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

Bindon 1995

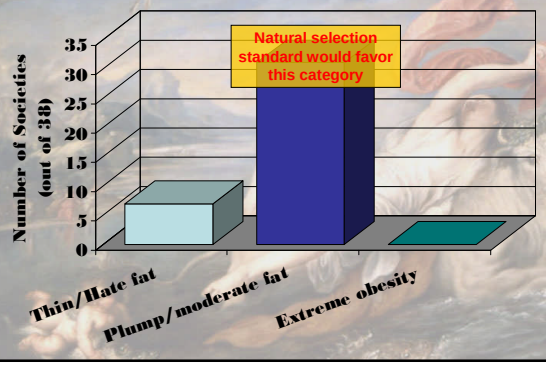
Why Standards?

- 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?

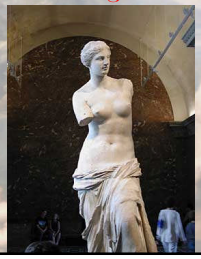
Cross-cultural Standards of Female Beauty

(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

Body Image Through History

- 1500's
  - Leonardo da Vinci's Mona Lisa

- 1600's
  - Rubens' Garden of Love

Rubens women described as "zaftig"

Body Image Through History

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

Seurat's A Sunday Afternoon

Body Image Through History

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

Body Image Through History

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

Body Image Through History

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

Body Image Through History

- 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

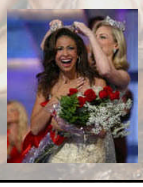
- 1960's
  - The gaunt Twiggy look
  - Typical Models:
    - Height: 5'7"
    - Weight: 98 lbs
    - BMI: 15.3
      - Clinically anorexic

Twiggy, the original size zero

Body Image Through History

- Miss America was normal weight in the 1920's through early 60's
- Underweight since the mid 60's






Body Image Through History

- 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

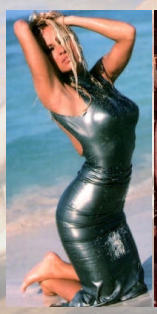


Body Image Through History

- 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


Body Image Through History

- 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



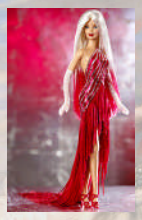

Body Image Through History

- 2000's
  - Average model:
    - Height: 5'8" – 5'11"
    - Weight: <120 lbs
    - BMI < 18.0
    - % body fat: <18%
  - The average North American woman:
    - Height: 5'4"
    - Weight: 152 lbs
    - BMI: 26.1
    - % body fat: > 32%

Most women DO NOT look like this!

If Barbie were real . . .

1959



- 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 muscularity

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

History of Standards

- 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

Limitations on Ideal Weight

- 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 Secty 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

Triceps Skinfold Standard		
Sex	Male	Female
Lean	< 10	< 15
Medium	10 – 19	15 – 29
Obese	20+	30+

- 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

History of Standards

- 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

History of Standards

- 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
    BMI ≥ 31.1, obese
  - Women BMI ≥ 27.3, overweight
    BMI ≥ 32.3, obese
    - Based on distribution of BMI in 20-29 y.o., 85%ile for overweight, 95%ile for obese

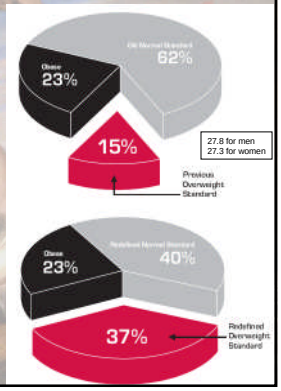
History of Standards

- 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:

<18.5 kg/m²	Underweight
18.5–24.9 kg/m²	Normal weight
25.0–29.9 kg/m²	Overweight
30.0–34.9 kg/m²	Obesity 1
35.0–39.9 kg/m²	Obesity 2
≥40 kg/m²	Extreme obesity

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

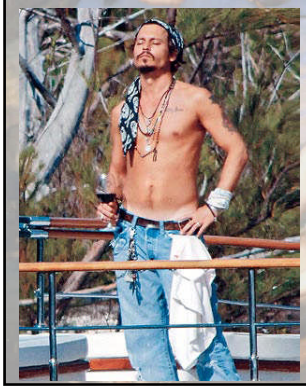
- Jennifer Lopez
- Height: 5' 6"
- Weight: 118 lbs
- BMI: 19 - Normal

