

# Topic 2: Obesity



# Outline

- Adult and childhood obesity are international problems
- The medical explanation of obesity is unpersuasive
- Is obesity an epidemic?
- The economic explanation of obesity emphasizes that people make rational choices about eating and exercise
- Adult and childhood obesity have some common features and some important differences
- What is the economic perspective on a fat tax, snack tax, or a tax on high-sugar sodas?
- What is the economic explanation for racial and socio-economic differences in obesity?



# Measurement of Obesity

- Body mass index (BMI) = weight in kg / height in meters squared
  - Adult BMI 25 to 29.9 = overweight
  - Adult BMI 30+ = obese
- Obesity in children is measured by % of body fat
  - > 25% is obese for boys
  - > 32% is obese for for girls



# Adult Obesity

“It is currently estimated that mortality due to lack of exercise and caloric intake is second only to tobacco consumption in the number of deaths that could be prevented by behavioral change.”

*Tom Philipson, “The World-Wide Growth in Obesity: An Economic Research Agenda,” Health Economics, 2001*



# Adult Obesity in U.S.

- In 1998, 36% of U.S. adults age 18-65 were overweight but not obese and 23% were obese
- In 2008, 34% were overweight but not obese and 34% were obese
- Obesity has the same association with chronic health conditions as adding 20 years to one's age
- This greatly exceeds the associations of smoking or problem drinking with chronic health conditions
- Obesity is associated with 36% increase in total health care spending and 77% increase in medication costs

*Roland Sturm, "The Effects of Obesity, Smoking, and Drinking on Medical Problems and Costs," Health Affairs, 2002; Katherine Flegal, et al., "Prevalence and Trends in Obesity among US Adults, 1998-2008," JAMA, 2010*



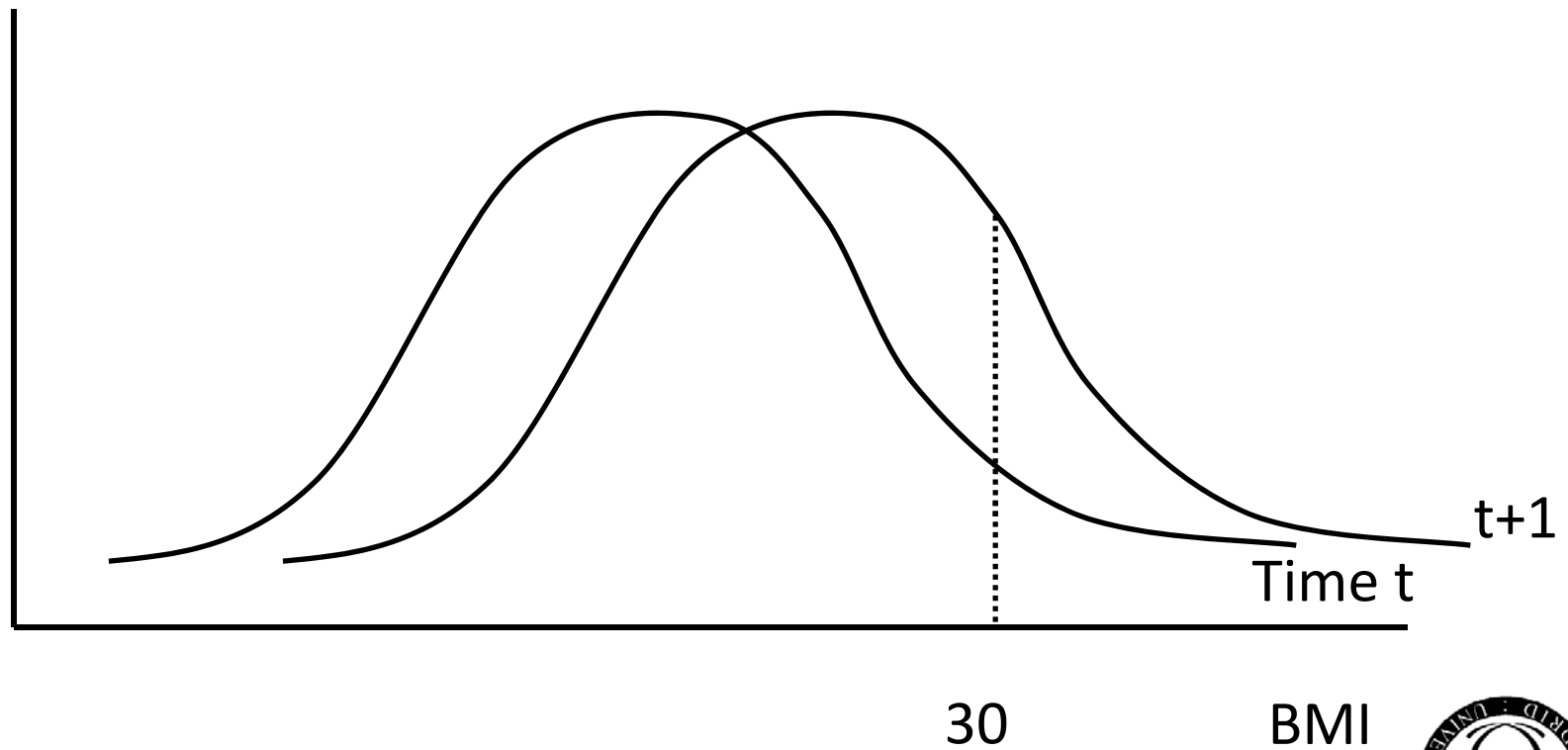
# Obesity in Spain

- Ministry of Health reported that 13.6% of adults were obese and 38.6% were overweight in 2003
- Obesity rate in Spain has doubled since 1985: fastest increase among EU countries
- Obesity is responsible for 5.5% of the total death rate in Spain  
– JR Banegas, et al., “A Simple Estimate of Mortality Attributable to Excess Weight in the European Union,” *European Journal of Clinical Nutrition*, 57 (2003), 201-208
- Also see Joan Costa-Font and Joan Gil, “What Lies Behind Socio-demographic Inequalities in Obesity in Spain: A Decomposition Approach,” *Food Policy*, 33 (2008), 62-73



# Obesity Can Increase Rapidly

Frequency



# Childhood Obesity

- Canada: obesity in boys increased from 5% in 1981 to 13.5% in 1996; obesity in girls increased from 5% to 11.8% over the same period
- England: 5% of boys were obese in 1974 and 1984, but 9% were obese in 1994

*Canadian Medical Association Journal*, 2000;

*British Medical Journal*, 2001





# Medical View of Obesity

- Obesity is a ‘chronic disease’
- The increase in obesity among both adults and children is an ‘epidemic’ caused by ‘changes in the environment that have caused genetically susceptible populations to express the obesity phenotype in increasing numbers’ (*American Family Physician*, 1999)
- The desired solution to the problem is a ‘pharmacologic agent’ (fat-reducing pill)
- Reducing food intake and education about good nutrition are the best available alternatives



# Is Obesity a Disease?

- Hormonal or genetic causes of obesity are rare but obesity is a worldwide problem
- In the UK, children's caloric intake actually decreased from 1980 to 1990 (although too much of the energy came from fat); children ate fewer saturated fats and the intake of vitamins and iron increased
- Adult weight has been increasing for many years and the upward trend was greater in the early part of the 20th century than today
- The vast majority of people know how to lose weight: eat less and exercise more



# Is Obesity an Epidemic?

- Definitions of epidemic:
- *Wikipedia*: “A disease that appears as new cases in a given population, during a given period, at a rate that substantially exceeds what is expected”
- *Understanding Epidemics*: “An epidemic is a disease which can be passed from person to person, increasing rapidly”



# Can Obesity be Transmitted?

- Nicholas Christakis and James Fowler, “The Spread of Obesity in a Large Social Network over 32 Years,” *NEJM*, 2007, found that a person’s chances of becoming obese increase by:
  - 57% if he/she has a friend who becomes obese
  - 40% ... a sibling who becomes obese
  - 37% ... a spouse who becomes obese
- It doesn’t matter how close the friends are and they don’t have to live in the same city!
- Others argue that common changes in unobserved variables may be responsible for the association of weight gains among friends, siblings, or spouses



