The Overweight Epidemic Among Children and Youth in the United States: Causes and Opportunities for Prevention

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The shape of things to come
Overview

- Recent trends – are rates leveling off?
- What we know about the causes of the epidemic
- Why the environments of children and youth are so important – this includes homes, schools, communities, the food industry, mass media, the health care system
- What science tells us: some of the best opportunities for prevention of overweight
The Problem:

- Overweight and obesity has been increasing rapidly among children, youth and adults in the US

- Increases are found in all regions of the country, urban/rural, both sexes, all ethnic groups, rich and poor
Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1991
(*BMI ≥30, or ~30 lbs. overweight for 5’4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1992

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1993

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1994
(*BMI ≥30, or ~ 30 lbs. overweight for 5’4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1995
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 1996

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Obesity Trends* Among U.S. Adults

BRFSS, 2000

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2001
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2002

(*BMI ≥30, or ~30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2003
(*BMI ≥ 30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2004

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2005

(*BMI ≥30, or ~30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 2006
(*BMI \geq 30, or \sim 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults

BRFSS, 2007

(*BMI ≥30, or ~30 lbs. overweight for 5’4” person)
Updates on NHANES Obesity Trends

Have we turned the corner on the obesity epidemic?

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Department of Society, Health and Human Development
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%Obese, Age 2-19, Standardized by sex and age

- 1970: 5.2%
- 1975: 5.5%
- 1980: 9.3%
- 1985: 10.2%
- 1990: 11.0%
- 1995: 14.2%
- 2000: 15.3%
- 2005: 17.0%
%Obese, Age 2-19, Standardized by sex and age

%: 5.2, 5.5, 9.3, 10.2, 11.0, 14.2, 15.3, 17.0, 15.0
% Obese, by Age: 1970-2004

*Standardized by single age and sex by NHANES 1999-2006 population
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Prevalence Trend:
by demographic group
Disparity (1): by Race-Ethnicity

AGE 6-11

*Obese is defined as BMI $\geq$ 95th percentile for age 2-19 and $\geq$ 30kg/m² for age 20+
Disparity (1): by Race-Ethnicity

AGE 12-19

- White
- Black
- Hispanic

*Obese is defined as BMI≥95th percentile for age 2-19 and ≥30kg/m² for age 20+.
*Obese is defined as BMI >= 95th percentile for age 2-19 and >= 30 kg/m² for age 20+
Disparity (2): by Household Income

AGE 12-19

*Obese is defined as BMI >= 95th percentile for age 2-19 and >= 30kg/m² for age 20+*
Causes of the Overweight Epidemic
Obesity Fundamentals

• Obesity is caused by Energy Intake in excess of Energy Expenditure

• The daily energy imbalance driving the epidemic is on average small - an extra sugar sweetened beverage per day (110-165 kcal/day) – but greater for obese youth (680-1010).

• Social context is important (e.g. sugar sweetened beverages everywhere)

The Energy Gap and Childhood Obesity in The United States

Steven L. Gortmaker, PhD
Harvard School of Public Health

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Columbia Mailman School of Public Health
What’s Behind the Trend: distribution shift due to excess weight gain

Baseline:
Age 2-7

10 years later

Counterfactual
Age 12-17
No excess weight gain

Actual:
NHANES 1999-2002
Age 12-17
Gained excess weight

Energy Gap: linking population trend to individual behavior

• Rationale: excess weight gain is caused by energy intake exceeds energy expenditure

• Definition of energy gap in children:
  – Imbalance between the calories children consume each day and the calories required to support normal growth, physical activity, and body function.

• Adjusting for energy expenditure due to weight gain

**Average Daily Energy Gap (kcal/day)**

<table>
<thead>
<tr>
<th></th>
<th>Excess Weight Gained (Lb)</th>
<th>Daily Energy Gap (kcal/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Teens</td>
<td>10</td>
<td>110 - 165</td>
</tr>
<tr>
<td>Overweight Teens</td>
<td>58</td>
<td>678 - 1,017</td>
</tr>
</tbody>
</table>

**Behavioral implications of 150 kcal:**

- Replacing 1 can of soda (12 oz) with water (140 kcal)
- Reducing TV watching by an hour (106 kcal/day)¹
- Walking 1.9 hours instead of sitting (for 30-kg boy)(150 kcal)
- Increasing PE from 1 to 3 times/week (240 kcal or 34 kcal/day)

The Important Forces:

- **F**ood producers and the "Fast Food" industry - if they’re successful, we all eat more

- **A**dvertisers for food and video/film industries - if they’re successful, we all buy more

- **T**elevision and video/film production and distribution industry - if they’re successful we all watch more
The growth of the fast food industry and increasing portion sizes make it easy for children to overeat
Add something to your Extra Value Meal®

$1 each Every Day!

