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# Obesity: The Big New Preventive Health Problem

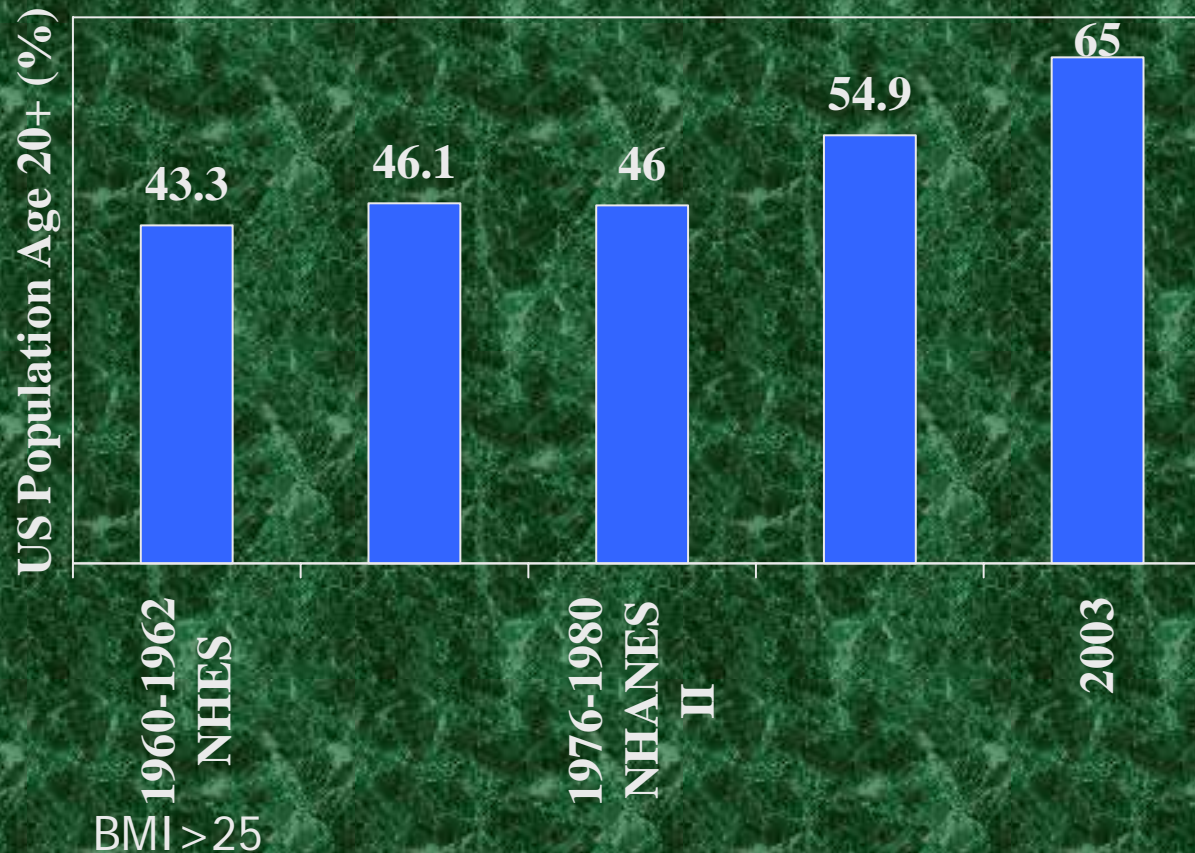
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**Lawrence J. Cheskin, M.D.**

**Associate Professor, International Health**

**Director, Johns Hopkins Weight Management  
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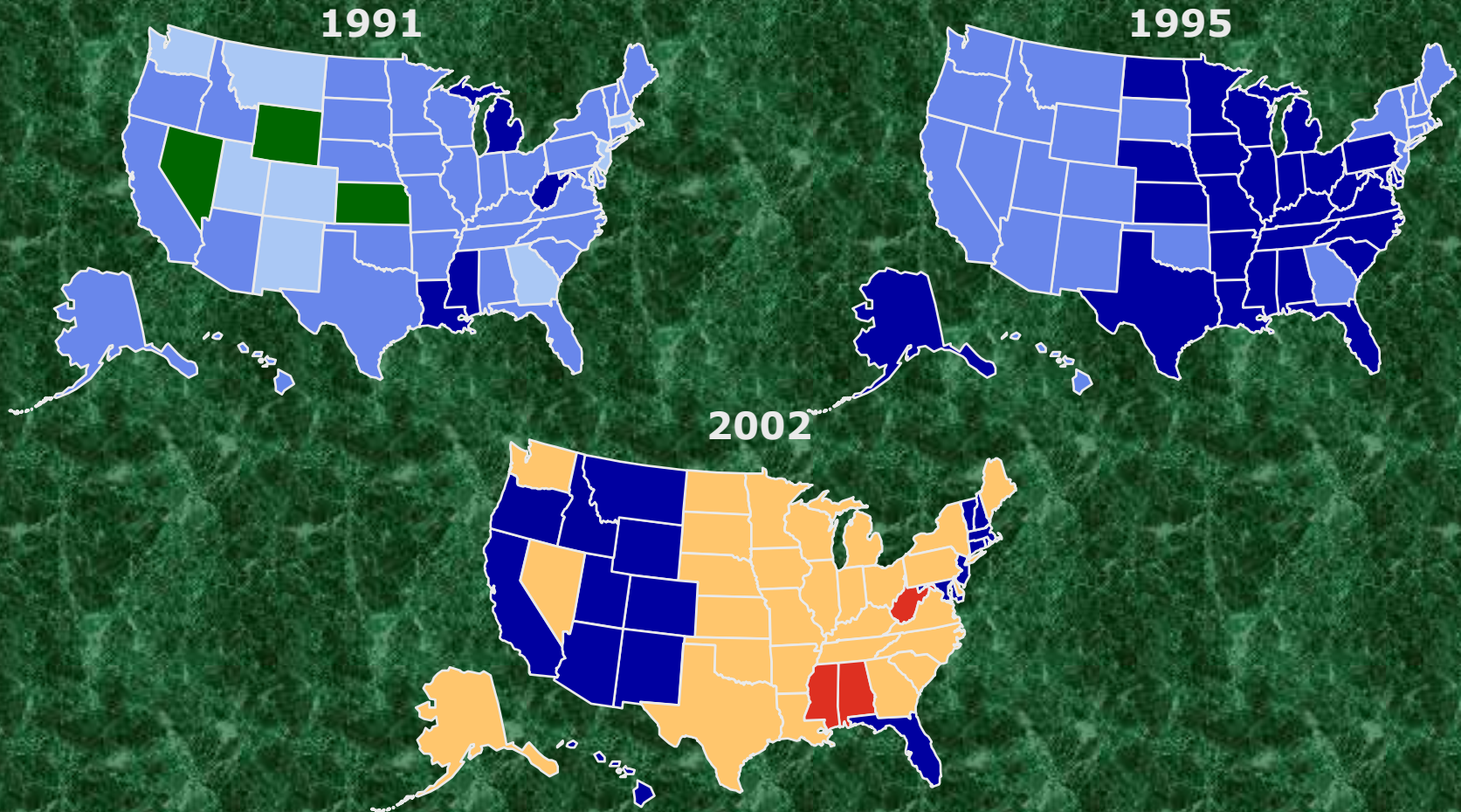
# Almost Two-Thirds of U.S. Adults Are Overweight or Obese



