

Childhood Obesity: The World's Biggest Public Health Problem?

Public Health Practice Grand Rounds

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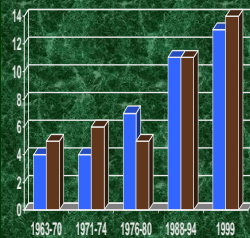
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What is obesity?

- Generally refers to excess body fat rather than weight (Normal adult body fat 8-29%)
 - Body mass index (BMI): kg/m²
 - Anthropometry
 - Bioimpedance
 - Hydrostatic (underwater) weighing
 - Total Body Electrical Conductivity (TOBEC)
 - Dual Energy X-ray Absorptiometry (DEXA)
 - MRI

Important Milestones

Childhood Obesity Prevalence

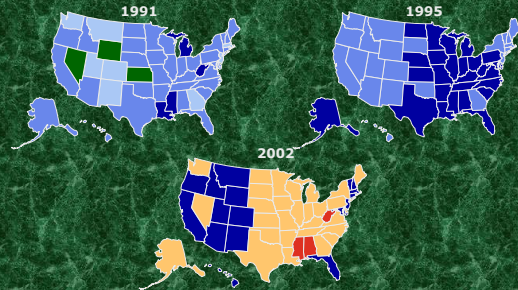


CDC

Obesity Trends* Among U.S. Adults

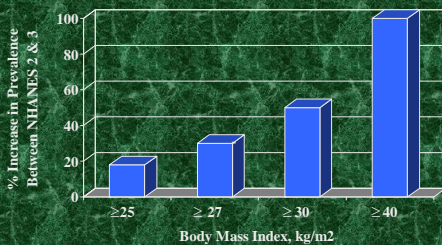
BRFSS, 1991-2002

(*BMI ≥30, or ~30 lbs overweight for 5' 4" woman)



Legend: No Data, <10%, 10%-14%, 15%-19%, 20%-24%, ≥25%

Severe Obesity is Increasing More Rapidly than Mild Obesity



Costs of Obesity

- Obesity and inactivity are estimated to cause 150,000- 400,000 US deaths annually
- Overtaking smoking as the #1 preventable cause of death
- 1-year direct and indirect costs are estimated to be \$117 billion
- This represents 9.4% of all US health care costs

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

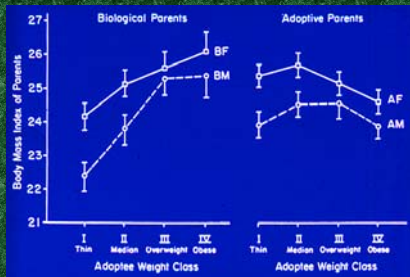
Genetic (Dysmorphic) Obesities

- Autosomal recessive
- X-linked
- Chromosomal

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

Adoption Studies



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: may reduce life by a mean of *13 years*
- *Projection: This may be the first generation of children to have shorter life expectancies than their parents...*

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	

Aspects of History in Obese Child

- **Young Child**
 - Inappropriate limits
 - Frequent snacks
 - Excess TV
 - Healthy food refusal
 - Diet history important for patterns, family motivation not amounts
- **Adolescent**
 - Reaction to stress, boredom or depression
 - Body image disturbance
 - Sedentary tendencies
 - Diet history important for patterns, motivation and accessibility

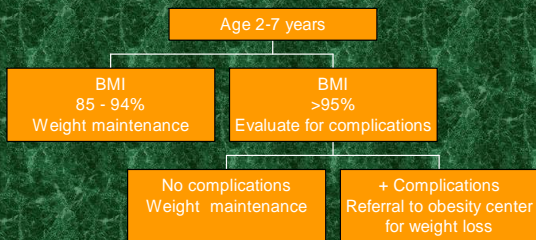
Psychological Morbidity

- Obesity Associated Psychological Conditions
 - Depression
 - Anxiety
 - Low self esteem
 - Teasing/Bullying
- Associated conditions impacting treatment
 - ADHD
 - Bipolar Illness
 - Adjustment Disorder