Products featured are the Small Soft Drink, McValue™ Fries, Side Salad, Big N' Tasty®, or Big N' Tasty® Classic,* Snack Size Fruit 'n Yogurt,** Parfait, 2 Pies and McChicken™ or Hot 'n Spicy McChicken™ Sandwich. Current prices and participation based on independent operator decision. Products and prices may vary. *weight before cooking 9.7 oz. **made with low-fat yogurt.
“A large fast food meal (double cheeseburger, french fries, soft drink, desert) could contain 2200 kcal, which would require a full marathon to burn off.”

"Can Johnny come out and eat?"
Fast Food and Diet of Children and Youth

• On days that children and youth eat fast food – they consume an extra 126 kcals/day (P<0.0001)
• Higher income children, non-Hispanic African Americans, and children in the South eat more fast food

Sugar-sweetened beverages contribute to childhood obesity incidence
Sugar-sweetened beverages contribute to childhood obesity incidence

A substantial body of research has determined that increased SSB consumption leads to excess weight gain and increased risk of obesity in youth (Vartanian et al., 2007; Malik et al., 2006; Pereira et al. 2006).
Soft Drink Consumption and Obesity

“For each additional serving of sugar-sweetened beverage consumed, both BMI (0.243 kg/m2; P=0.03), and incidence of obesity (odds ratio 1.60; P=0.02) increased.”

Reducing Intake of Sugar Sweetened Beverages Can Reduce Overweight Among Youth

A school-based randomized controlled intervention found that intake of carbonated drinks could be decreased, and that this change was accompanied by a decrease in percentage of overweight and obese children (-7.7%; 95% confidence interval 2.2% to 13.1%)

...women consuming 1 or more sugar-sweetened soft drinks per day had a relative risk of type 2 diabetes of 1.80; P<0.001 for trend) compared with those who consumed less than 1 of these beverages per month."

How?

Individuals do not appear to compensate for excess liquid calories by reducing consumption of calories from solid food (Bellisle and Rolland-Cachera, 2001; Mattes, 1996; DiMegio and Mattes, 2000.)
Replace SSB with What?

- Replacing with water results in less total caloric intake for the day (Wang et al 2009)
- Public water supplies (fountains, bubblers)
- Creative replacement – a perfect place for participatory research with community partners
- Replacing with low fat milk does not cut calories, but adds nutrients
- I don’t like artificial sweeteners myself – too much sweetness!
Patterns of sugar sweetened beverage (SSB) intake: clues to prevention
Types of SSB & 100% FJ Consumed

Where SSB & 100% FJ Consumed

How Much SSB Do Children Consume? And How Much is Spent?

• Based on national NHANES data through 2004, children and youth ages 2-19 consume 7.2 trillion calories in SSB per year
• In dollars, at $0.50 per can, this is $24 billion/year
• These beverages can be replaced with water at virtually no cost
• We need a SSB Bailout Plan!
The Important Forces:

• **Food producers and the "Fast Food" industry** - if they’re successful, we all eat more.

• **Advertisers for food and video/film industries** - if they’re successful, we all buy more.

• **Television and video/film production and distribution industry** - if they’re successful we all watch more.
Television Viewing and Energy Balance: The Science

- How can television viewing cause obesity?
- Evidence in support of hypothesis
Hypothesized Impact of Television Viewing on Obesity

Television Viewing → Dietary Intake → Obesity

Television Viewing → Inactivity → Obesity
Evidence for the Impact of Television Viewing on Obesity

The first nationally representative study linking television viewing and childhood obesity was published in 1985. By 2008 there were more than 250 citations on this topic in PubMed.

Prevalence of Obesity by Hours of TV per Day; NHES Youth Aged 12-17 in 1967-70 and NLSY Youth Aged 10-15 in 1990

Prevalence (%)

TV Hours Per Day (Youth Report)

Child and Adolescent Television Viewing Predicts Overweight at Age 26

“...children currently view as many as 40,000 commercials on television and cable per year.”

“Finding: Children are exposed to extensive advertising for high-calorie and low-nutrient foods and beverages and very limited advertising of healthful foods and beverages during their daily television viewing.”

Evidence for the Impact of Television Viewing on Obesity

5 Randomized Controlled Trials

“Every few years, Gordon and the TV get a couple of inches wider.”
Independent relationship of TV viewing and physical activity to diabetes incidence; males

(Hu et al, Arch Intern Med. 2001;161:1542-8)
The Important Forces:

- **F**ood producers and the "Fast Food" industry - if they’re successful, we all eat more

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The Consequences?