# Obesity Trends\* Among U.S. Adults

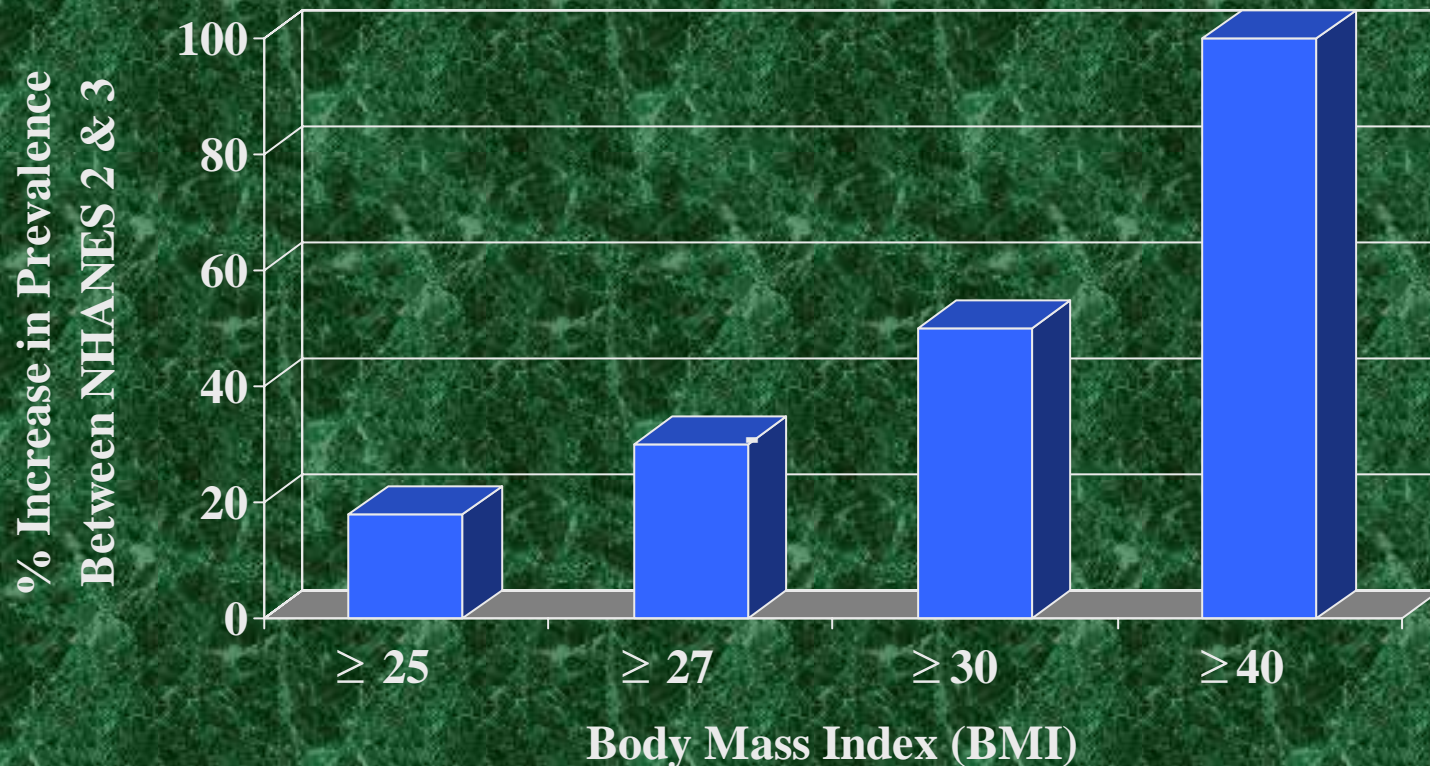
## BRFSS, 1991-2002

(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)





# Severe Obesity is Increasing More Rapidly than Mild Obesity



Approximately 25% of children and adolescents are overweight

- more than any other time in history

# Do You Know Your Own BMI?

$$\text{BMI} = \text{weight}(\text{kg}) / \text{height}(\text{m})^2$$

		Weight (lbs)													
		120	130	140	150	160	170	180	190	200	210	220	230	240	250
Height	5'0"	23	25	27	29	31	33	35	37	39	41	43	45	47	49
	5'2"	22	24	26	27	29	31	33	35	37	38	40	42	44	46
	5'4"	21	22	24	26	28	29	31	33	34	36	38	40	41	43
	5'6"	19	21	23	24	26	27	29	31	32	34	36	37	39	40
	5'8"	18	20	21	23	24	26	27	29	30	32	34	35	37	38
	5'10"	17	19	20	22	23	24	26	27	29	30	32	33	35	36
	6'	16	18	19	20	22	23	24	26	27	29	30	31	33	34
	6'2"	15	17	18	19	21	22	23	24	26	27	28	30	31	32

# Life Expectancy and Obesity

- Two studies published in 2003 find that obesity shortens life expectancy by at least several years
- The combination of obesity and smoking is particularly costly, and may reduce life by a mean of 13 years



