Energy In, Energy Out—Rethinking the Balance

2016 OAC Your Weight Matters
Washington, DC
August 27, 2016

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Arnold School of Public Health
University of South Carolina
Disclosures for Past 5 Years

- Medical/Scientific Advisory Boards
  - Technogym
  - Cancer Foundation for Life
  - Santech
  - Clarity Project
  - Sports Surgery Center-Dublin

- Research Funding
  - NIH
  - Body Media
  - The Coca-Cola Company
  - Technogym
  - U.S. Department of Defense

- Royalties
  - Human Kinetics
Lecture Outline

- World obesity problem
- Confusion about obesity and health
- Causes of the obesity problem
  - Energy imbalance
    - Calories in
    - Calories out
- Balanced discussion of these points
World-Wide Prevalence of Women with Obesity
http://www.worldobesity.org/resources/world-map-obesity
Confusion and Bias about Obesity and Health
<table>
<thead>
<tr>
<th>Weight by Measured BMI</th>
<th>Underweight</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Class I Obesity</th>
<th>Class II Obesity</th>
<th>Class III Obesity</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Perception of Weight by Respondents</th>
<th>Underweight</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**SOURCE:** Harris 2008 Int J Obesity
Deaths associated with underweight, overweight and obesity

Compared to Normal Weight Individuals

- BMI <18.5
- BMI 25-<30
- BMI 30-<35
- BMI 35+

Flegal et al. JAMA 293:1861, 2005

BMI 30+: 111,909 deaths
What is causing the increase in obesity?

- Many people being in a positive caloric balance on too many days
- What is a positive caloric balance?
Energy Balance - Simple Model

Calories Consumed

Calories Burned

Energy Balance

Slide courtesy of Robin Shook
Energy Balance System

Cooke D; Nature Reviews Drug Discovery 5, 919-931
Slide courtesy of Jim Hill
We Need More Balance in the Discussion of Energy Balance
Imbalance in Energy Balance

- **Google search March 21, 2016**
  - Physical inactivity and obesity
    - 524,000 hits
  - Diet and obesity
    - 68,500,000 hits

- **PubMed search January 1, 2015**
  - Physical inactivity and obesity
    - 2,504 manuscripts
  - Diet and obesity
    - 50,354 manuscripts

Are Americans Eating More Now than They Did Decades Ago?
Trends in Energy Intake
NHANES 1971-2000

- NHANES I—1971-1974
- NHANES II—1976-1980
- NHANES III—1988-1994
- NHANES—1999-2000
- Surveys were representative samples of noninstitutionalized U.S. women and men aged 20 to 74 years

Source: MMWR Feb 6, 2004
Trends in Energy Intake: 1971 to 2000, Women, NHANES

Kcal/day

Source: MMWR Feb 6, 2004
NHANES Survey Methods 1971-2000

- NHANES I and NHANES II
  - 24-hour dietary recall, Monday-Friday
- NHANES III and NHANES
  - 24-hour dietary recall, Monday-Sunday
- Other changes in methodology included better probing techniques and better training of interviewers
Just to Be Clear, I Do Support Programs to Promote Healthful Diets
Comparison Shopping:
McDonald’s for Four

$27.89

- 2 Big Macs
- 1 cheeseburger
- 1 6-pc. Chicken McNuggets
- 2 medium fries
- 2 small fries
- 2 medium Cokes
- 2 small Cokes

Nutrition facts per person
Chicken, Potatoes and Salad for Four

$13.78

A savings of $14.11, or 51%, over the McDonald’s meal.
Prices per item:

- $1.50
- $2.98
- $5.96
- 50 cents
- 55 cents
- 75 cents
Comparison Shopping: McDonald's for Four

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Nutrition facts per person

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>CALORIES</td>
<td>900 (average)</td>
</tr>
<tr>
<td>FAT</td>
<td>37 grams</td>
</tr>
<tr>
<td>CARBOHYDRATES</td>
<td>123 grams</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>23 grams</td>
</tr>
</tbody>
</table>
Chicken, Potatoes and Salad for Four

$13.78

A savings of $14.11, or 51%, over the McDonald's meal.

Prices per item:

- $1.50
- $2.98
- $5.96
- 5 cents
- 50 cents
- 75 cents
- 55 cents
- 75 cents

Nutrition facts per person and difference from McDonald's meal

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>CALORIES</td>
<td>934</td>
</tr>
<tr>
<td>+4%</td>
<td></td>
</tr>
<tr>
<td>FAT</td>
<td>39 grams</td>
</tr>
<tr>
<td>+5%</td>
<td></td>
</tr>
<tr>
<td>CARBOHYDRATES</td>
<td>80 grams</td>
</tr>
<tr>
<td>-35%</td>
<td></td>
</tr>
<tr>
<td>PROTEIN</td>
<td>67 grams</td>
</tr>
<tr>
<td>+191%</td>
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</table>
Simplistic and Unscientific Statements

- Popular media
- Scientific journals
- By researchers & professionals!
- Driving public policy
- Constraining science
“…Americans continued to consume an average of 3800 calories per person per day, or about twice the daily requirement.”
What Is Wrong with the Statement?