- '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: 6'5"
- 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

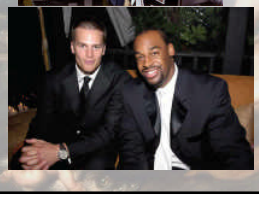
- Salma Hayek
- Height: 5' 2"
- Weight: 115 lbs
- BMI: 21 – Normal

- 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)

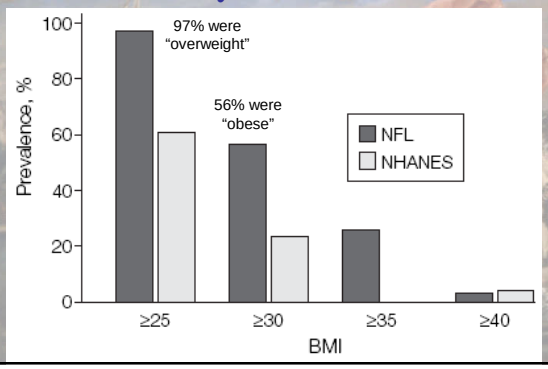
Underweight – Normal Weight – Overweight – Obese



- Donovan McNabb
- Height: 6' 3"
- Weight: 240
- BMI: 30.0 (obese)

- Tom Brady
- Height: 6' 4"
- Weight: 225
- BMI: 27.4 (overweight)

Prevalence of Overweight and Obesity in the NFL



Causes of Obesity

Energy Balance

Socio-Cultural Factors

Energy Balance

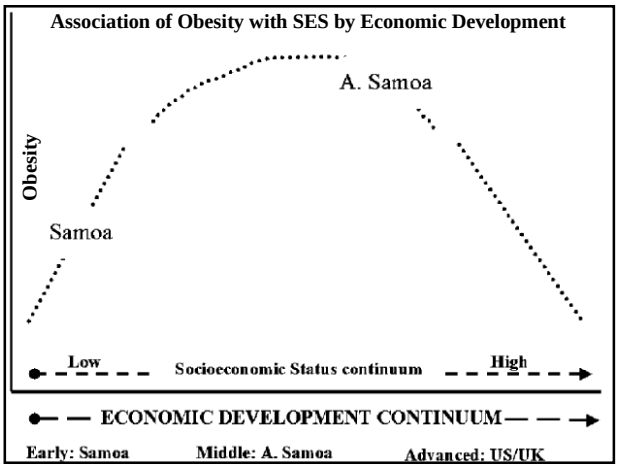
- Positive energy balance (intake > expenditure) will cause weight gain
- Negative energy balance (intake < expenditure) will cause weight loss
- Excess calories are primarily stored as triglycerides in adipose tissue
- In negative energy balance adipose tissue is the primary source of energy for the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



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**

Body Image

"In communities where many children or adults are obese, as in many ethnic minority and low-income communities, attitudes, norms, behaviors, and cultural influences may be in equilibrium with a high level of obesity. There may be a mixture of positive and negative attitudes about being overweight, especially where people who are thin are thought to be sick, addicted to drugs, too poor to have enough to eat, or to risk 'wasting away' in the case of food shortage or of serious illness. In such environments, parents and other family members may consider being overweight as normal, perhaps determined by heredity. Shapeliness, robustness, and nurturing qualities may be standards of female attractiveness that encourage the overall acceptance of people who—by BMI standards—are otherwise considered overweight or obese."

(Kumanyika and Grier, 2006:198-199)

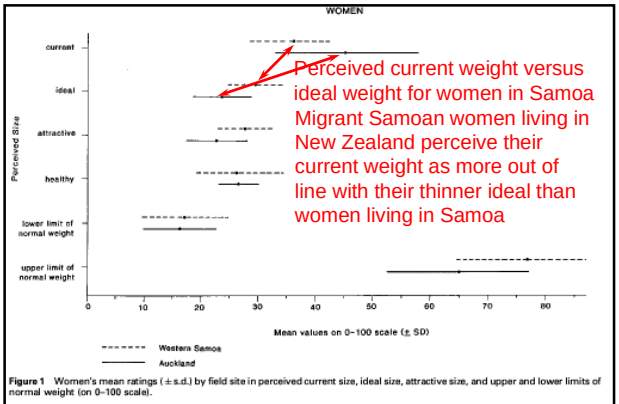


Figure 1 Women's mean ratings (±s.d.) by field site in perceived current size, ideal size, attractive size, and upper and lower limits of normal weight (on 0–100 scale).

