Childhood Obesity: A public health perspective

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Obesity Epidemic: 1980-Current Day

Trends in obesity among children

Figure 1: Trends in obesity among children and adolescents aged 2–19 years, by sex: United States, 1971–1974 through 2009–2010

Trends in obesity among adults

NOTES: Age adjusted by the direct method to the 2000 U.S. Census population using age groups 20–39, 40–59, and 60–74. Overweight is a body mass index (BMI) of 25 kg/m² or greater but less than 30 kg/m²; obesity is a BMI greater than or equal to 30 kg/m²; and extreme obesity is a BMI greater than or equal to 40 kg/m².

Why is childhood obesity a public health concern?

> Obesity in childhood tracks into adulthood
  – ~80% of children who are obese remain obese into adulthood
> Obesity in childhood is associated with increased risk of high blood pressure and elevated glucose/diabetes in childhood
> Obesity in adulthood is associated with increased risk for diabetes, stroke, heart disease, some cancers
Health consequences of obesity (BMI≥30)

• 1) Associated with increased risk for morbidities:
  – **Diabetes**: Relative Risk~10.5
  – **Hypertension**: Relative Risk~2.3
  – **Coronary Artery Disease**: Relative Risk~1.75
  – **Stroke**: Relative Risk~1.5
  – **Some cancers** (endometrial, breast, colon): Colon RR~1.3
  – **Gallbladder disease**: Relative risk~2.4
  – **Sleep apnea and breathing problems**: Relative risk ~2.0-4.0
  – **Osteoarthritis**: Relative Risk ~4.0

However,

- Can reverse the effects of childhood obesity if we can reverse the obesity itself
Metabolic activity of the fat cell

Fat cells secrete fatty acids, VLDL, cholesterol → likely related to endothelial function (CVD) and to accumulation of fat in the liver and to gallbladder disease.

Fat cells also release cytokines which, in combination with the free fatty acids are believed to contribute to low-grade chronic inflammation → insulin and leptin resistance, vascular disease, pancreatic beta cell dysfunction.


Drivers of the obesity epidemic
Causes of obesity

Obesity is not...

> “Obesity is not a character flaw. It is a normal response to an abnormal environment"
Causes of obesity

Figure 4: A framework to categorise obesity determinants and solutions

The more distal drivers are to the left and the environmental moderators that have an attenuating or accentuating effect are shown, along with some examples. The usual interventions for environmental change are policy based, whereas health promotion programmes can affect environments and behaviours. Drugs and surgery operate at the physiological level. The framework shows that the more upstream interventions that target the systemic drivers might have larger effects, but their political implementation is more difficult than health promotion programmes and medical services.
Causes of obesity epidemic

• Societies: Obesity Epidemic implies pervasive changes resulting in ~70% adults and 40% of children being overweight/obese and no world region being spared from increase

• Factors that have changed concurrent with obesity prevalence changes (i.e. over the last 30-40 years)
What are some of these pervasive changes that have led to increases in obesity among adults or children?

Probable population contributors:

- More calories available
- Snacking
- Portion size
- Relative price of junk food vs healthy food
- Food marketing
- Screen time
- Eating away from home
- Higher BMI entering pregnancy
Cutler and colleagues note, there was “a revolution in the mass preparation of food that is roughly comparable to the mass production revolution in manufactured goods that happened a century ago,” that “lowered the time price of food consumption”.

Figure 3: Food availability for the USA, 1910-2006
There are two distinct phases: a decrease in food energy supply (postulated to be pulled down by reduced energy expenditure requirements for daily living), followed by an increase in food energy supply (postulated to be pushed up by increasing food access). An energy balance flipping point is proposed, marking the change in how the US population generally achieved energy balance.
Modern American diet has gotten bigger, heavier on grains and fat

Average per capita calorie consumption per day, 1970 & 2010

Note: “Fats and oils” includes butter, cream and other dairy fats. Figures adjusted for spoilage and other losses. Source: USDA Economic Research Service; Pew Research Center analysis

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Food Norms

• Passively consuming these ~500 extra calories because of changing food norms
Food Norms: Portion Size