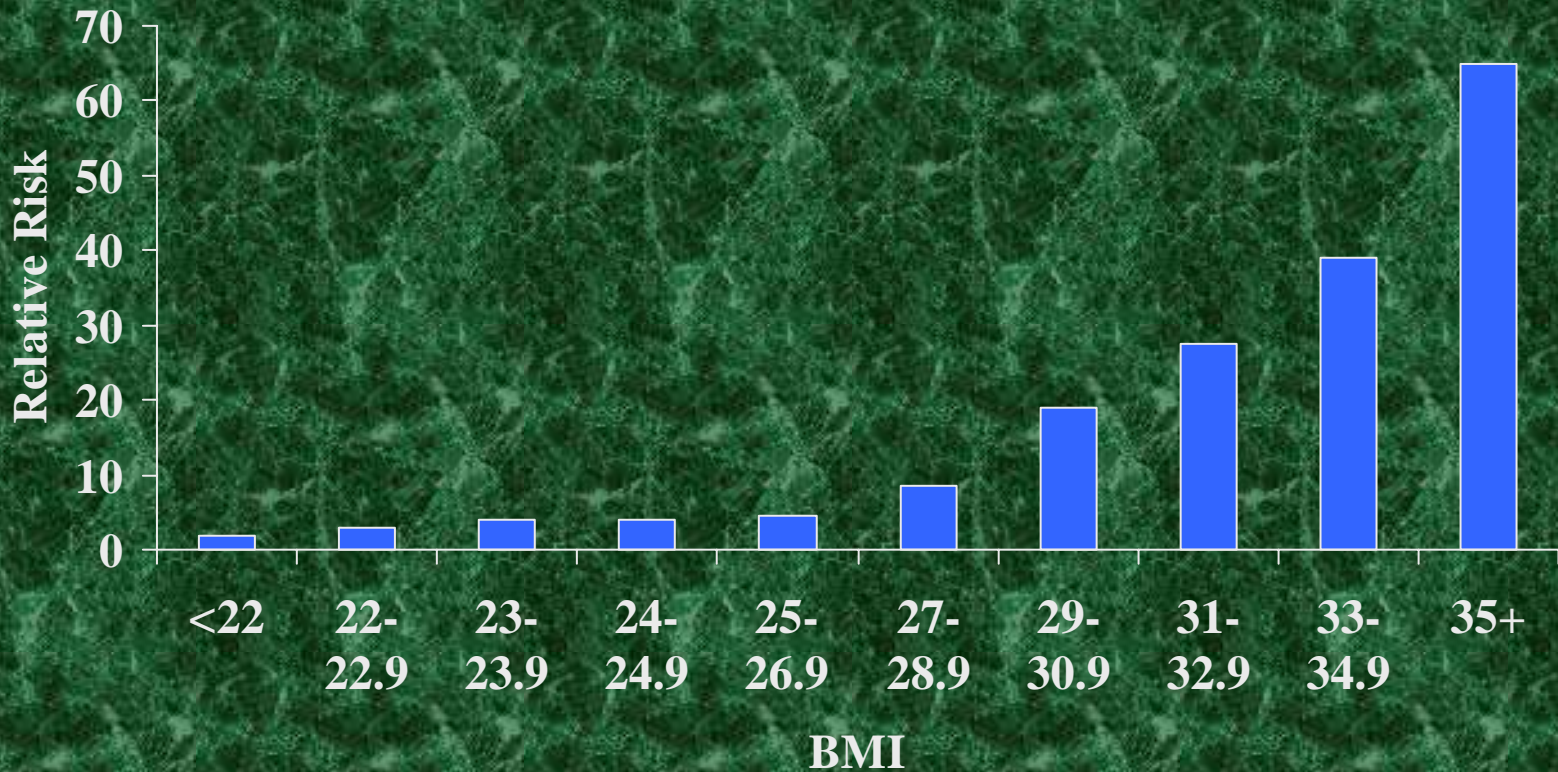
# How Might Obesity Shorten Lifespan?

## *Leading Causes of Death, U.S.*

Cause	Rate/100,000	Obesity-Related
1. CHD	175	Yes
2. Cancer	133	Yes
3. Accidents	35	
4. Stroke	31	Yes
5. COPD	19	
6. Diabetes	16	Yes
7. Pneumonia	14	
8. Suicide	12	

# BMI and Relative Risk of Type 2 Diabetes

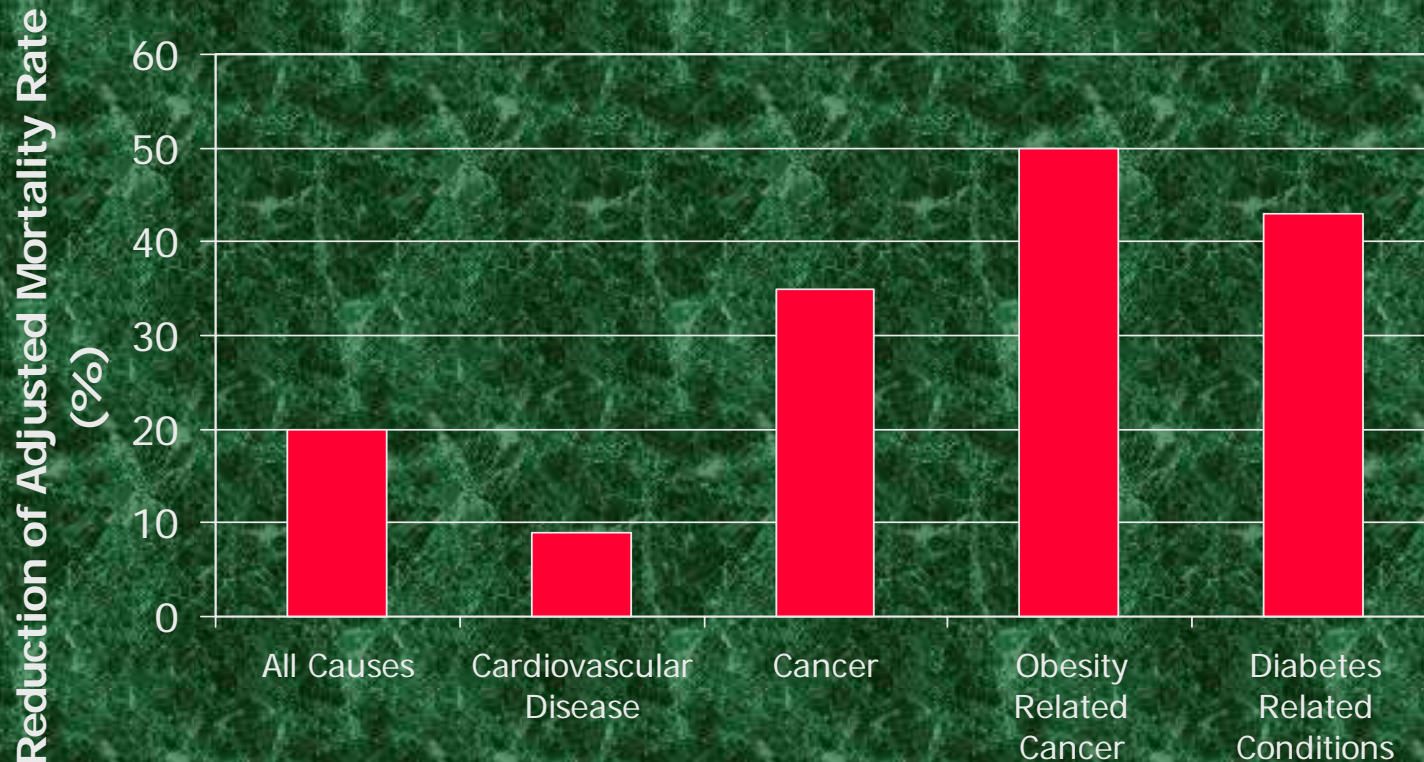
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# Obesity and Cancer