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

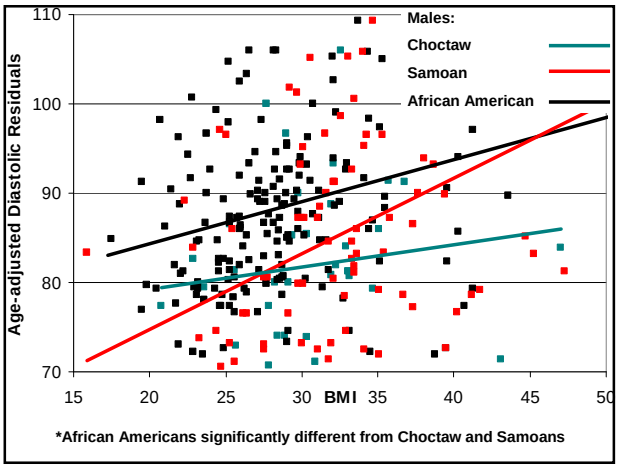
Samoans have a relatively "thin" ideal, but also show an absence of a strongly negative view of obesity

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**



*African Americans significantly different from Choctaw and Samoans

So as BMI has increased over the past several decades, we should be seeing increasing CVD risk, RIGHT?

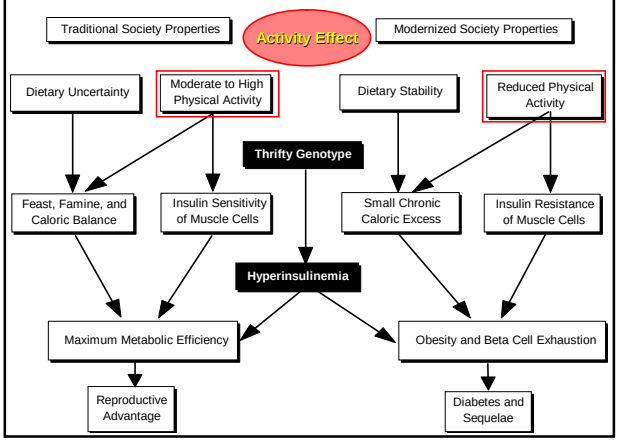
2002 study of deaths from NHANES I, II, III

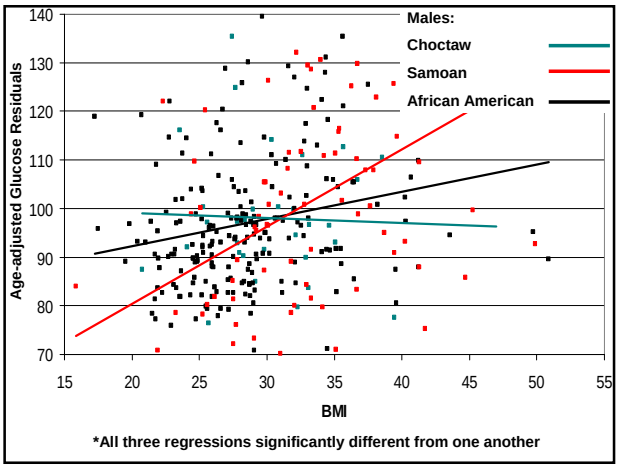
- Relative to NHANES I, the more recent data from NHANES II and NHANES III suggest . . . Cardiovascular risk factors have declined at all BMI levels in the US population, but, except for diabetes, the decline appears to be greater at higher BMI levels
- That is, CVD risk has declined with increasing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

How About Diabetes?

Yes, type II diabetes is associated with higher BMI

Figure 1. A speculative model of modernization and the "thrifty" genotype.





*All three regressions significantly different from one another

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 74 percent increase in obesity, reflecting the strong correlation between obesity and the development of diabetes.