# Economic View of Obesity

- Obesity is the result of rational choices about eating and exercise
- Choices may be influenced by advertising, peer effects, availability of snacks, etc.
- Choices create external costs for society

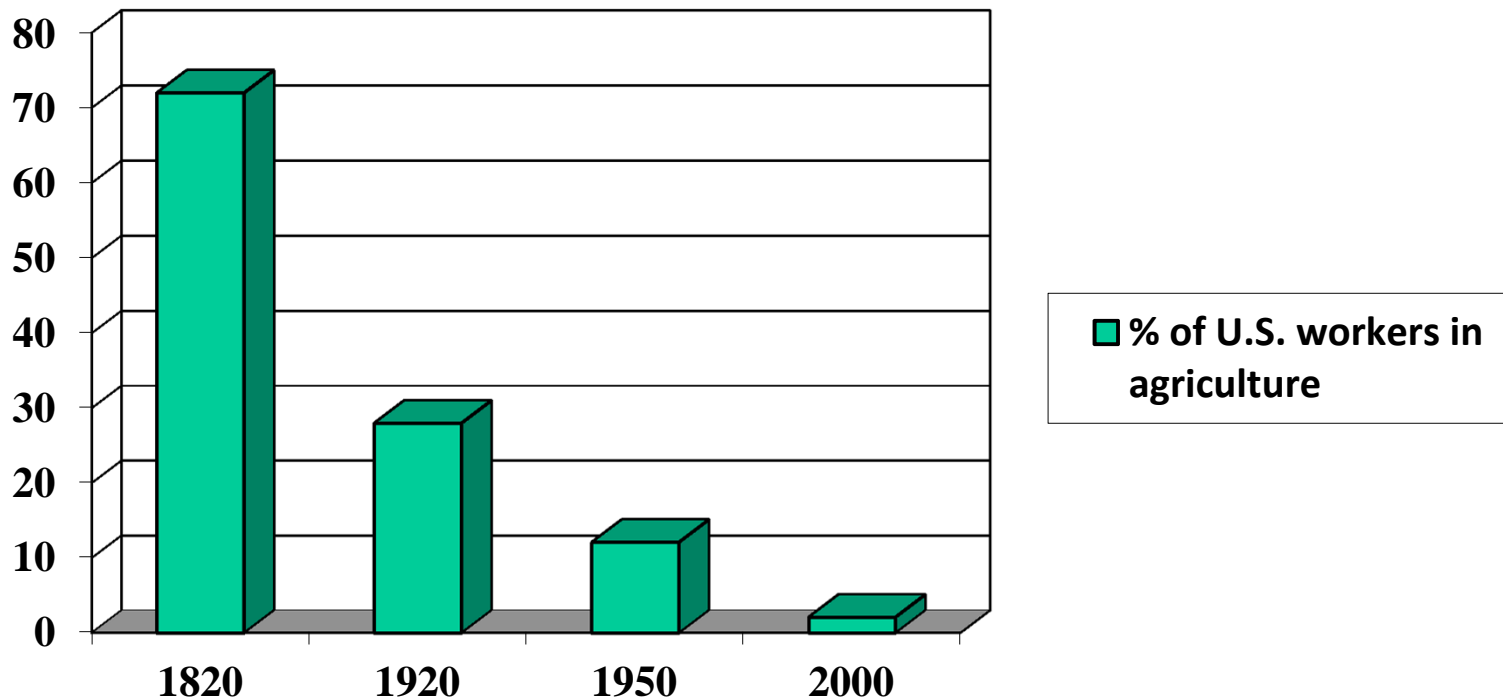


# Economists Disagree About Fundamental Cause of Obesity

- Tom Philipson argues that adult obesity is caused by technological change at work and the falling cost of food
- David Cutler emphasizes rising caloric intake – especially more snacks



# Fewer Farmers



*Jonathan Hughes and Duncan McDougal, American Economic History, 1961; President's Council of Economic Advisers Report, 2001*



# Cotton Picking

- 1920s: A good 'field hand' could pick 250-275 pounds of raw cotton per day in backbreaking labor
  - Raw cotton was dumped into wagons and carried to a gin where the seeds were removed
  - Between 1,200 and 1,500 pounds of raw cotton yield one 500-pound bale of ginned cotton
- 1931: First mechanical cotton picker is introduced and picks 1 bale/day
- 2015: John Deere cotton picker can harvest 80-100 acres of land (roughly 200 bales) per day
  - 1,000 times more productive than hand picking
  - Driver rides in air-conditioned cab and controls the machine by computer
  - Machine spits out rolls of raw cotton wrapped in plastic
  - Costs \$650,000 (about €580,000)





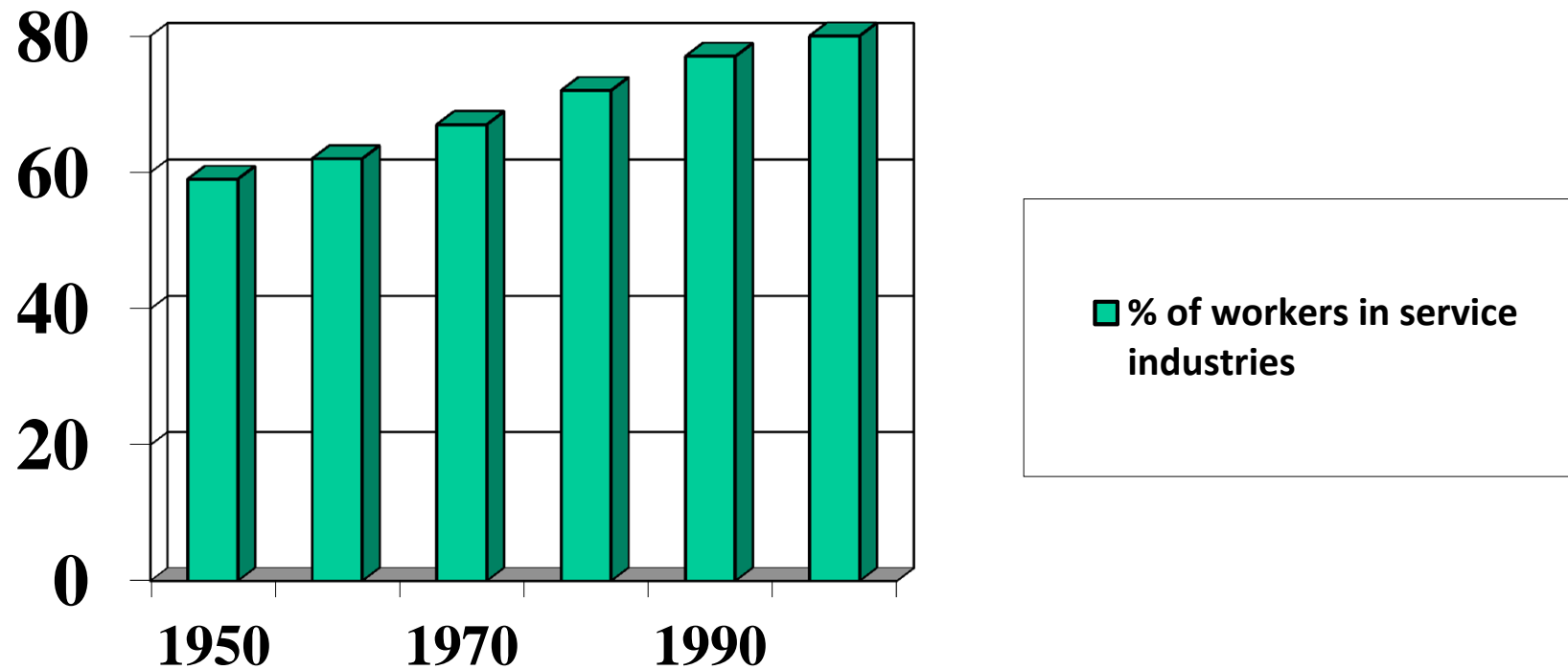
# My Aching Back!