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

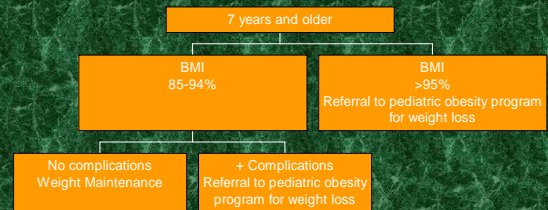
- *Hypertension* (41% prevalence)
 - BP normalized, off all drugs 71%
 - BP normalized, still on drugs 12%
 - BP still high after weight loss 17%
- *Diabetes mellitus* (8% prevalence)
 - Oral hypoglycemics discontinued 100%
 - Insulin discontinued completely 87%
 - Insulin dose decreased 10%
- *Dyslipidemias*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

Obesity Prevention Guidelines in the Young Child



Barlow SE and Dietz WH, Peds 1998

Obesity Prevention Guidelines in the Child and Adolescent



Barlow SE and Dietz WH, Peds 1998

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

Regulation of body weight

Calories consumed in 1 year: 980,000

Weight gained per year* (kcal): 1,600 (1/2 lb)

Error = 0.16%

*Average of 20 yrs, 30-50 yrs of age (Framingham study)

What drives food choice?

- TASTE - consumers consistently rate this as the number one reason for the food choices they make
- COST - consumers look for bargains/values that taste good
- CONVENIENCE - consumers want choices that simplify their lives
- PROBLEM - These factors are often barriers to reducing energy intake

Portion size & consumption

- Portion sizes began growing in the 1970s
- Marketplace portions are now 2-8x standard serving sizes
- In children, (similarly in 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 an entrée than when served a large entrée portion.

Diet Composition and Satiety

Hierarchy of satiety (per kcal):

Protein
Complex carbohydrates
Simple carbohydrates
Fat
Ethanol

Liquids are less satiating than solids

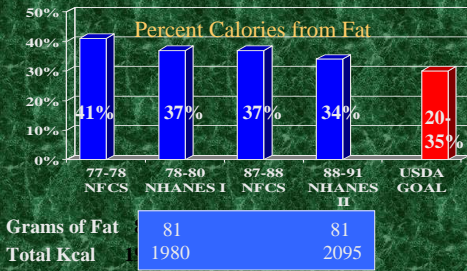
Dietary Fat and Obesity

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

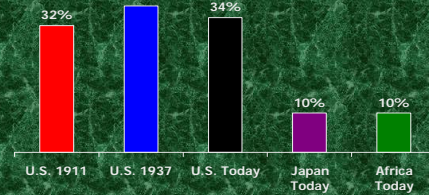
Obesity and Macronutrients

- 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

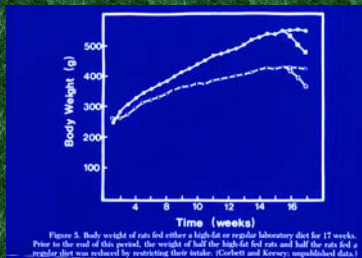
Fat Consumption in the U.S.



Fat as a Percentage of Calories in Daily Diets



Effect of Dietary Fat on Body Weight Gain



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

Inexpensive Weight loss Aids



5 Cardinal Rules of Mealtime

- Structured meals *AT DINNER TABLE* without distractions
- Use smaller plates and utensils to slow meal pace
- Avoid high calorie/sodium condiments and fried foods
- Do not leave food containers on the table
- Avoid second helpings
- Clean plates directly into garbage

Is sedentariness a risk factor for obesity?