- ACS study of 750,000 men and women followed for 12 years found the following:
  - Men: mortality ratio for 40% + overweight = 1.3
    - Colorectal (1.7) and prostate cancers
  - Women: mortality ratio for 40% + overweight = 1.6
    - Endometrial (5.4), gallbladder, cervical, ovarian, and postmenopausal breast cancers

# Intentional Weight Loss and Reduction in Mortality



Source: Williamson, D.F, et al. (1995). Am J Epidemiol 141: 1128–1141

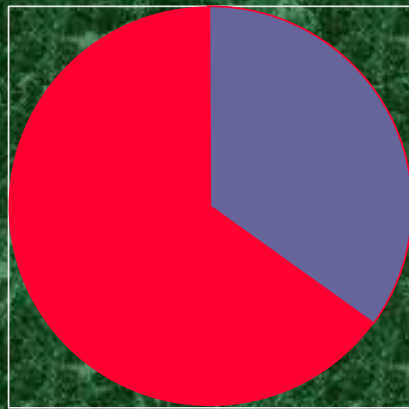


# Effects of Substantial Weight Loss on Coexisting Health Problems (Among ~850 Patients Who Completed a Very Low Calorie Diet)

- *Hypertension* (41% prevalence)
  - BP normalized, off all drugs 71%
  - BP normalized, still on drugs 12%
  - BP still high after weight loss 17%
- *Diabetes mellitus* (8% prevalence)
  - Oral hypoglycemics discontinued 100%
  - Insulin discontinued completely 87%
  - Insulin dose decreased 10%
- *Dyslipidemias* (40% prevalence)
  - Cholesterol normalized by diet alone 70%
  - Triglycerides normalized by diet alone 75%



# Comorbid Conditions and BMI > 27 kg/m<sup>2</sup>



■ No Comorbidity 35%  
■ Comorbidity 65%

Comorbid conditions that increase as BMI increases:

- Hypertension
- Dyslipidemias
- Type-2 diabetes

# Costs of Obesity

- Obesity and inactivity are estimated to cause 300,000- 400,000 US deaths annually
- Overtaking smoking as the number one preventable cause of death
- 1-year direct and indirect costs are estimated to be \$117 billion
- This represents 9% of all US health care costs

# Assessing Obesity in Clinical Practice

- *Body mass index (BMI) = weight (kg)/height (m)<sup>2</sup>*
  - Normal weight: BMI 18.5-24.9
  - Overweight: BMI 25.0–29.9
  - Obesity: BMI 30.0-39.9
  - Extreme obesity: BMI 40.0+
  - Correlated with health risk

*Source: NHLBI Obesity Guidelines. Obesity Res 6(suppl 2) (1998)*

# Assessing Obesity in Clinical Practice

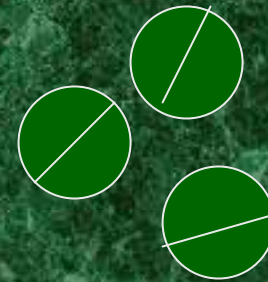
- Waist circumference
  - High risk:*
    - **Men > 40 inches**
    - **Women > 35 inches**
- Indirect measure of central adiposity, correlated with visceral fat
- Excess fat in the abdomen is an independent predictor of risk factors and morbidity

*Source: NHLBI Obesity Guidelines. Obesity Res 6(suppl 2) (1998)*



# Drugs Associated with Weight Gain

- Steroids; BCPs; HRT
- Tricyclic antidepressants
- Phenothiazines
- Lithium
- Antihistamines
- Sulfonylureas, insulin
- Beta blockers, thiazides





# A Classification of the Obesities

## Neuroendocrine Obesities

- Hypothyroidism
- Hypothalamic syndrome
- Cushing's syndrome
- Polycystic ovary (Stein-Leventhal) syndrome
- Pseudohypoparathyroidism
- Hypogonadism
- Growth hormone deficiency
- Insulinoma and hyperinsulinism