# Farm Labor, 2014



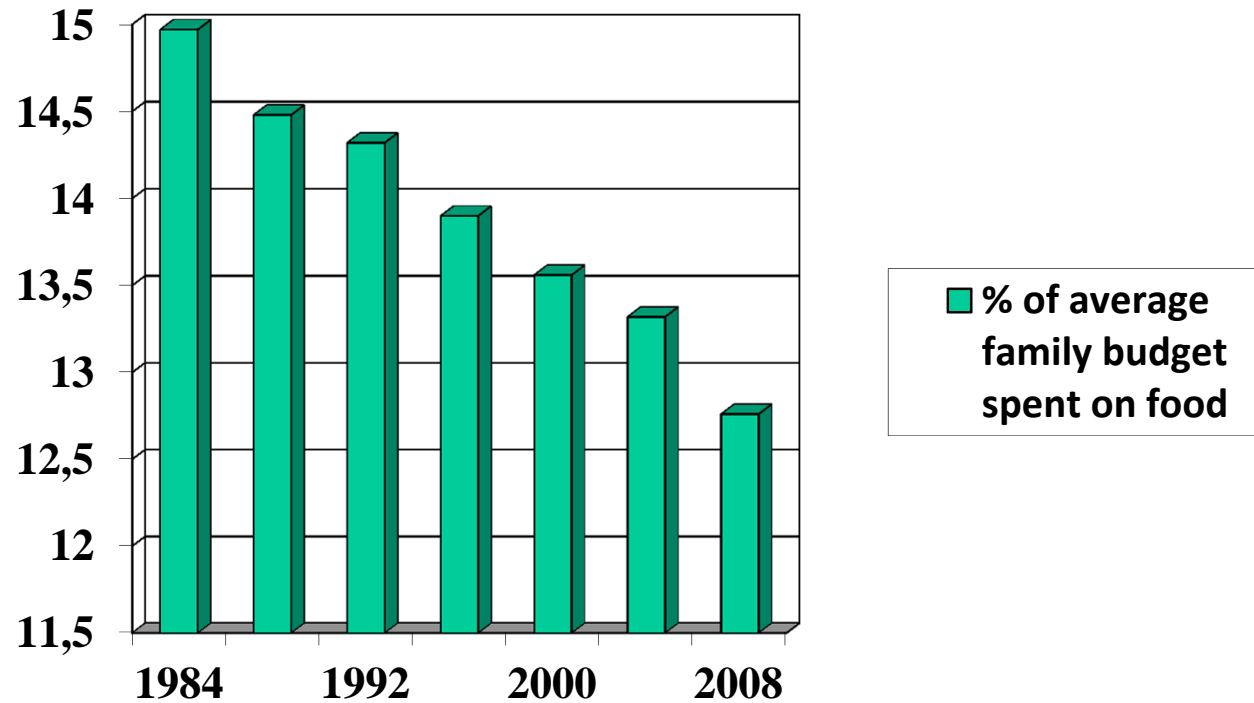
# More Jobs in Service Industries



*President's Council of Economic Advisors Report, 2001*



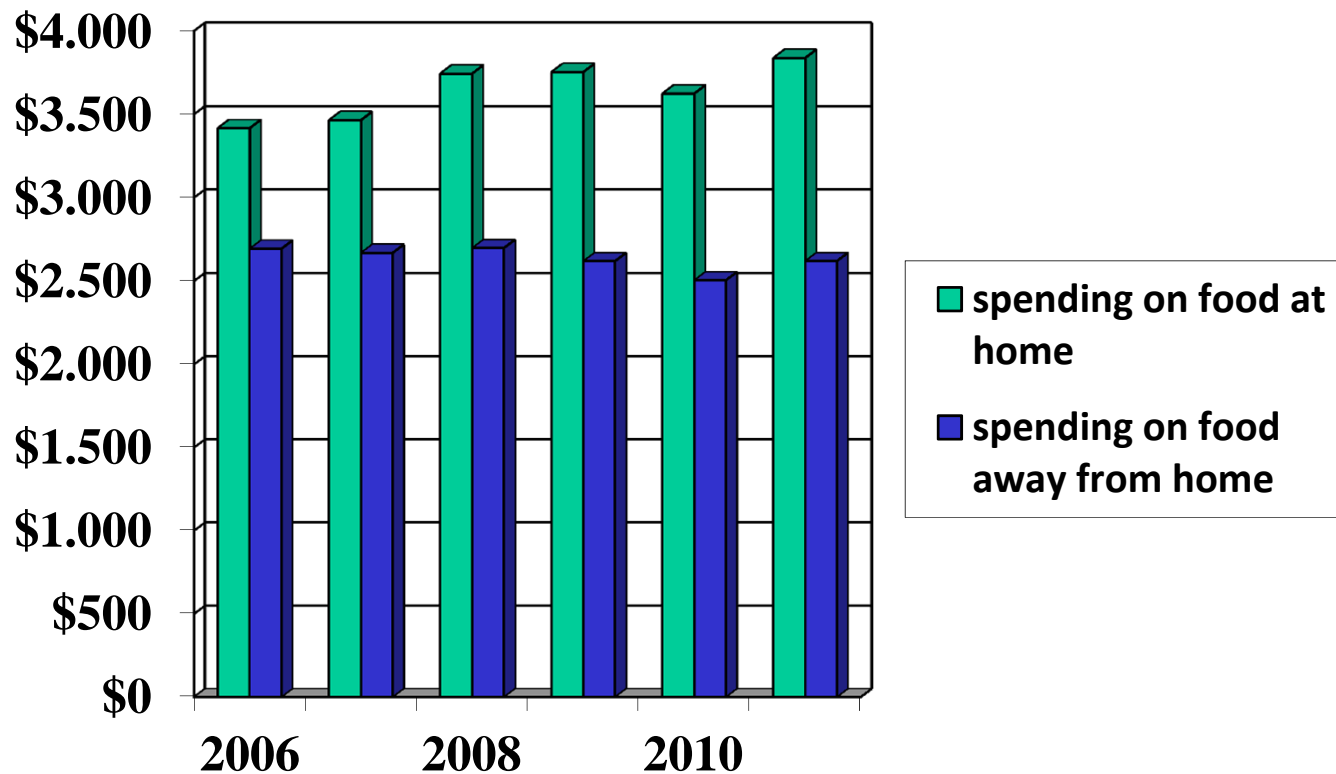
# Cost of Food in Family Budgets is Falling



*U.S. Bureau of Labor Statistics, Consumer Expenditure Survey*



# Is Eating Food Away from Home the Culprit?



*U.S. Bureau of Labor Statistics, Consumer Expenditure Survey*



# It Ain't Peanuts

- U.S. government farm subsidies per year:
  - \$7.3 billion for corn and other feed grains
  - \$3.5 billion for cotton
  - \$1.6 billion for soybeans
  - \$1.5 billion for wheat
  - \$1.5 billion for tobacco
  - \$686 million for dairy
  - \$626 million for rice
  - \$271 million for peanuts

*U.S. Congressional Budget Office*



# Have a Snack

		<u>1977-78</u>	<u>1994-96</u>
Male	Breakfast	384	420
	Lunch	517	567
	Dinner	918	859
	<b>Snacks</b>	<b>261</b>	<b>501</b>
	Total Cal.	2,080	2,347
Female	Breakfast	286	312
	Lunch	368	398
	Dinner	676	602
	<b>Snacks</b>	<b>186</b>	<b>346</b>
	Total Cal.	1,515	1,658

*David Cutler, Edward Glaeser, and Jesse Shapiro,  
Journal of Economic Perspectives, 2003*



# Childhood Obesity

- Childhood obesity requires a different explanation because children don't work in the same sense as adults
- Child's main constraint is *time*
  - for simplicity, suppose kids can spend their time eating or playing
  - they choose how much time to spend in each activity, subject to a limited total amount of time