- Few historical records of activity levels, but in UK, E_{act} by 500 kcal/d 1970-1990, but BMI \uparrow by 1.0 kg/m²; thus P-act must have \downarrow 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.
- In US children, TV watching correlates with BMI

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 E_{act} 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 E_{act} as formal exercise

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 E_{act} of 2800kcal
 - That's 400 kcal/d
 - Equals 4 miles on a treadmill (takes 1hr @ 4 mph)

The National Weight Control Registry

- Established 1994 (Hill JO, Wing RR)
- ~3000 adults
- Entry criteria: >30 pound weight loss maintained at least 1 year
- Means: BMI 24.8 (peak 36.2) Δ 11.4kg/m² (70lbs)
- Mean weight maintenance period: 6 years

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 10:73-81,2002

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

Health Journal / By Tara Parker-Pope

Should Overweight Kids Take Pills? Doctors Study Diet Drugs and Slim-Fast

AN EPIDEMIC OF CHILDHOOD OBESITY has parents and doctors trying a solution and teens on diet drugs. In a shocking shift in thinking about kids and weight, doctors are studying the drugs Xenical and Meridia, as well as the diet drug (lipoamide), to treat seriously overweight children. Another recent study even put six-year-olds on the liquid diet Slim-Fast. Early results show the drugs can help kids lose weight. But fear of side effects—particularly the fact that other diet drugs have been linked to life-threatening problems in adults—has limited enthusiasm to pediatric uses. That worry is compounded by the fact that children would start taking the drugs decades sooner and possibly for years longer than an adult. "It's not what happens in a week or a month," says Steven Heymsfield, deputy director of St. Luke's-Roosevelt Hospital's Obesity Research Center in New York. "It's what happens 10 years down the line."

Nevertheless, busy doctors now believe that obesity—just like cancer, heart disease or diabetes—is a grave medical problem that requires drug intervention, no matter the age of the patient. Advocates of weight loss drugs argue that the pills are specially "designed as lifestyle drugs, therefore hard to be misused."

Drug side effects weren't the biggest concern for Pops Mack when she enrolled her daughter Melissa in a Meridia study in July. "The health risks of being overweight carry a

lot of burdens themselves," says Mrs. Mack, of Cherry Hill, N.J. Melissa, 10, who began the study at 5 feet 2 inches and about 190 pounds, has lost 20 pounds. "I don't mind going into the junior stores with my friends because I know I'll be able to find something," she says.

The traditional approach to kids and diet certainly hasn't worked very well. For years, doctors believed that growing children, even fat ones, shouldn't lose weight. Instead, the goal was to help kids stop gaining pounds so their bodies could catch up to their weight without stalling the nutritional needs of growing bones. But today, about 25% of kids are overweight, twice as many as 20 years ago. As many as 14% of children are obese—a jump from 1% just five years earlier.

"The medical risks [of obesity] to these kids are enormous," says Don Berrowitz, medical director of the weight and eating-disorders program at the University of Pennsylvania in Philadelphia and lead investigator on a federally funded study of Meridia for children. "If this was an epidemic of polio, we would have moved fast to stop it."

The side effects from diet drugs can be significant, some carry potential long-term health risks, others have effects that are merely uncomfortable or embarrassing. Meridia, for example, changes the brain chemistry so the body feels full. In the federally funded study, about 40 teens age 13 to 17 took the drug and 40 took a placebo. Early results showed the Meridia kids lost twice as much weight.

Wall Street Journal April 9, 2002

Pharmacotherapy for Pediatric Obesity

- 2 fenfluramine- vs. placebo trials in 5-18 year olds found no difference in weight loss
- Phentermine: questionable results
- Sibutramine has decreased weight in adult studies
 - In 12-16 yo's (Berkowitz, AIM, 7/2006): much better than placebo x 1yr
- Orlistat has produced a 4.6% decreased in body fat among adolescents in a 3 month trial
- Leptin Rx in a leptin deficient child (rare) resulted in a 1-2 kg/month weight and fat loss
- Metformin: 10.9 kg mean weight loss over 3 months in 1 adult trial; less in other small studies.
 - Pediatric trials in progress.

Downsizing America: The Obesity Epidemic

Panel Discussion:
Overview of Presentations

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Center for Human Nutrition, JHBSPIH

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
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”

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
- A solution will require widespread changes in our society, and **education of children is critical**