Number 1 pinup image of the GIs was this full-bodied bathing suit photo of Betty Grable
- Re-emphasizing curves

1950s
- Full-figured shapes of Marilyn Monroe and Jayne Mansfield

Typical models
- Height: 5’8”
- Weight: 132 lbs.
- BMI: 20.1
Body Image Through History

- **1960’s**
  - The gaunt Twiggy look
  - Typical Models:
    - Height: 5’7”
    - Weight: 98 lbs
    - BMI: 15.3
    - Clinically anorexic

- **1970’s and 1980’s**
  - Taller, thinner look
  - No visible body fat
  - Muscles highly toned from hours of working out
  - Typical models:
    - Height: 5’8”
    - Weight: 117 lbs
    - BMI: 17.8

- **Early 1990’s**
  - Waif-like figure of Kate Moss
  - Pre-teen look in adult women
  - < 4% of women have this tall, very thin look naturally
  - Typical models:
    - Height: 5’10”
    - Weight: 110 lbs
    - BMI: 15.8

- **Late 1990’s**
  - Narrow hips yet large breasts
  - Rare combination without breast implants
  - Pamela Anderson:
    - 36-22-34
    - Height: 5’7”
    - Weight: 105 lbs
    - BMI: 16.4

- **2000’s**
  - Average model:
    - Height: 5’8” - 5’11”
    - Weight: <120 lbs
    - BMI < 18.0
    - % body fat: <10%
  - The average North American woman:
    - Height: 5’4”
    - Weight: 152 lbs
    - BMI: 26.1
    - % body fat: > 32%
If Barbie were real . . .

• She would stand 6’ tall, weigh 101 lbs, have a BMI of 13.7, wear a size 4, and her measurements would be 39-19-33

If G.I. Joe were real . . .

• His biceps would be 27”
• He would have a 55” chest
• His BMI would be over 25, probably over 30 to reflect the excessive musculature

History of Standards

• 1942 First Edition of the Metropolitan Life Insurance Company (MLIC) tables
  – Weight-for-height tables
    • Ideal weight—range for each inch of height
    • Individuals outside of range are considered overweight or underweight

• 1959 MLIC tables used for 24 years
  – Derived from distributions of weight-for-height associated with minimal mortality
  – Snapshot of large group in the U.S. and Canada who purchased life insurance policies from 26 life insurance companies from 1935 to 1954
    • Desirable weight
    • Distribution divided into thirds for “small”, “medium”, and “large” frames
    • No measurement of frame size

Limitations on Ideal Weight

• Height and weight measured while subjects wear street shoes and indoor clothing of varying amounts
• Measured with non-standardized protocols and equipment
• Self reported for up to 20% of the sample

• Self report bias:
  – Women and heavy men tend to underestimate and light men tend to overestimate weight
  – Men tend to overestimate height
  – Women underestimate height
• Weight in pounds is frequently rounded to digits ending in 0 or 5; home bathroom scales are known to be inaccurate
• Recorded or reported only at time of application for life insurance policy
**History of Standards**

- **1984 Health United States**
  - Official annual report of the Sec'y of DHHS on the health status of the nation
  - First report of national overweight prevalences
  - Men, BMI ≥ 28.0
  - Women, weight/height \(1.5 > 35.0\)
    - The power of 1.5 was used for women because, for an earlier report, this was calculated as the power to be used for height in the index for women

- **Bindon and Baker, 1985**
  - Adiposity was analyzed as a categorical variable on the basis of the triceps skinfold, with lean, medium, and obese groups
  - The defining values for the obese categories were chosen because they approximate estimates of 20% body fat for males or 30% body fat for females, values that are accepted by several authorities as being the lower bounds of obesity

- **1985 NIH Consensus Development Conference on the Health Implications of Obesity**
  - Worked to develop a new definition of overweight
  - Panel defined obesity as a BMI ≥ 27.8 for men and a BMI ≥ 27.3 for women
  - These BMI cutoffs represented the sex-specific 85th percentile of the BMI distribution for persons aged 20-29 y in NHANES II
  - Used in every Health United States from 1985 -1998

