Obesity in the 21st-century: It's more than just behavior.

Obesity: A multifactorial disease

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Disclosures

**Martin Binks PhD., FTOS** has financial or other relationship(s) with the following companies and or organizations:

- Takeda Pharmaceutical (Speaker)
- Novo Nordisk (Speaker)
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- The Obesity Society (Secretary Treasurer-Development Chair)
Objectives:

- Provide an overview of the disease of obesity.
- Address public and professional misperceptions surrounding the causes, maintaining factors and remedies for obesity.
- Summarize future directions and encourage fresh perspectives and inclusive approaches.
PREVALENCE OF OBESITY
Obesity Trends* Among U.S. Adults
BRFSS, 1990, 2000, 2010
(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)
Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

Summary

- No state had a prevalence of obesity less than 20%.
- 7 states and the District of Columbia had a prevalence of obesity between 20% and <25%.
- 23 states had a prevalence of obesity between 25% and <30%.
- 18 states had a prevalence of obesity between 30% and <35%.
- 2 states (Mississippi and West Virginia) had a prevalence of obesity of 35% or greater.
- The prevalence of obesity was 27.0% in Guam and 27.9% in Puerto Rico.†

http://www.cdc.gov/obesity/data/prevalence-maps.html

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

† Guam and Puerto Rico were the only US territories with obesity data available on the 2013 BRFSS.
Medical & Psychosocial Consequences of Obesity

- **Depression, low self esteem, stigmatization, body image issues, reduced quality of life**
- **Pulmonary disease**
  - abnormal function
  - obstructive sleep apnea
  - hypoventilation syndrome
- **Idiopathic intracranial hypertension**
- **Stroke**
- **Cataracts**
- **Coronary heart disease**
- **Diabetes**
- **Dyslipidemia**
- **Hypertension**
  - Metabolic Syndrome
- **Severe pancreatitis**
- **Cancer**
  - breast, uterus, cervix
  - colon, esophagus, pancreas
  - kidney, prostate
- **Depression, low self esteem, stigmatization, body image issues, reduced quality of life**
- **Nonalcoholic fatty liver disease**
  - steatosis
  - steatohepatitis
  - cirrhosis
- **Gall bladder disease**
- **Gynecologic abnormalities**
  - abnormal menses
  - infertility
  - polycystic ovarian syndrome
- **Osteoarthritis**
- **Skin**
- **Gout**
- **Phlebitis**
  - venous stasis
POTENTIAL CONTRIBUTORS TO OBESITY
INTERVENTIONS
Treatment options
Obesity Treatment Pyramid

Surgery & Devices

Pharmacotherapy

Lifestyle Focused Behavior Therapy

Nutrition

Physical Activity
Comparison of Intervention Types

**Figure 1.** Average weight loss of subjects completing a minimum 1-year weight-management intervention; based on review of 80 studies (N=26,455; 18,199 completers [69%]).

**Exercise Plus Diet:**
- 7.9 kg at 6 months maintained about half (3.9 kg) at 3 and 4 years

**Exercise Alone:**
- 2.4 kg at 6 months, maintained about half (1.0 kg) at 24 months

POSITIVE ENERGY BALANCE: INGESTION
Neural Systems Controlling the Drive to Eat: Mind Versus Metabolism
The gut-brain axis...
Sleep: Relationships to appetite, obesity and insulin resistance.

- Sleep disordered breathing
- Circadian amplitude ↓
- Sleep ↓
  - Leptin ↓, Ghrelin ↑, Orexin ↑, Melatonin ↓, TSH ↓, Sympathovagal Adiponectin ↓
  - Appetite ↑
  - EE ↓
  - Insulin resistance ↑
  - Obesity
  - Diabetes

Life style depression stress →
Diabetic symptoms →
RESISTANCE AND ADAPTATION TO NEGATIVE ENERGY BALANCE
Energy expenditure increased with weight gain, decreased with weight loss.

Figure 1. Study Design.
All subjects were studied at their initial weight and after at least one change in weight.