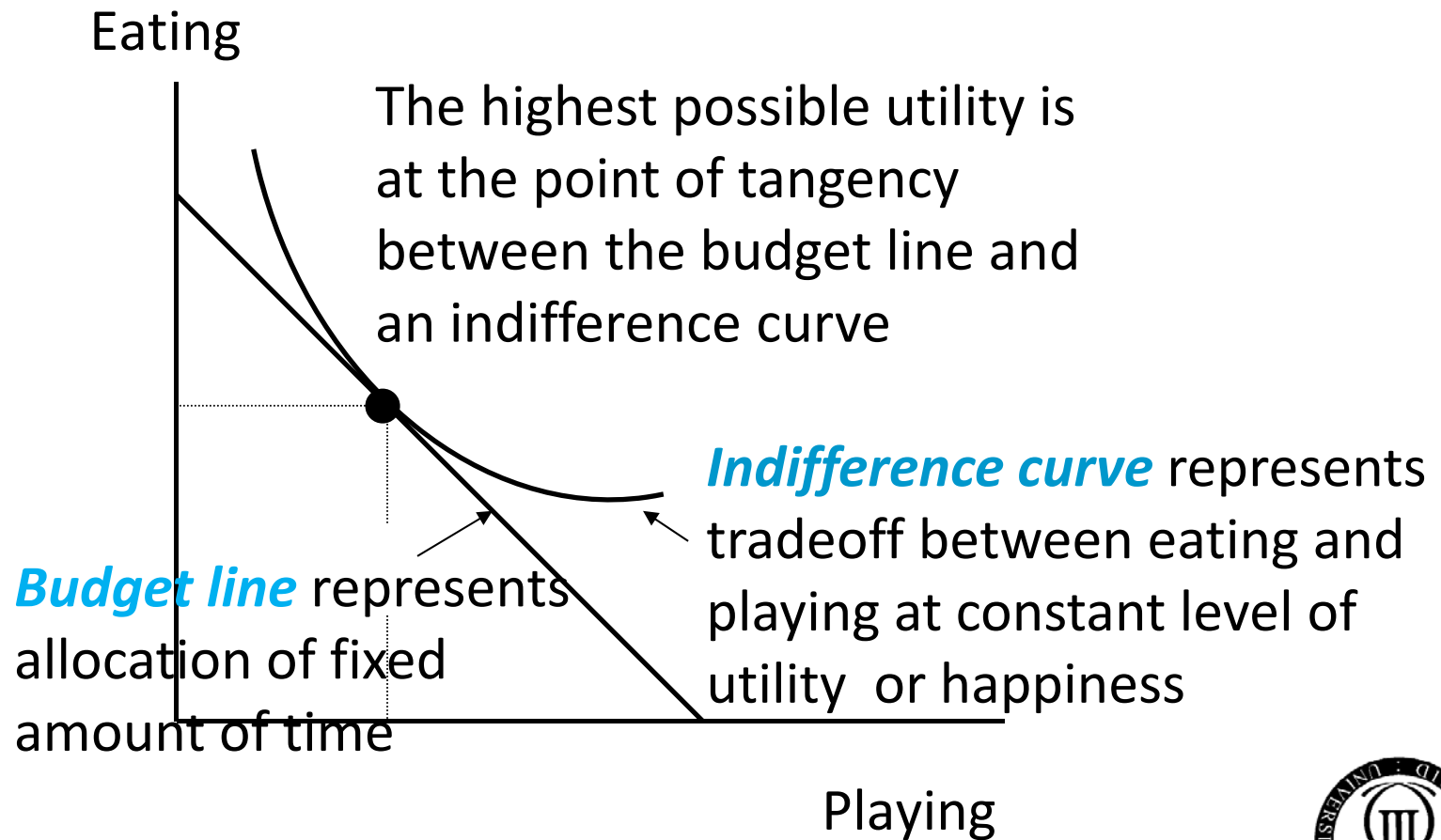


# Childhood Obesity

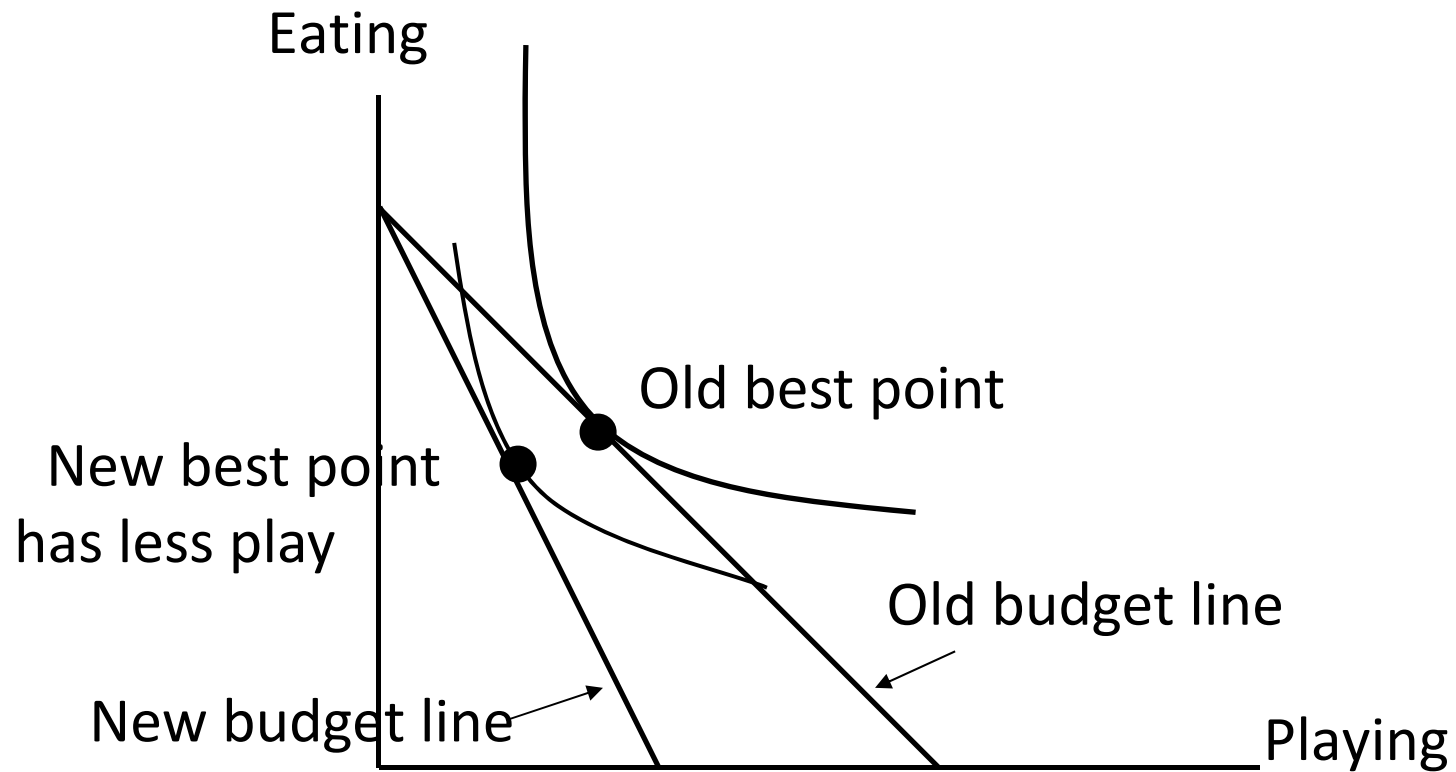
- Food industry tries to change preferences by targeting advertising at children
  - ‘Coolification’ of food makes eating more attractive
  - Snacks are a problem for kids as well as adults
  - The Centers for Disease Control (CDC) found that 74% of middle schools and 98% of high schools in the U.S. have snack bars
- The price of playing is rising
  - Schools have dropped required gym classes
  - Lack of inner city playgrounds and safety issues
  - Single-parent families or both parents working
- Kids can watch TV and eat at the same time



# Eat or Play?



# The Price of Playing Rises



# Public Policy Response

- Justification for public intervention is that obesity creates *external costs* for society
  - Public medical care and medical insurance costs
  - Lost productivity
- Some suggestions:
  - U.S. Surgeon General recommends goal of promoting daily physical education for all K-12 school children
  - Ban or restrict food advertising
  - Require nutrition labeling of restaurant food
  - ‘Fat tax’ or ‘sugar tax’
  - Lawsuits (e.g. against McDonalds)