### Portion Distortion

<table>
<thead>
<tr>
<th>20 YEARS AGO</th>
<th>TODAY</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>333 Calories</td>
<td>590 Calories</td>
<td>257 MORE CALORIES</td>
</tr>
<tr>
<td>Lifting weights for 1 HOUR AND 30 MINUTES burns approximately 257 calories*</td>
<td>Based on 130-pound person</td>
<td></td>
</tr>
<tr>
<td>500 Calories</td>
<td>850 Calories</td>
<td>350 MORE CALORIES</td>
</tr>
<tr>
<td>Playing golf (while walking and carrying your clubs) for 1 HOUR burns approximately 350 calories*</td>
<td>Based on 160-pound person</td>
<td></td>
</tr>
<tr>
<td>500 Calories</td>
<td>1,025 Calories</td>
<td>525 MORE CALORIES</td>
</tr>
<tr>
<td>Housecleaning for 2 HOURS AND 35 MINUTES burns approximately 525 calories*</td>
<td>Based on 130-pound person</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>20 YEARS AGO</th>
<th>TODAY</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 Calories</td>
<td>250 Calories</td>
<td>165 MORE CALORIES</td>
</tr>
<tr>
<td>Working in the garden 35 MINUTES burns approximately 165 calories*</td>
<td>Based on 160-pound person</td>
<td></td>
</tr>
<tr>
<td>210 Calories</td>
<td>500 Calories</td>
<td>290 MORE CALORIES</td>
</tr>
<tr>
<td>Vacuuming for 1 HOUR AND 30 MINUTES burns approximately 290 calories*</td>
<td>Based on 160-pound person</td>
<td></td>
</tr>
<tr>
<td>270 Calories</td>
<td>630 Calories</td>
<td>360 MORE CALORIES</td>
</tr>
<tr>
<td>Doing water aerobics for 1 HOUR AND 15 MINUTES burns approximately 360 calories*</td>
<td>Based on 160-pound person</td>
<td></td>
</tr>
</tbody>
</table>

*Based on averages from the National Heart, Lung and Blood Institute, [http://nhlbi.nih.gov/guidelines/portion](http://nhlbi.nih.gov/guidelines/portion)
Food norms: increases in food away from home

Food away from home as a share of household food expenditures has risen steadily since 1970, reaching its highest level of 43.1 percent in 2012

Source: ERS
Food Norms: Snacking

• Number of snacking occasions increased from 1.3 to 2.2 between 1977 and 2006

• Calories per snack increased from 144 to 226

• Foods that increased the most were salty snacks and “other snacks” (candies, ready to eat cereal)

Piernas C and Popkin B M. J. Nutr. 2010;140:325-332
Relative Food Price

Figure 1
Consumer price index for fresh fruits and vegetables and consumer price index for cakes, cupcakes, and cookies (both relative to CPI-U for all items)

Source: BLS Consumer Price Index-All Urban Consumers data.
Adult obesity affecting childhood probability of obesity

> Women entering pregnancy at higher BMI
> Women with higher BMIs tend to gain excessively during pregnancy
> Both having high pre-pregnancy BMI and excessive gestational weight gain increases risk for being born large and later childhood obesity
  – Believed to operate through developmental origins; hypernutrition pathway
    > Hypernutrition is thought to affect adipogenesis and appetite control functions.
    > Adipogenisis begins in mid to late gestation and the formation of adipose tissue occurs around the time of birth
MARKETING:
Total food advertising expenditures per person: a 60% real increase between 1980 and 2000s

Every day, children ages 2-17 see, on average, 12-21 TV commercials for food products → 4,400-7,600 commercials a year

**Distribution of Types of Food in TV Advertising Targeted to Children or Teens, 2005**

Among all food ads targeted to children or teens, percent that are for:

- Breads and pastries: 2%
- Fruit juices: 1%
- Dairy: 4%
- Prepared foods: 4%
- Dine-in restaurants: 7%
- Sodas & soft drinks: 9%
- Fast food: 10%
- Sugared cereal: 28%
- Candy and snacks: 34%

Children’s understanding of media

- **Under age 6:** cannot distinguish between program content & ads
- **Under age 8:** most do not understand purpose of advertising is to sell a product
- **Age 8-10:** may understand nature of advertising, but may not always discern the persuasive intent or understand disclaimer wording
- After reviewing the research, the American Academy of Pediatrics concluded that “advertising directed toward children is inherently deceptive & exploits children < 8 yrs of age”

## Screen time among children

### Media Use Over Time

Among all 8- to 18-year-olds, average amount of time spent with each medium in a typical day:

<table>
<thead>
<tr>
<th>Medium</th>
<th>2009</th>
<th>2004</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV content</td>
<td>4:29a</td>
<td>3:51b</td>
<td>3:47b</td>
</tr>
<tr>
<td>Music/audio</td>
<td>2:31a</td>
<td>1:44b</td>
<td>1:48b</td>
</tr>
<tr>
<td>Computer</td>
<td>1:29a</td>
<td>1:02b</td>
<td>:27c</td>
</tr>
<tr>
<td>Video games</td>
<td>1:13a</td>
<td>:49b</td>
<td>:26c</td>
</tr>
<tr>
<td>Print</td>
<td>:38a</td>
<td>:43ab</td>
<td>:43b</td>
</tr>
<tr>
<td>Movies</td>
<td>:25a</td>
<td>:25ab</td>
<td>:18b</td>
</tr>
<tr>
<td>TOTAL MEDIA EXPOSURE</td>
<td>10:45a</td>
<td>8:33b</td>
<td>7:29c</td>
</tr>
<tr>
<td>Multitasking proportion</td>
<td>29%a</td>
<td>26%a</td>
<td>16%b</td>
</tr>
<tr>
<td>TOTAL MEDIA USE</td>
<td>7:38a</td>
<td>6:21b</td>
<td>6:19b</td>
</tr>
</tbody>
</table>

Notes: See Methodology section for a definition of terms, explanation of notations, and discussion of statistical significance. See Appendix B for a summary of key changes in question wording and structure over time. **Total media exposure** is the sum of time spent with all media. **Multitasking proportion** is the proportion of media time that is spent using more than one medium concurrently. **Total media use** is the actual number of hours out of the day that are spent using media, taking multitasking into account. See Methodology section for a more detailed discussion. In this table, statistical significance should be read across rows.

Source: KFF
Reflection

> You are part of a childhood obesity task force assigned to advise the federal government on solutions to the obesity epidemic.

> What types of solutions would you be considering?
Policy Approaches to Preventing Obesity
To affect obesity, a multiple, layered policy actions

- Restrict marketing to children
- Consumer-friendly nutrition labeling
- Invest in infrastructure to produce healthy foods
- Incentive healthy food vendors in lower income neighborhoods
- Set standards for school meals
- Set standards for food provided through food assistance program
- Regulate unhealthy foods in and around schools
- Increase shelf-space for healthy foods
- Minimum stocking standards
- Subsidize healthy foods
- Tax unhealthy foods
- Reformulate products to reduce unhealthy ingredients
Examples of policy approaches to obesity

- Healthy Hunger Free Kids Act (Setting standards for meal served in school)
- WIC Package Change (Providing healthier foods in food assistance programs)
- Taxing Sugary Drinks (Mexico and Berkeley)
Healthy Hunger Free Kids Act 2010

All Food Sold in Schools must:

• Be a whole-grain rich product, or
• Have a first ingredient be a fruit, veg, dairy or protein, or
• A combo food that contains at least ¼ cup of fruit or veg, or
• Contain 10% of the Daily Value of one of calcium, potassium, vit D or Fiber
• Also limits on calories, sodium, fats, sugar for entrees and for snacks

After

Slide courtesy of Mary Podrabsky
Nutrient and Energy Density of meals: Pre and Post Implementation of new standards

Slide courtesy of Mary Podrabsky
Will the Trump Era Transform the School Lunch?
WIC food package change of 2009
Results from evaluations

• Pre-post changes:
• Increase in whole grains, fruits and vegetables; Decrease whole milk (Whaley 2012)
• Decrease in obesity prevalence (Chiasson et al. 2013)
• Increase in healthy food availability in urban settings (Hillier 2012; Cobb 2016)
Sugary Drink Taxes

Demonstrations «500,000 deaths in six years» in front of the Ministry of Health
Background: Why tax sugary drinks

> Sugar is a nutrient of concern:
  - it is linked to weight gain, diabetes and heart disease 1-6, and
  - we eat too much (see panel)

> Sugary drinks are single largest contributor to sugar intake 7

> Liquid form of sugar seems particularly harmful, i.e. lack of compensation in calories

7. Estimates based on day 1 dietary recalls from What We Eat in America, NHANES 2009-2010.
Soda/Sugary Drink Taxes

- Evidence from Mexico and Berkeley suggests these taxes are effective in changing purchasing
  - Mexico: **10% decline in purchasing of taxed beverages**; 17% decline among lower income populations
  - Berkeley: **10% decline in purchasing**; 21% decline in consumption among lower-income adults
  - Philly: **preliminary results suggest 57% decline in volume sold** of taxed beverages (higher tax)
To affect obesity, a multiple, layered policy actions

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