- **1987 National Center for Health Statistics**
  - Anthropometric reference data and prevalence of overweight, United States, 1976-80 (based on NHANES II)
  - Men: BMI ≥ 27.8, overweight
  - Women BMI ≥ 27.3, overweight
    - Based on distribution of BMI in 20-29 y.o., 85%ile for overweight, 95%ile for obese

- **1998 National Heart, Lung, and Blood Institute (NHLBI)**
  - Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults
  - Extended WHO standards for BMI:
    - Underweight: <18.5 kg/m\(^2\)
    - Normal weight: 18.5-24.9 kg/m\(^2\)
    - Overweight: 25.0-29.9 kg/m\(^2\)
    - Obesity 1: 30.0-34.9 kg/m\(^2\)
    - Obesity 2: 35.0-39.9 kg/m\(^2\)
    - Extreme obesity: ≥ 40 kg/m\(^2\)

**The 1998 Crisis**

- 35,000,000 Americans went to sleep one night in 1998 at a government-approved weight and woke up “overweight” the next morning, thanks to a change in the government’s definition.
Underweight – Normal Weight – Overweight – Obese

Jennifer Lopez
Height: 5’6”
Weight: 118 lbs
BMI: 19 (Normal)

’I couldn’t ever be a size zero. I just don’t see how I could get down to that size and still be healthy. I have a butt, I have boobs, I have a woman’s curves; there is no way I would see them go to size zero.’

Underweight – Normal Weight – Overweight – Obese

Dwayne (The Rock) Johnson
Height: 6’3”
Weight: 275 lbs
BMI: 33 (Obese)

Underweight – Normal Weight – Overweight – Obese

Johnny Depp
Height: 5’10”
Weight: 190
BMI: 27.3 (overweight)

Underweight – Normal Weight – Overweight – Obese

Salma Hayek
Height: 5’2”
Weight: 115 lbs
BMI: 21 (Normal)

’I find it very boring to have to be skinny all the time. It bores me and makes me bitchy. And yet in Hollywood it’s okay if you’re a bitch, as long as you’re skinny!’

Underweight – Normal Weight – Overweight – Obese

Jessica Alba
Height: 5’6”
Weight: 107 lbs
BMI: 17.3 (underweight)

Underweight – Normal Weight – Overweight – Obese

Donovan McNabb
Height: 6’3”
Weight: 210
BMI: 30.0 (Obese)

Tom Brady
Height: 6’4”
Weight: 225
BMI: 27.4 (overweight)
Prevalence of Overweight and Obesity in the NFL

![Prevalence Chart]

- 97% were "overweight"
- 56% were "obese"

Causes of Obesity

Energy Balance

Socio-Cultural Factors

- Positive energy balance (intake > expenditure) will cause weight gain
- Negative energy balance (intake < expenditure) will cause weight loss
- Excess calories are primarily stored as triglycerides in adipose tissue
- In negative energy balance adipose tissue is the primary source of energy for the body

Energy Balance

- To gain or lose a pound of adipose tissue requires an imbalance of approximately 3500 kcal
- A pound of adipose tissue (454 grams) consists of approximately:
  - 337 grams of fat (9 kcal/g)
  - 117 grams of protein and glycerol (4 kcal/g)
- That’s the physics and chemistry of weight gain and loss

Energy Balance

- Diet tends to vary less between individuals and activity varies more
  - The expenditure side of the energy balance equation appears to be more influential in determining balance
  - In my studies, for Samoans and African Americans
    - Diet was NOT associated with BMI
    - Activity WAS associated with BMI

Association of Obesity with SES by Economic Development

- Economic Development Continuum
  - Low: Samoa
  - Middle: A. Samoa
  - High: Advanced: US/UK

A. Samoa
Causes of Positive Energy Balance

- **Other Cultural Factors**
  - **Shared Ideals of Body Image**
  - As noted by Brown and Konner, many societies prefer plump women as mates
  - Events accompanying life events
  - Fattening for initiation rites

“...by BMI standards—otherwise considered overweight or obese.”
(Kumanyika and Grier, 2006:198-199)

Body Image in Samoan Women

Perceived current weight versus ideal weight for women in Samoa. Migrant Samoan women living in New Zealand perceive their current weight as more out of line with their thinner ideal than women living in Samoa.

Samoans have a relatively “thin” ideal, but also show an absence of a strongly negative view of obesity.