## Iatrogenic

- Drugs (psychotropics, corticosteroids)
- Hypothalamic surgery

## Nutritional Imbalance and Obesity

- High-calorie, high-fat diets
- Cafeteria diets

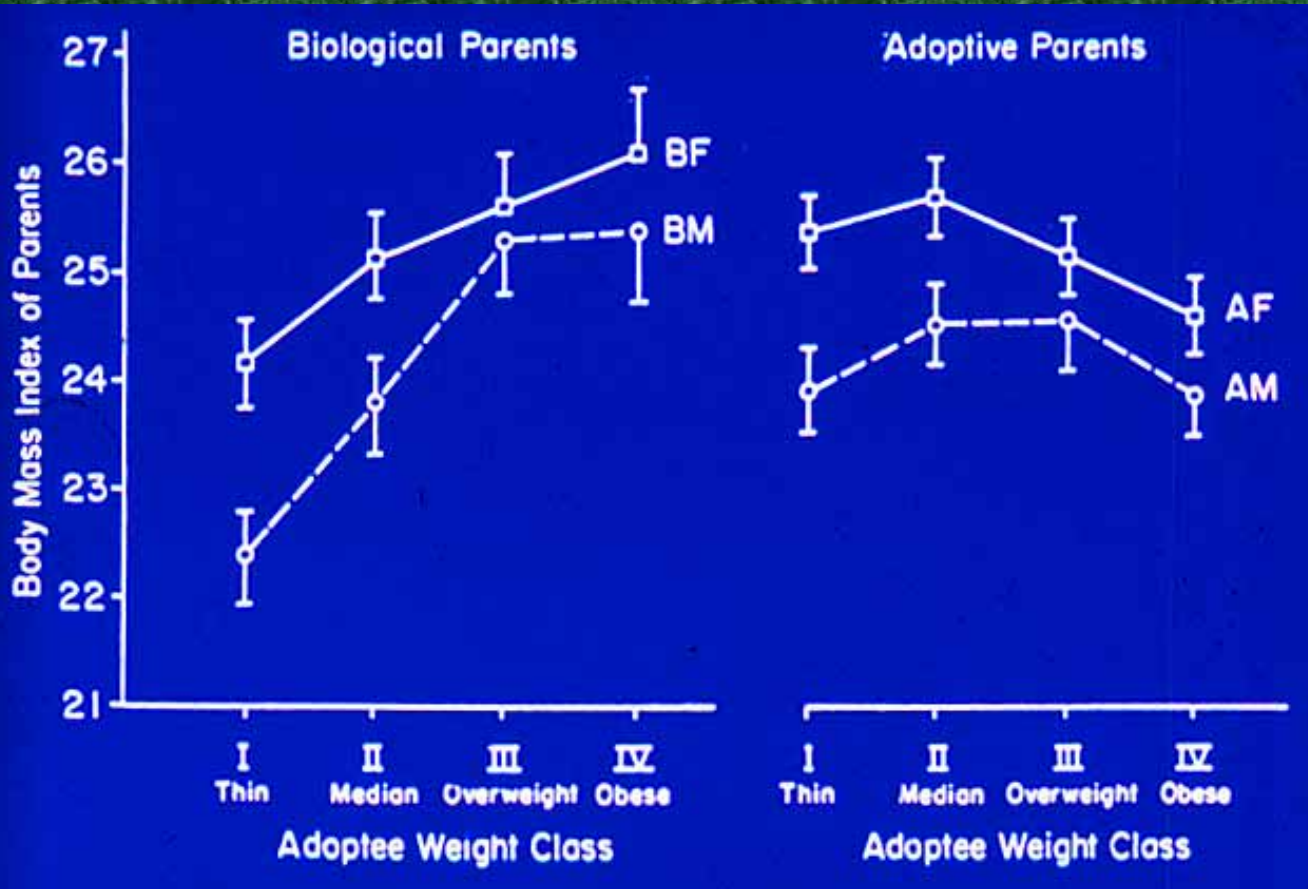
## Physical Inactivity

- Enforced (postoperative)
- Aging
- Job-related

## Genetic (Dysmorphic) Obesities

- Autosomal recessive
- X-linked
- Chromosomal

# Adoption Studies



# Childhood Onset Obesity

- May lead to **hypercellular obesity** (age 4–11)
- In first five years, not predictive
- Only 21% of a cohort of obese individuals 36-years-old were obese children
- 80% become overweight adults



# Treatments for Obesity

- Lifestyle modification
  - Diet
  - Physical activity
  - Behavior modification
- Pharmacotherapy
- Surgery

# Lifestyle Modifications Alone May Not Provide Long-Term Results

- **Diet alone:**
  - 75% regain most of their weight by year one
  - 85%–90% regain most of their weight by year two
- **Diet and behavior modification:**
  - 71% regain within 30 months
  - Weight regain greater than initial weight by year five
- **Diet and behavior modification with exercise:**
  - 58% regain weight lost by year two



# Portion size & consumption

- Portion sizes began growing in the 1970s
- Marketplace portions are now 2-8x standard serving sizes
- In children, (~ to adults), doubling portions of a lunch entrée increased entrée and total energy intakes by 25% and 15% (Orlet et al. 2003).  
When children were allowed to serve themselves, they consumed 25% less of the entrée than when served a large entrée portion.