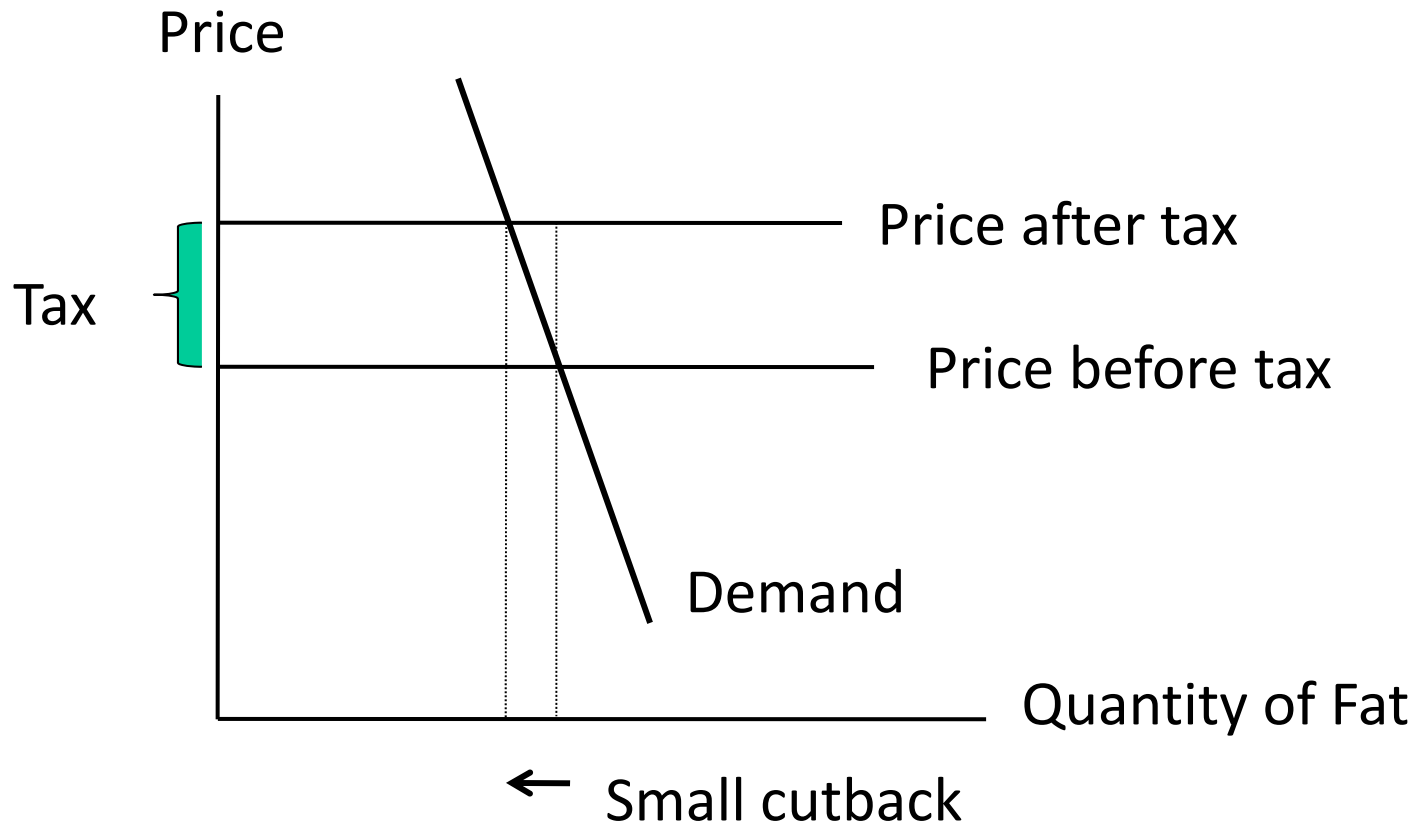


# Fat Fax?

- **Price elasticity** of demand for dairy fat and fats in general is low ( $\eta = -.14$ )
  - 10% increase in price would decrease consumption by only 1.4%
- **Income elasticity** of demand for fat is negative, meaning that consumption declines as income rises
  - Typical of many goods (e.g. cigarettes) associated with negative health externalities
  - A fat tax would be regressive
  - Would it be unfair?
- Moderate consumption of fat is not harmful



# Inelastic Demand for Fat



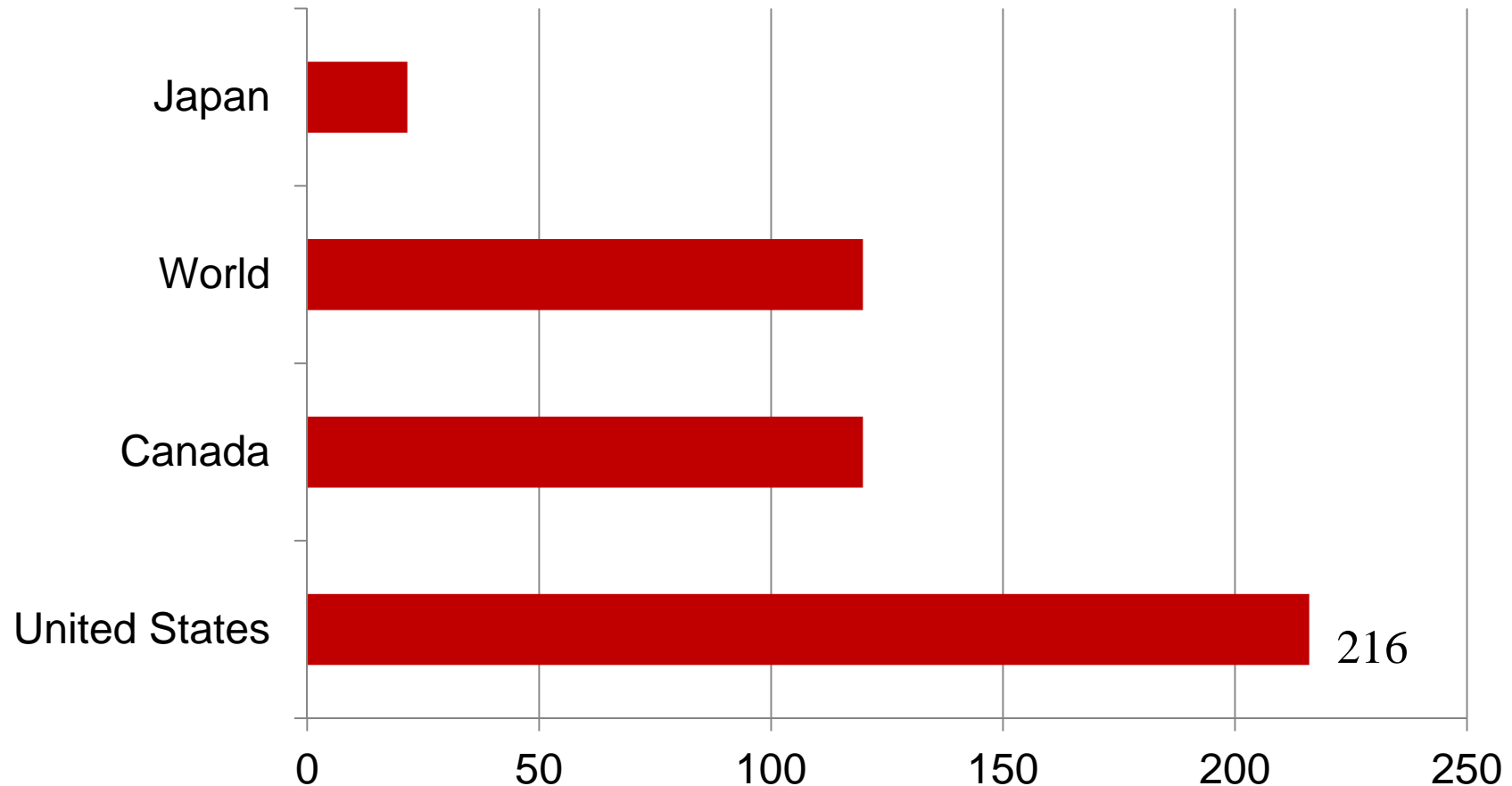
# Soda Tax?