Consequences of Obesity

- **Heart Disease**
- **Diabetes**
- **Mortality**

Cardiovascular Disease

- Increasing BMI has been shown to be related to:
  - Higher Blood Pressures
  - Higher Cholesterol
  - Higher Triglycerides
- All these are risk factors for CVD

*Data from African American, Choctaw, and Samoan populations.*
So as BMI has increased over the past several decades, we should be seeing increasing CVD risk, RIGHT?

How About Diabetes?
Yes, type II diabetes is associated with higher BMI

2002 study of deaths from NHANES I, II, III
- Relative to NHANES I, the more recent data from NHANES II and NHANES III suggest . . . Cardiovascular risk factors have declined at all BMI levels in the US population, but, except for diabetes, the decline appears to be greater at higher BMI levels
- That is, CVD risk has declined with increasing BMI from 1971 – 1994!

An Epidemic?
- The twin epidemics of diabetes and obesity continue. From 1991 to 2001, a recent CDC study found a 61 percent increase in diagnosed diabetes (including gestational) in Americans and a 71 percent increase in obesity, reflecting the strong correlation between obesity and the development of diabetes.

*All three regressions significantly different from one another
**CDC, 2003**

- Diabetes epidemic amounts to 0.4% increase (or 5% of 8.2%)

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<tr>
<td>Adjusted percentage of adults aged ≥ 20 with fasting blood glucose levels above 126 mg/dL</td>
<td>8.2%</td>
<td>8.6%</td>
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**Say What?**

- The CDC relies on two sources for these statements
  - Behavioral Risk Factor Surveillance System which is a self-report
  - People report false positives and false negatives
  - Both true and false positives rise with increasing public notice about diabetes
  - NHANES based on fasting blood glucose measurements

- Which would you trust more?

**One More Thing**

- 1997 (the year before 33,000,000 Americans became overweight overnight) the American Diabetes Association lowered the standard for diagnosing diabetes from a fasting blood glucose level of 140 mg/dL to 126 mg/dL
- The CDC’s Morbidity and Mortality Weekly Report citing the 0.4% increase in diabetes notes: the potential impact on the prevalence estimates of the change in diagnosis of diabetes adopted by the ADA in 1997 should be accounted for
- However, the CDC’s web site estimate of a 61% increase continues to fail to account for changes in how diabetes is diagnosed

**But didn’t we hear about obesity becoming the #1 preventable cause of death?**

**The CDC Strikes Again**

- On March 9, 2004, the heads of the Department of Health and Human Services, National Institutes of Health (NIH), and Centers for Disease Control and Prevention (CDC) stood in front of a packed press conference to announce the conclusions of a CDC study that attributed 400,000 deaths each year to poor diet and physical inactivity

- USA Today typified the press coverage the next day with its lead story, “Obesity on Track as No. 1 Killer.”

**But Did You Hear . . .**

- A little over one year later, a scientifically superior study conducted by researchers from the CDC and the NIH found that obesity and overweight were responsible for fewer than 26,000 deaths per year—one-fifteenth the CDC’s original 100,000-deaths estimate
High and correct obesity mortality estimates showed that overweight actually decreased mortality, and obesity effects only showed up at BMI > 35. Underweight shows greater contribution to excess mortality than 25 < BMI < 35. Overweight and Class I obese actually show decreased mortality!

So is obesity a disease or a risk factor or a marker of lifestyle disease risks?

Fitness and Fatness

16-year follow-up study
- Prospective study among middle-aged and elderly men and women
  - Obesity (BMI ≥ 30) NOT related to increased risk of CVD and all-cause mortality
  - Low-level leisure time physical activity IS related to increased risk of CVD and all-cause mortality

Obesity is a Lifestyle Marker
- Low levels of physical fitness and physical activity are associated with
  - Insulin resistance → Type II Diabetes → Increased Blood Pressure and Blood lipids → Increased CVD
  - Decreased cardiorespiratory function
    - Less reserve capacity for stressful situations
    - Decreased cardiac vascularity
    - Makes the heart more susceptible to major damage from MI
Obesity Marks Low Activity

Obesity → Low Physical Activity → Diabetes CVD → High Mortality → Positive Energy Balance → Obesity