# Diet Composition and Satiety

*Hierarchy of satiety (per kcal):*

Protein

Complex carbohydrates

Simple carbohydrates

Fat

Ethanol

*Ethanol may even stimulate further food intake*

Liquids are less satiating than solids

# Dietary Fat and Obesity

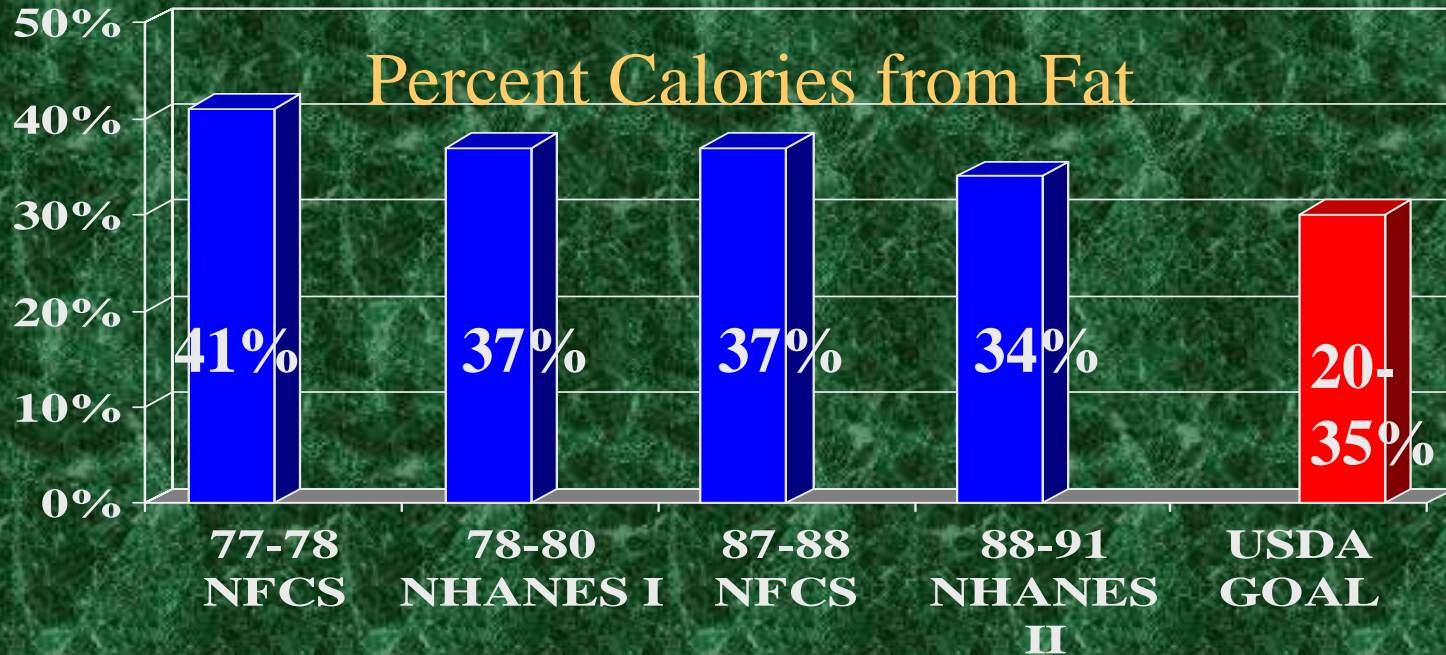
- Epidemiologic evidence of a direct link
- Calorically dense; 9 kcal/gram
- Highly palatable
- Efficiently stored
- Virtually unlimited storage

# Obesity and Macronutrients

- Obese prefer fattier & sweeter foods more than lean
- “Passive” over consumption of calories may occur on high fat diets
- Prevalence of obesity in populations correlates with % dietary energy from fat
- Some evidence for genetically-influenced ease of wt gain on high fat diet (+FHx)