- Clear evidence for increasing risk of cardiovascular disease, diabetes, adult obesity and cancer

- But we don’t really know the magnitude: never before have our children and youth been so overweight (and we don’t know consequences for adults either)


Can the Epidemic be Halted?

- Limited evidence for effective treatment of overweight
- The causes of the epidemic are rooted in the success of the food, beverage, television/video/movie/game and advertising industries.
- But we do have some scientific evidence that we can initiate change among children and youth
Planet Health

An Interdisciplinary curriculum for 6th-8th grade students

Behavioral Targets

• Reduce TV viewing to less than two hours per day
• Decrease consumption of high fat/saturated fat/trans fat foods
• Increase moderate and vigorous activity
• Increase consumption of fruits and vegetables to five-a-day or more
Effects of Planet Health

- Obesity among females in intervention schools was reduced compared to controls (OR 0.48; P=0.03)
- Reductions in TV; both boys & girls
- Among girls, each hour of TV => reduced obesity (OR 0.86/hour; P=0.02)
- Increases in fruit and vegetable intake and less increment in total energy intake among girls (P=0.003 and P=0.05)

Impact of Planet Health on Disordered Weight Control Behaviors: Females

“...girls in intervention schools were less than half as likely to report purging or using diet pills at follow-up compared with girls in control schools (odds ratio, 0.41; 95% confidence interval, 0.22-0.75).”

Cost-Effectiveness

An independent economic analysis of Planet Health found:

• An estimated program cost of $14/student/year
• Planet Health is more cost-effective than commonly accepted preventive interventions, such as screening and treatment for hypertension.
• $4300 per QALY (quality adjusted life year)

Planet Health
Implementation/Dissemination

- Expansion in Boston Public Schools via CDC, US Dept of Education, and STEPS (Boston Public Health Commission)
- Blue Cross Blue Shield of MA has funded a four-year, $3 million program for grants to middle schools throughout MA to implement Planet Health & additional after school programming
- 9500 copies of Planet Health now distributed in 48 states and 20 countries
• Steven Gortmaker PhD  PI
• Charles Deutsch ScD  Co-PI
• Multiple Community Committees
• 20 other faculty and staff
• Funding: Centers for Disease Control and Prevention
A Broad Vision of Our Work

• It’s not just individual choice - we focus on social ecological, behavioral, and transdisciplinary approaches to improving nutrition, physical activity, and reducing overweight and chronic disease in children and youth.

• We work with community partners to develop and evaluate interventions within multiple social and environmental settings: e.g. schools, pre-schools, after schools, primary health care, worksites, neighborhoods and homes. Supportive change in many such environments/channels will be needed to halt the rise in chronic disease risk.
Starting Young: Preventing Overweight in the Head Start Setting

Funded by Harvard Pilgrim Health Care Foundation
Interdisciplinary curriculum for 4th and 5th grade

Evaluation indicates improved dietary intake
(total fat, sat fat, fruits/vegetables, vit C, & dietary fiber)

and Reduced Television Viewing


Play Across Boston
ACTIVATE AMERICA

Community Leadership
Strengthening YMCAs’ capacity for community leadership in support of healthy living

The Gulick Project
Directly helping individuals and families lead healthier lives

Strategic Partnerships
Magnifying the YMCAs’ impact through strategic partnerships

Built on a solid foundation:
A 150 year commitment to health in spirit, mind, body
Clinical Interventions in Primary Care Settings

- **Maine Youth Overweight Collaborative** (lead by Maine Center for Public Health; Maine Health Access Foundation)

- **High Five for Kids** (lead by Department of Ambulatory Care and Prevention, Harvard Medical School (NICHD))
What can YOU do to help keep kids healthy?

Follow the 5-2-1-0 countdown to good health

5: Eat at least 5 servings of fruits & vegetables on most days
2: Limit screen time to 2 hours or less daily
1: Participate in at least 1 hour or more of physical activity every day
0: Avoid soda & sugar-sweetened drinks; limit fruit juice to half cup or less per day.
   Instead, encourage water and 3-4 servings/day of fat-free milk.
A Vision For Ending the Obesity Epidemic and Eliminating Disparities

• We can develop interventions - grounded in science - that effectively provide supportive environments for healthy eating and physical activity for children (and adults)

• But unless this science is translated into action – into the diverse lives of households and children and youth – and via a multitude of channels, throughout the life course – the impact may be trivial.