Leibel RL, NEJM. 1995; 332: 621-628

Slide content courtesy of Nikhil Dhurandhar Ph.D. FTOS
- Weight loss induced after 10 weeks:
  - 13.5 kg, 14% of initial weight
- Weight maintenance at end of week 10:
  - Individual counseling
  - Written advice from Registered Dietitian
  - Visit clinic every 2 months
  - Receive telephone dietary counseling
- Follow up at 62 weeks

Weight Loss → Hunger hormone response becomes amplified...

Change from baseline to week 10: Increase in levels of ghrelin (P<0.001)

Change from baseline to week 62: Ghrelin remained significantly higher (P<0.001)

Weight Loss → Satiety hormone response is blunted ...

PYY lower at week 10 and 62 than baseline (P<0.001)

PYY lower at week 62 than week 10 (P<0.004)

Weight loss increased subjective feelings of hunger and drive to eat …

a. Don’t feel as full  
b. Stronger hunger urges  
c. Harder to say “no more”

\[aP<0.001, \ bP=0.09, \ cP=0.008 \text{ vs mean at baseline (week 0).} \]

Ratings were based on a visual-analogue scale ranging from 0 to 100 mm. Higher numbers indicate greater hunger or desire.


Slide content courtesy of Nikhil Dhurandhar Ph.D. FTOS
PHYSICAL INACTIVITY
CHILDHOOD OBESITY BY THE NUMBERS

1 in 3 children and teens age 2 to 19 are considered overweight or obese.

2 out of 3 don’t get any daily physical activity.

96% of elementary schools offer no physical education classes.

7 hours is the amount of time kids spend in front of TV or computer screens daily.

ACCELEROMETER DATA SHOWS

**PEOPLE ARE MUCH LESS ACTIVE THAN THEY THINK THEY ARE**

- **40% OF MEN**
- **30% OF WOMEN**

**SAID THEY PARTICIPATE IN MODERATE INTENSITY SPORT AT LEAST ONCE A WEEK**

**BUT**

- **6% of men**
- **4% of women**

according to objective data collected by the National Obesity Observatory

**94% of kids die**

**3 out of 4**

Full-Time Employment of College Graduates

Wish They Studied Less Time than Their Working Hours Sitting too much

Standing for more than an hour each day tones muscles, improves posture, increases blood flow, and uses up more calories.

Join the Lightning at www.lightning.org

Source: CDC
EFFECT OF PHYSICAL INACTIVITY ON MAJOR NON-COMMUNICABLE DISEASES WORLDWIDE:
AN ANALYSIS OF BURDEN OF DISEASE AND LIFE EXPECTANCY

I-Min Lee, Eric J Shiroma, Felipe Lobelo, Pekka Puska, Steven N Blair, Peter T Katzmarzyk, for the Lancet Physical Activity Series Working Group
Findings

• Between 6-10% of the world’s major NCD is attributable to inactivity

• By eliminating inactivity, >5.3 M deaths/year may be prevented

• (For perspective: Smoking causes 5 M deaths/y worldwide)
Daily Occupational Caloric Expenditure

Occupation Related Daily Energy Expenditure (calories)

Men

Women

Church TS et al. PLoS 2011
Physical Activity Necessary for Weight Loss Maintenance

Concomitant Behavior Therapy

- Weekly
- Biweekly
- Monthly

Change in Weight (kg)

Time (months)

< 150 min /wk

≥150 min/wk

≥200 min/wk

*P<0.05

PUBLIC PERCEPTIONS
“Trusted Doctors” give weight loss advice.

https://youtu.be/mTtCXHbLPUM
Politicians Enact Solutions to the “Obesity Epidemic”

Fail to account for the complexity of the issue.
Partnering to get it right
Addressing obesity from myopic unidimensional perspectives is simply not working.

Personal Responsibility for diet and exercise.

Multiple perspectives; various stages of knowledge – Little communication.

Technological and scientific advances – Scientists still not communicating across disciplines.
Silos are for Corn... (not scientists)