# Fat Consumption in the U.S.



Grams of Fat

81

81

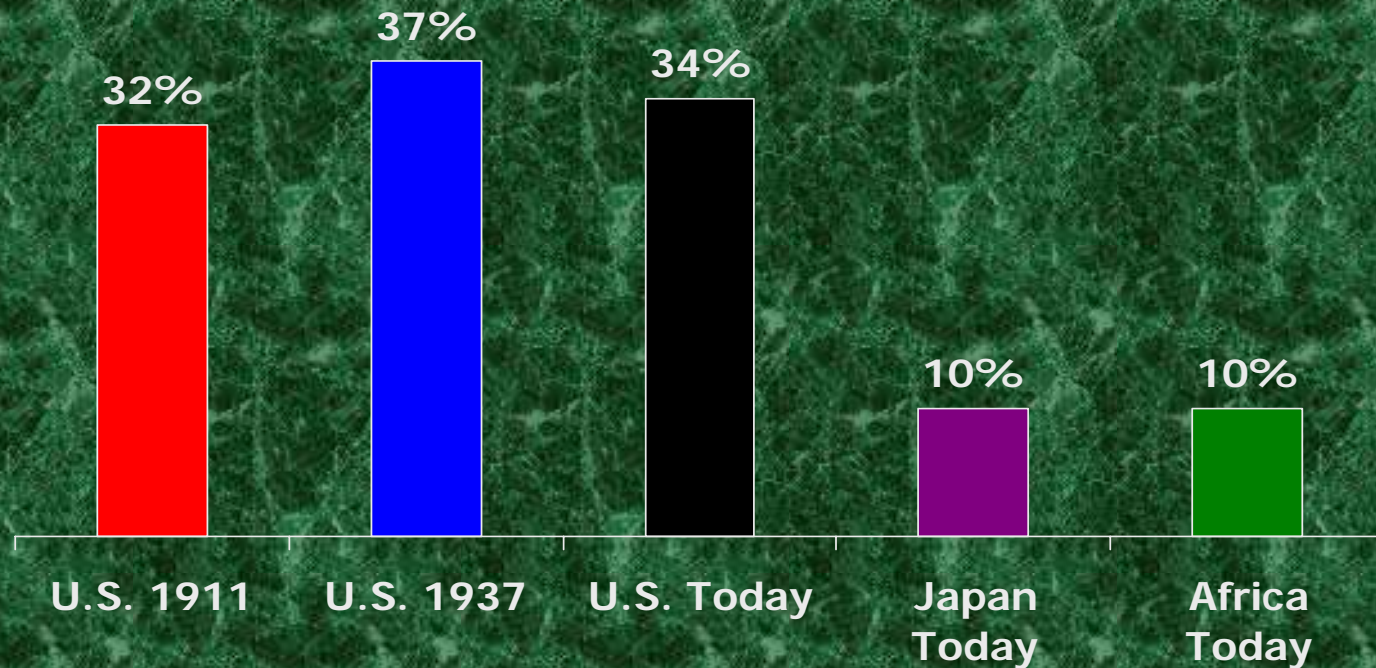
Total Kcal

1980

2095



# Fat as a Percentage of Calories in Daily Diets



# Effect of Dietary Fat on Body Weight Gain

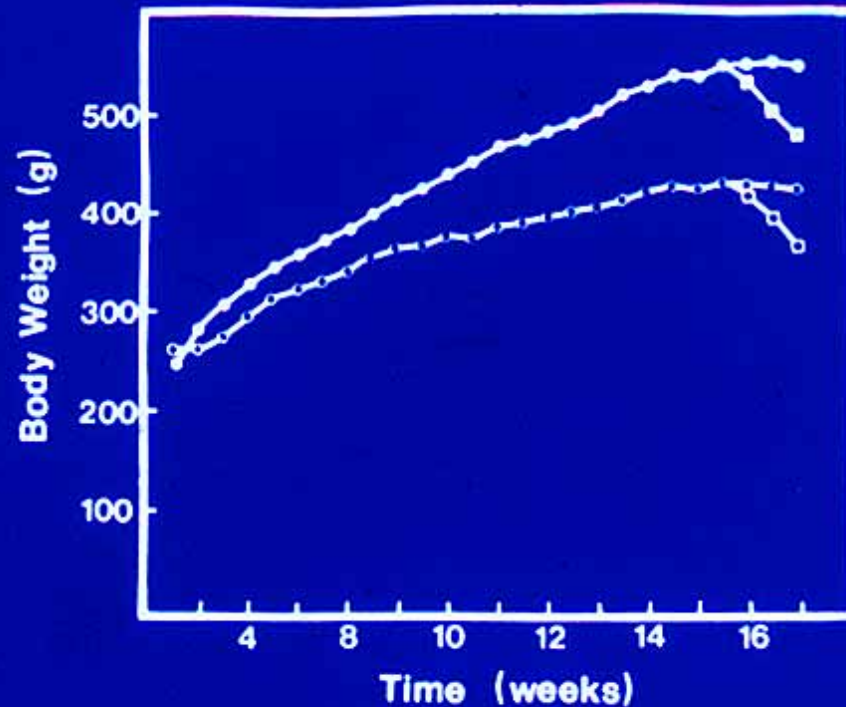


Figure 5. Body weight of rats fed either a high-fat or regular laboratory diet for 17 weeks. Prior to the end of this period, the weight of half the high-fat fed rats and half the rats fed a regular diet was reduced by restricting their intake. (Corbett and Keesey; unpublished data.)

# Nibbling Versus Gorging

- Obese individuals frequently eat fewer meals per day
- Of 379 men fed 1–2 meals per day, they were heavier, had higher cholesterol, and higher glucose than those who ate more frequently

*Continued*

# Nibbling Versus Gorging

- School children fed three meals per day gain more than those fed five to seven meals per day
- Frequent meals study
  - Reduces cholesterol and glucose intolerance
  - Decreases incorporation of F.A. into adipocytes



# Role of P-act in obesity etiology

- Decreasing P-act will lead to wt gain unless EI is decreased by the same amount
- Increasing P-act will cause wt loss unless EI is increased to compensate
  - Degree of compensation is highest in young males, lowest in obese middle-aged females
- P-act also influences fat stores
  - CHO and protein stores are limited and tightly regulated, so changes in  $EE_{act}$  tend to be reflected in fat stores

# Is low EE a risk factor for obesity?

- Few historical records of activity levels, but in UK, EI↓ by 500 kcal/d 1970-1990, but BMI↑ by 1.0 kg/m<sup>2</sup>; thus P-act must have↓ by >500 kcal/d, but there are no data
- In USA: inverse correlation between self-reported P-act and BMI
  - True for men, women, AA, Latino, white, etc.
  - Confirmed by DLH<sub>2</sub>O studies and 2/3 longitudinal studies (2-10y duration) showing BMI/P-act at f/u

# Obesity and types of P-act

- Moderate intensity exercise burns more fat than high, but high intensity exercisers have the lowest BMIs
- Both aerobic and resistance exercise are helpful in weight control
- Short bouts of exercise (3x10min) are as effective for wt loss as long (1x30min) if total  $EE_{act}$  is equal (Jakicic)



# Obesity and Exercise

- It is much more effective to eat less than to try to burn off the caloric equivalent
  - Running a marathon burns about 2600 kcal or the equivalent of 2/3 of a lb. of body fat
- Exercise plays a key role in maintenance of weight loss
- Promotes preferential loss of fat stores
- May ameliorate obesity-related conditions



# Types of Physical Activity

- Incidental and fidgeting (Non-exercise activity thermogenesis, NEAT)
- Lifestyle change
- Progressive walking
- Traditional exercise
  - Aerobic dance
  - Strength training
- Sports

# How much exercise is needed for weight control?

- For cardiovascular and other health benefits, most guidelines have called for 20-30 min of moderate-intensity exercise on most, and preferably all days
- 2005 IOM and USDA guidelines find that 60 min daily exercise may be needed just to *maintain* weight, 90 min to lose
- Reduction in time at sedentary activities can also increase EE<sub>act</sub> and TEE
- At least 2 studies have found that kids who watch a lot of TV are more likely to be obese
- “Lifestyle” activities (taking stairs, parking farther away, etc) can add up to same EE<sub>act</sub> as formal exercise

# Exercise during weight maintenance-1

- More important effect here than during active weight loss:
- (King) 1 yr study: weight maintenance by diet alone; or by exercise alone (RCT)
  - Better maintenance of weight loss with exercise
- (Van Dale) the 13% of a group of 18-40 mos-post-obese women who exercised at least 3x/wk maintained >50% of their wt loss
  - This subset also restored their RMR (adjusted for metabolic mass)



## Exercise during weight maintenance-2

- (Kayman) 80% of successful post obese maintainers exercised regularly
  - 20% of unsuccessful maintainers exercised
- National Weight Control Registry (Hill, Wing)
  - Maintainers report weekly EEact of 2800kcal
  - That's 400 kcal/d
  - Equals 4 miles on a treadmill (takes 1hr @ 4 mph)



# Health benefits of exercise

- Improves body comp (fat, VAT, muscle)
- Increases TEE, (RMR)
- Increases fitness ( $\text{VO}_{2\text{max}}$ )
- Improves muscle fiber morphology
- Improves insulin sensitivity
- Improves plasma lipid profile (HDL, TG)
- Decreases BP
- Improves mood, self-esteem, motivation

# Characteristics of NWCR Subjects

- 91% are regular exercisers, 9% are not
- Most eat a low-fat, high carbohydrate diet
- Most weight themselves daily
- Most monitor their food intake

# Weight Control and Breakfast

- National Weight Control Registry

Findings: 78% eat breakfast daily  
10% 4-6 days/week  
8% 1-3 days/week  
4% rarely/never (vs 25% in  
general population)

No difference in reported energy intake between  
groups.