- “…Americans continued to consume an average of 3800 calories per person per day, or about twice the daily requirement.”
- $\frac{3800}{2} = 1900$ extra calories/day
- $\sim 3500$ calories to lay down 1 pound of fat
- $\sim 1$ pound every 2 days
- $\sim 180$ pounds/year

“Increased energy intake alone virtually explains all the increase in body weight in the United States from the 1970s to the 2000s.”

Swinburn B. European Congress on Obesity; May 6-9, 2009; Amsterdam, the Netherlands.
Obesity Epidemic Caused by Eating too Much, Claims Academic

- Average caloric expenditure in 1980
  - Women=950 kcal/day
  - Men=1380 kcal/day
- Average caloric intake is now 3,500 kcal/day
- “Over the past 25 years...there has been no change in our levels of physical activity” “there has been no change in energy expenditure”

Article on British Science Festival in the September 16, 2010 Daily Telegraph
Has There Really Been No Change in Energy Expenditure for the Average Person?

- Occupational physical activity
- Household work
- Gardening
- Transportation
Jobs in U.S. Over Last 50 Years

Church TS et al. PLoS 2011
Daily Occupational Caloric Expenditure

<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>1500</td>
<td>1400</td>
</tr>
<tr>
<td>1970</td>
<td>1400</td>
<td>1300</td>
</tr>
<tr>
<td>1980</td>
<td>1300</td>
<td>1200</td>
</tr>
<tr>
<td>1990</td>
<td>1200</td>
<td>1100</td>
</tr>
<tr>
<td>2000</td>
<td>1100</td>
<td>1000</td>
</tr>
<tr>
<td>2010</td>
<td>1000</td>
<td>900</td>
</tr>
</tbody>
</table>

140 daily kcals
120 daily kcals

Church TS et al. PLoS 2011

Slide courtesy of Robin Shook
Exhibit 1 – Mode of Arrival to School by Children Ages 6-12, 1969 and 2001 NHTS

Source: NHTS Data Series
Do We Need a New Strategy for Dealing with Obesity?

- Example of a failed strategy
  - June 17, 1971 President Nixon declared a “War on Drugs”
  - There were two principal strategies
    - Interdiction—Keep drugs out of the U.S.
    - Incarceration—Lock people up who use them or people who sell them

- How well is this working?
How Should We Deal with the Obesity Epidemic?

- Understand energy balance
- Design interventions to address the problem
  - Public policy
  - Educational programs
  - Clinical medicine
  - Technological lifestyle interventions
- Conduct research to test interventions
- Implement successful interventions
Let Us Develop a New Strategy to Deal with the Obesity Epidemic

- Focus more effort on helping people meet physical activity and dietary recommendations
  - 150 minutes of moderate intensity activity/week or 75 minutes of vigorous activity/week
  - Eat 8–10 servings of fruit and vegetables each day

- Implement widespread programs to help people learn how to use cognitive and behavioral strategies to manage a healthful lifestyle
More Support for Physical Activity Research
### NIH Estimates of Funding for Nutrition and Food Categories

Dollars in millions and rounded

<table>
<thead>
<tr>
<th>Categories</th>
<th>FY 2013</th>
<th>FY 2008-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anorexia</td>
<td>$11</td>
<td>$61</td>
</tr>
<tr>
<td>Digestive diseases</td>
<td>$1,704</td>
<td>$10,199</td>
</tr>
<tr>
<td>Eating disorders</td>
<td>$27</td>
<td>$144</td>
</tr>
<tr>
<td>Food allergies</td>
<td>$33</td>
<td>$99</td>
</tr>
<tr>
<td>Food safety</td>
<td>$287</td>
<td>$1,728</td>
</tr>
<tr>
<td>Nutrition</td>
<td>$1,386</td>
<td>$8,825</td>
</tr>
<tr>
<td>Obesity</td>
<td>$827</td>
<td>$4,983</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$4,275</td>
<td>$26,039</td>
</tr>
</tbody>
</table>

NIH Estimates of Funding for Physical Activity and Exercise

Out of 233 categories of funding that are listed on the website

Number of categories of exercise, physical activity, or physical fitness

Zero!!!!!!!

My primary hopes for the future:

- There will be more emphasis on both sides of the energy balance equation when dealing with the obesity epidemic
- There will be more balance in research funding for physical activity and obesity
How to Stay in Energy Balance
THANK YOU FOR YOUR ATTENTION

THE ENERGY BALANCE RESEARCH TEAM