- Consumption of sugar-sweetened beverages has been linked to obesity, diabetes and heart disease
- Kelly Brownell, et al., “The Public Health and Economic Benefits of Taxing Sugar-sweetened Beverages,” NEJM, 2009, recommend a tax of 1 cent/ounce on any beverage with added caloric sweetener
- Let’s review the pros and cons for a soda tax, but first I will present some background information on consumption of sugar-sweetened and carbonated soft drinks in the U.S.
- Data from Spain would be welcome!



# Consumption of Carbonated Soft Drinks

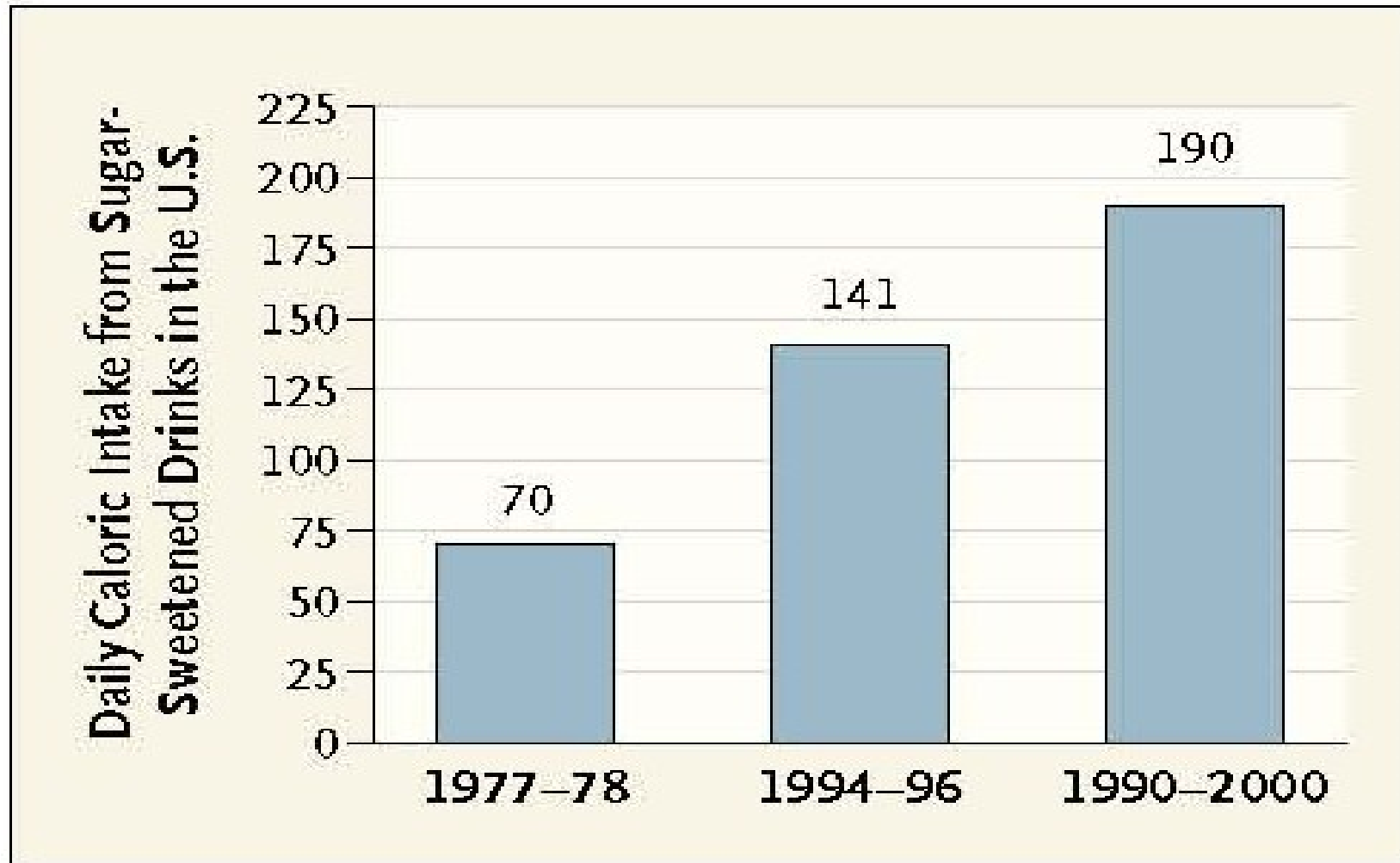
(liters/capita, sugared and diet soft drinks combined, 2002)



*Euromonitor's Global Market Information*





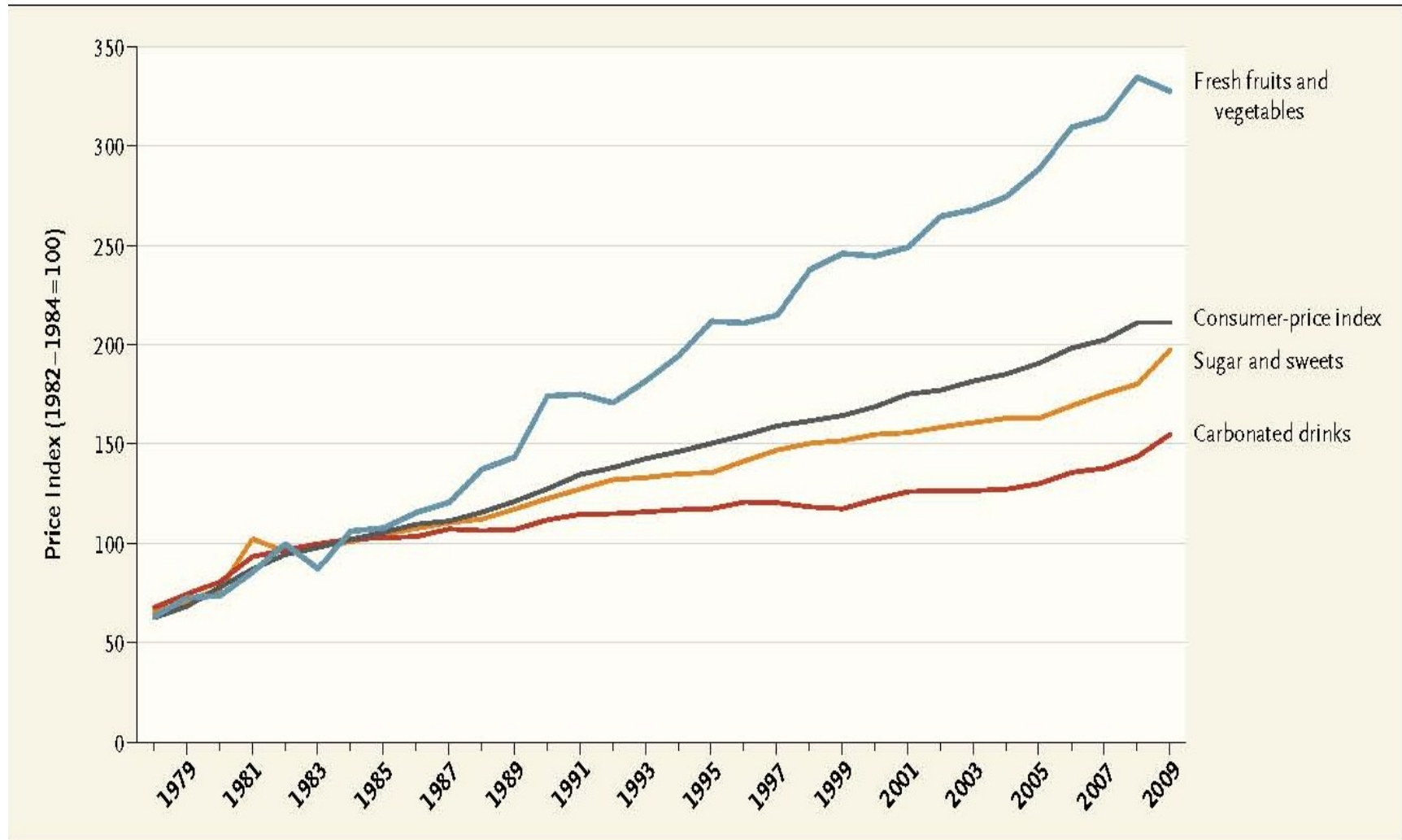


### Daily Caloric Intake from Sugar-Sweetened Drinks in the United States.

33 Data are from Nielsen and Popkin.<sup>3</sup>



# Price of Fruit & Veggies versus Sugar



Relative Price Changes for Fresh Fruits and Vegetables, Sugars and Sweets, and Carbonated Drinks, 1978–2009.