Wyatt HR, et al. Obesity Research 10:78-81,2002



# Dieting Techniques and Tools:

## *Degree of Compensation*

- The utility of a food substitution, such as a fat mimetic hinges on the degree of compensation for fat and calories it elicits
- Compensation formula:

$$\%C = 1 - \frac{(\text{EI unsubstituted} - \text{EI substituted})}{(m \text{ kcal} - u \text{ kcal})} \times 100$$

*Where:*

*m* = calories of substituted food consumed

*u* = calories consumed at baseline of unsubstituted food

EI = total energy intake in kcal consumed *ad libitum* during each measurement period (includes the calories of the substituted or unsubstituted food).



# Studies of Degree of Compensation- II

- **Aspartame (Nutrisweet):**
  - Energy compensation is nearly complete in the majority of studies
- **Differences in %C by age, gender, BMI:**
  - Young males exhibit more complete compensation than females and older adults (Rolls 1998)
  - Obese individuals generally have been found to compensate more poorly than lean (Rolls 1994, Roe 1999)

# **WHY DO I EAT--LET ME COUNT THE WAYS**

**The concept of appropriate/inappropriate eating cues:**

**Food as a habit**

**Food as a stress reliever**

**Food as a reward**

**Food as a boredom reliever**

**Food as a social facilitator**

**Food as love**

**Food as a mountain**

# Teaching Patients to Be Informed Consumers of (Obesity) Science

- Learn to read food labels: portion size warning
- Learn to distinguish association from causation
- Learn to distinguish statistical from medical significance
- Caveat emptor



# Some Key Scientific Questions in Obesity Rx

- Is there a “best diet” for weight loss? Wt maintenance? Mechanism? Demographic differences?
- Can satiety be altered long-term?
- Best ways to alter eating and exercise behaviors?
- Best ways to individualize Rx?
- Resource allocation: which methods have the greatest PH impact and cost effectiveness? Built environment, food supply/composition, individual responsibility? Children?
- How can we avoid further exporting obesity worldwide?



# Downsizing America: The Obesity Epidemic

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Panel Discussion:  
*Overview of Presentations*

Lawrence J. Cheskin, M.D.  
Center for Human Nutrition, JHBSPPH

## *Themes, by speaker*

# Kelly Brownell:

- *The Obesigenic Environment and How to Deal with It:*
  - Commercial aims often are at odds with public health
  - Industry playbook: focus on individual responsibility, freedom and choice cards, no good/bad foods, shift blame to p-act
  - Public health messages and individual behavior change are overwhelmed by commercial messages (volume, skill, appeal)
  - Marketing to children is an area of particular concern, and bears remarkable similarities to pro-smoking campaigns of the past (“They got lips, we want ‘em”)
  - Only advocacy for regulation and taxation by government can even the playing field, perhaps parallel to the path of smoking regulation

*Themes, by speaker*  
**Robert Jeffery:**

- *Behavior Change for Weight Change:*
  - While knowledge of behaviors that increase or decrease obesity have improved, and the efficacy of individual treatment of obesity has doubled in the past 20 years, public health messages are the only viable tool for solving the whole problem of obesity
  - Messages of proved individual value: less TV, more activity, less fatty/fried/fast foods and red meat, more fruits, vegetables
  - Decreasing intake is more effective than increasing physical activity



*Themes, by speaker*

**Adam Drewnowski:**

- *Poverty and Obesity: Food Choices and Energy Costs:*
  - Economics strongly influences health behavior (e.g. cost of foods/macronutrients per kcal )
  - Strong correlation of obesity with SES makes genetic and neurochemical etiologies irrelevant
  - Trend of privatizing profits and socializing costs leads to further disparity between rich and poor
  - Food choices are driven by taste, cost, convenience (not health, variety)
  - “As long as (healthful foods) cost more than a burger and fries, the battle against obesity will be lost”



# Consensus and Extrapolations

- The behavior of groups is more important than individual behavior or genetic factors
- To solve many public health problems, we must understand political behavior and change governmental policies
- To solve public health problems with a behavioral basis, culture change must also occur
- Tools to achieve policy and social change include savvy use of the media, political pressure, and convincing scientific evidence applied with knowledge of motivators of change for individuals

# Public Health Lessons from Obesity

- Epidemiologic trends are powerful and cures unlikely
- Persistence is the best hope for the afflicted
- Education is the best hope for the “at-risk”
- Prevention is the best hope for future generations
- Absent a “cure,” fundamental cultural, economic, and governmental changes may be needed to address this epidemic

# Are We Addressing Obesity Adequately?

## I- Access to care & care utilization

- **Obese should *need* to seek care more, yet...**

Studies show:

- obese get fewer preventive tests (Pap, breast exams)
- more obese delay/cancel medical appointments

These findings could be due to patient discomfort with providers, or vice versa



# Are We Addressing Obesity Adequately?

## II- Health Professionals' Attitude

- Obesity is almost uniformly endorsed as a problem second in importance only to smoking cessation (survey of 1222 physicians); however,
- Most physicians surveyed express low confidence in their ability to treat obesity
- Most report low or no exposure to systematic training in Rx of obesity
- Yet, rarely refer formally to weight-loss programs



# Are We Addressing Obesity Adequately?

## III- Health Professionals and Prejudice

- Survey of Canadian nurses:
  - 1/3 prefer not to care for obese at all
  - 24% agreed that the obese are “repulsive”
- Survey of physicians (Adams, 1993):
  - 21% reluctant to do pelvic exams on obese
  - 2% reluctant for very attractive patients
  - 0% reluctant for thin patients

# Are We Addressing Obesity Adequately?

## III- Health Professionals & Prejudice-2

- Blinded evaluation of a chart by 122 PCPs: told only CC (migraines), sex, nl/OW/obese
  - Obese pts were prescribed more tests
  - Providers estimated they would spend less time with the pts they were told were obese (22 vs 31 min)
  - Obese were described more negatively on 12/13 indices (eg, “extent patient would annoy me”)

# But is Obesity Preventable?

- *Yes and no...*
- In *theory*, even modest changes yield large dividends:
  - 50 kcal/d saved (2%) = 5 lbs/yr
  - Adding a 20 min walk (50 kcal) = same result (ignoring compensation!)
- In *practice*, only intermediate outcomes are benefited, not body weight in the long run



# What's Our Best Hope for Obesity Prevention?

- Change the food supply: availability, cost, advertising
- Change the built environment: paths, safety
- Change our schools
- Change attitudes and beliefs
- Serve as role models ourselves
- Devote resources to research and programs
- Be persistent