(CDC. http://www.cdc.gov/diabetes/news/docs/010912.htm)

CDC, 2003

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

Adjusted percentage of adults aged ≥ 20 with fasting blood glucose levels above 126 mg/dL	
NHANES III (1988–1994)	NHANES IV (1999–2000)
8.2%	8.6%

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 35,000,000 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**

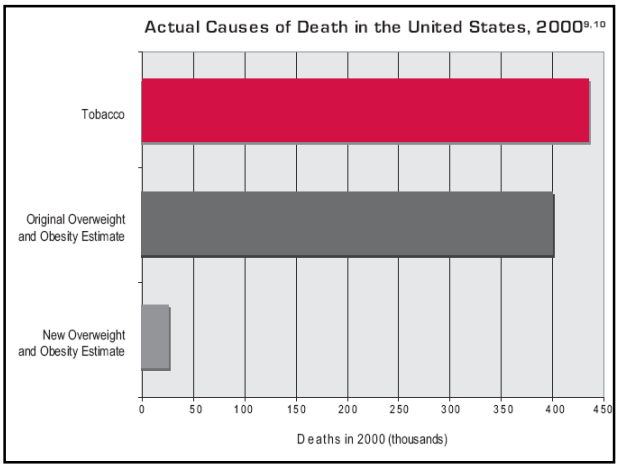
But didn't we hear about obesity becoming the #1 preventable cause of death?

The CDC Strikes Again

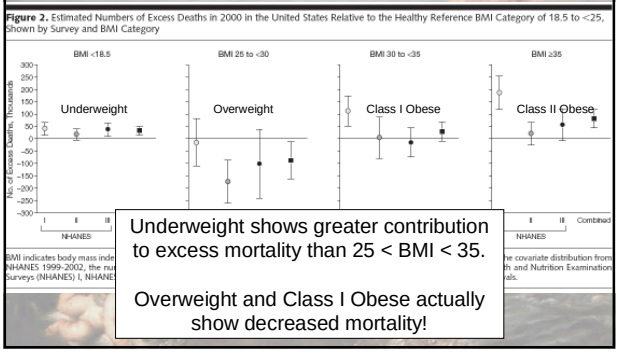
- **On March 9, 2004, the heads of the Department of Health and Human Services, National Institutes of Health (NIH), and Centers for Disease Control and Prevention (CDC) stood in front of a packed press conference to announce the conclusions of a CDC study that attributed 400,000 deaths each year to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



Overweight actually decreased mortality, and obesity effects only showed up at BMI > 35

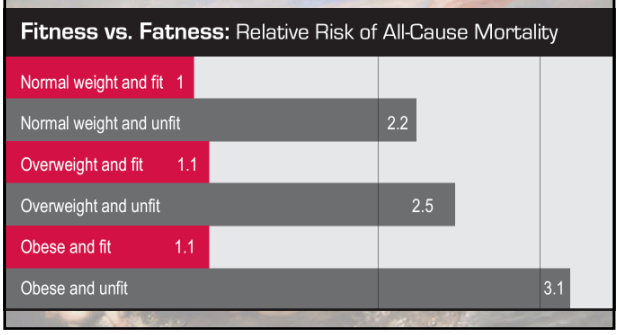


Underweight shows greater contribution to excess mortality than 25 < BMI < 35.

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

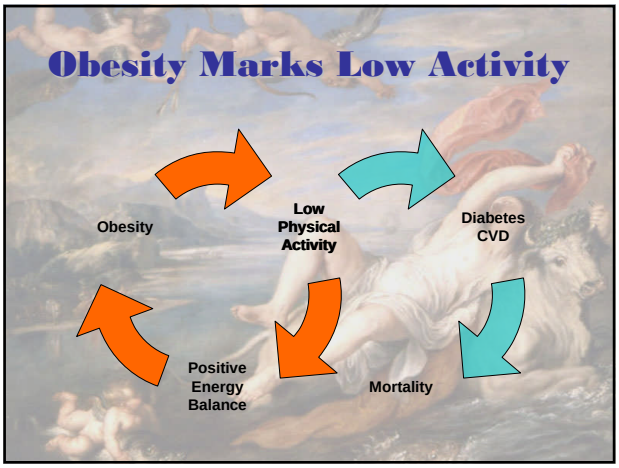


16-year follow-up study

- **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
Positive Energy Balance
Mortality