Data are from the Bureau of Labor Statistics and represent the U.S. city averages for all urban consumers in January of each year



# Soda Tax Approved



**Nation's First Soda Tax Passes In Berkeley, CA:** Berkeley's measure imposes a 1-cent-per-ounce general tax on sugar-sweetened beverages and sweeteners used to flavor drinks. *The Huffington Post*, November 6, 2014



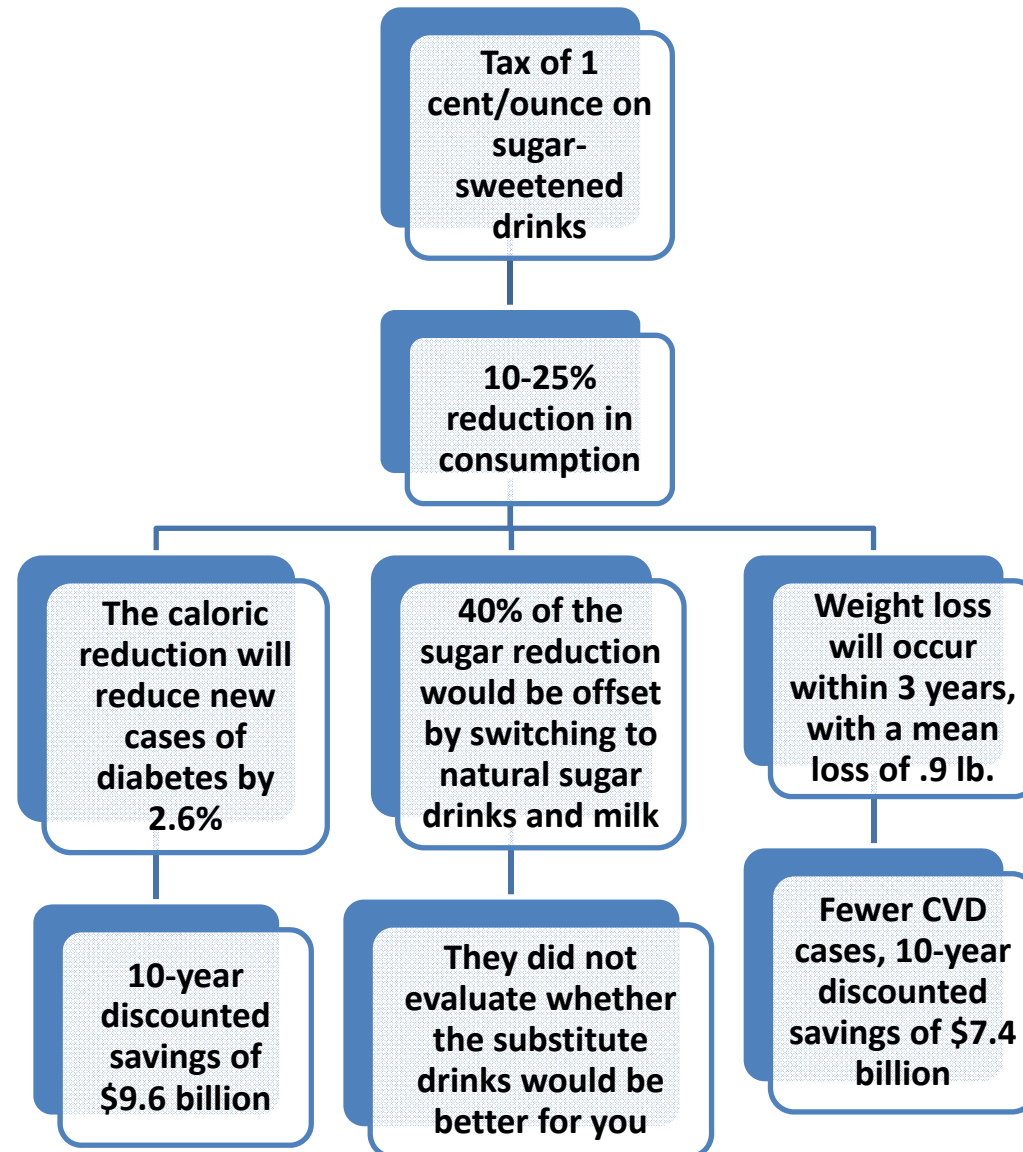
# Should We Tax Sugar-Sweetened Drinks?

- Claire Wang, et al., present the ‘pro’ argument: A tax on sugar-sweetened drinks would lead to fewer cases of cardiovascular disease (CVD) and diabetes, with a 10-year savings of \$17 billion
- Fletcher, Frisvold and Teft present the ‘con’ argument: Soft drink taxes have only a small effect on BMI

*Y. Claire Wang, et al., “A Penny-Per-Ounce Tax on Sugar-Sweetened Beverages Could Cut Health and Cost Burdens of Diabetes,” Health Affairs, 31:1 (2012), 199-207; Jason Fletcher, David Frisvold, and Nathan Teft, “Can Soft Drink Taxes Reduce Population Weight?” Contemporary Economic Policy, 28:1 (2010), 23-35*



# Claire Wang's Cost Model



# Fletcher, Frisvold, and Teft

- They use individual data from 1990-2006 to estimate a difference-in-differences model:

$$BMI_{ist} = \beta_0 + \beta_1 TAX_{st} + \beta_2 X_{ist} + \beta_3 STATE_s + \beta_4 YEAR_t + u_{ist}$$

BMI = body mass index for person  $i$  in state  $s$  and year  $t$  (they also look at outcomes for obesity and overweight)

TAX = state tax on soft drinks in year  $t$

$X$  = individual characteristics

STATE = fixed effect for state of residence

YEAR = fixed effect for year

$U$  = random error



# Results

- State soft drink taxes have statistically significant but small effect on BMI
  - One percentage-point increase in tax would lead to drop in BMI of .003
  - A tax of 1 cent per ounce is equivalent to a 30% price hike on soft drinks in the U.S.
  - This could cut BMI by  $-.003 \times 30 = -.087$
  - For a woman on the borderline of obesity, that is about 250 grams (1/2 pound)
  - Their estimated BMI reduction is about half the size of Wang's



# Comments

- Strength: They assess the relation between actual changes in state soft drink taxes and changes in BMI
- Drawbacks:
  - State taxes are small (the average tax is about 3.5%) and the effects on BMI may be hard to detect
  - Changes in BMI may take several years to appear, so looking for associations between changes in state taxes and contemporaneous changes in BMI may understate the true effect of a tax
  - Reducing consumption of sugar may have health benefits (e.g. fewer cases of type-2 diabetes) in addition to weight loss





# Effects of Soda Tax in Minnesota

- I will focus on the consumption and revenue effects of a hypothetical tax on high-sugar sodas – not the health effect
- Price elasticity of demand for soda is about -1
  - A 10% increase in the price of soda → 7.8% drop in consumption
  - 6.8% increase in the price of carbonated soft drinks → 7.8% drop in sales
  - Coca-Cola sales dropped 14.6% when price increased by 12%
- Assumptions
  - MN consumption mirrors national data at 128 liters per person
  - 5.3 million MN population
  - 12-pack of 12-oz cans currently costs \$4.80
  - 2-cent tax per can
- Demand falls by \_\_\_\_\_%
- The state collects \$\_\_\_\_\_ in tax revenue



# Racial and Socio-economic Differences in Obesity

- Obesity rates in U.S. vary dramatically by race (black women have the highest obesity rate)
- Some argue that 'norms' in the black community are more accepting of obesity
- Economic explanation: more time devoted to work and less to labor-intensive home cooking favors fast food and prepared food
- Obesity is highest among groups (low-wage earners and women) whose real incomes have fallen even as they work more



# Economic Explanation for Differences in Obesity

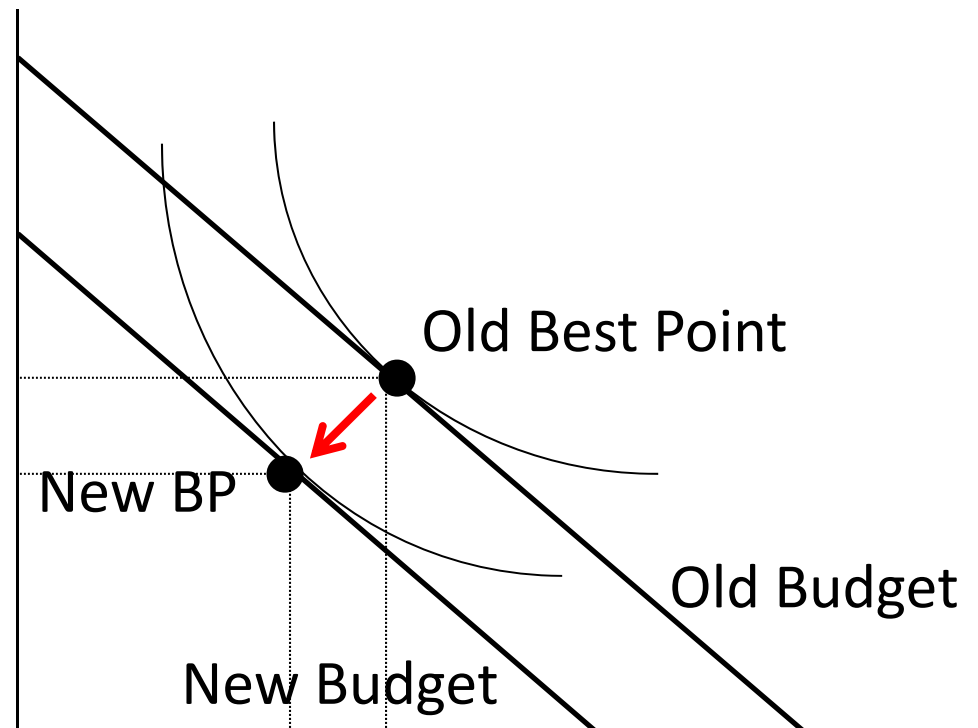
- Suppose it takes 1 hour to make food at home, while prepared food can be heated in a microwave in 5 minutes
- Suppose \$\$ cost is equal
- Many people are working longer but their real incomes are falling
  - As real incomes fall, people have less money to spend on food
  - But working longer makes time more valuable, so people cut down on food preparation time by switching to prepared food
- In this view, race is a *correlate but not a cause* of obesity

S. Chou, H. Saffer, and M. Grossman, “An Economic Analysis of Adult Obesity: Results from the BRFSS” *Journal of Health Economics*, 2004



# Graph of Economic Explanation

Time spent preparing food



Non-working time  
spent on other  
things



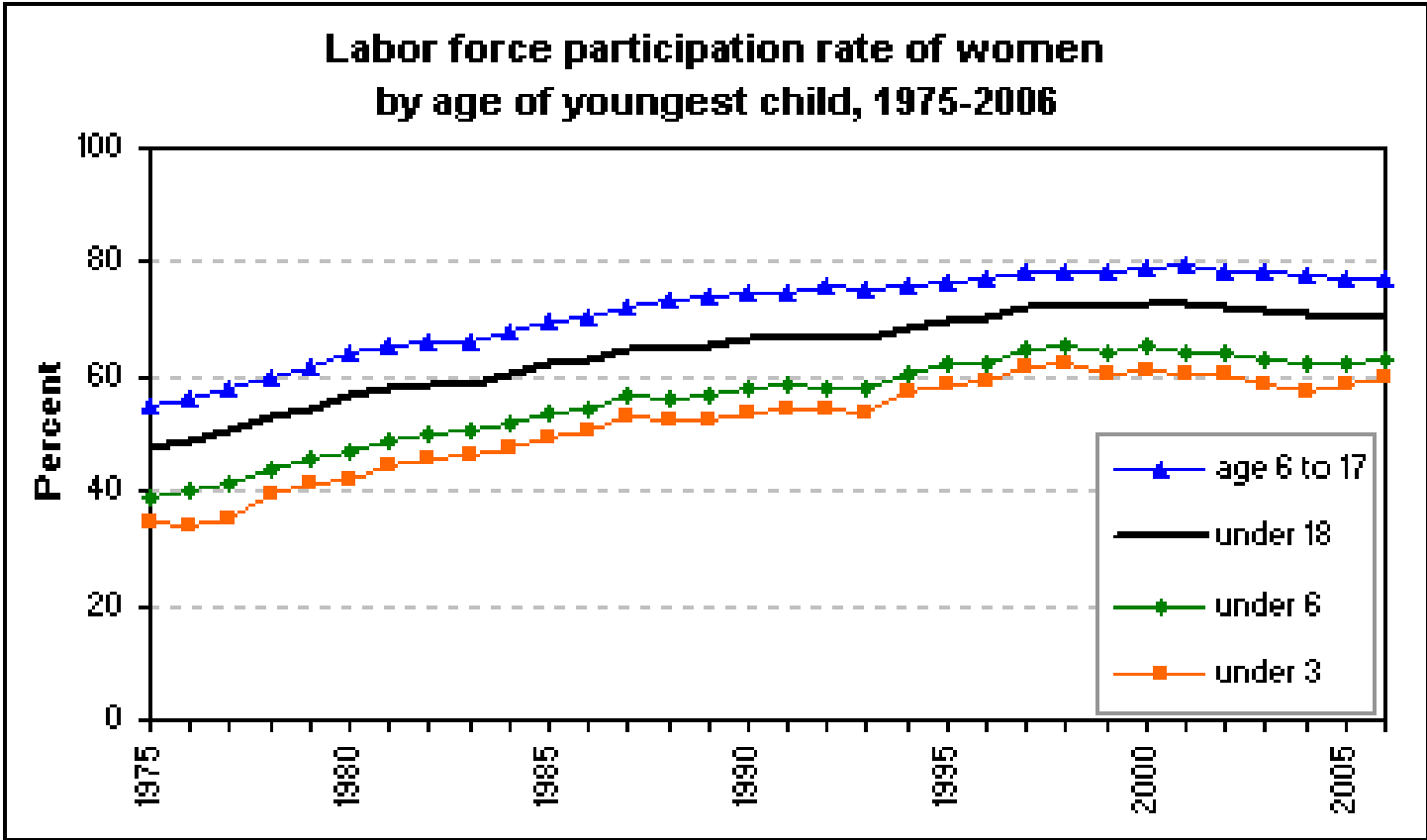
# Women in the Labor Force

- In 1950 about one in three women in the U.S. participated in the labor force
- By 1998, nearly three of five women of working age were in the labor force
- The labor force participation rate among women age 16 and over was 59.8 percent in 1998, compared with 33.9 percent in 1950

*U.S. Bureau of Labor Statistics*



# Women with Children in Labor Force



# What's Ahead?

- Adult obesity rate in U.S. appears to be leveling off
  - Cynthia Ogden, senior epidemiologist with the National Center for Health Statistics: “From 2003-04 through 2011-12, there have been no statistical changes in obesity in adults.”
- Too early to know the causes
  - Probably multiple explanations
  - Robin Thomas, et al., *Procedia Food Science*, 2013, found that nutritional composition of breakfast cereals improved from 2005-2011
  - Eating habits have been switching away from traditional fast food



## Optional Reading

- L.M. Powell, et al., “Assessing the Potential Effectiveness of Food and Beverage Taxes and Subsidies for Improving Public Health: A Systematic Review of Prices, Demand, and Body Weight Outcomes,” *Obesity Reviews*, 14 (February, 2013), 110-128

