REDUCING OBESITY: POLICY STRATEGIES FROM THE

TOBACCO WARS

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Executive Summary

Obesity is widely recognized as one of the country's leading public health problems. The obese and overweight experience chronic illness, poor health, and more than 100,000 preventable deaths each year. For the average affected individual, obesity has a much greater impact on health status and health care costs than either smoking or heavy drinking.

In purely financial terms, obesity and excess weight reduce the productivity of American industry and cause over $200 billion in annual health care spending, half of which is funded by the taxpayers. Further, private premiums for nonobese workers are nearly $26 billion higher each year because of obesity-generated health care costs. If recent trends continue, 40 percent of adults will be obese in just 6 years and, for the first time in history, Americans' average life span will shrink rather than grow.

In attacking the epidemic of obesity, policymakers can turn for guidance to the country's long-term effort to combat another, equally pressing public health problem—tobacco use. The share of adults who smoke fell from 42.4 percent in 1965 to less than 20 percent in 2007. Still further progress is likely under recently enacted measures that placed tobacco under the Food and Drug Administration's regulatory authority.

Aggressive public policy interventions that helped bring down tobacco use could be modified and applied to fight obesity, including

- imposing excise or sales taxes on fattening food of little nutritional value, as the tax on cigarettes has proven to be the single most effective weapon in decreasing tobacco use;

- putting graphic, simple labels on the front of packaged foods showing their nutritional value in a form that consumers can easily understand and use;

- requiring restaurant chains to put simple nutrition information on the menu next to each listed item; and

- banning advertising and limiting the marketing of fattening food.

A national excise or sales tax on fattening food would also yield revenue that could finance both anti-obesity activities and national health care reform. Foods subject to taxation could be identified using a carefully developed, repeatedly validated nutrient profiling model applied by the British Food Standards Agency to identify the foods that may not be advertised to children and adolescents. A 10 percent tax on fattening foods, defined using this model, would yield more than $500 billion in revenue over ten years. If combined with a subsidy that lowered the price of fruits and vegetables by 10 percent, the net revenue would exceed $350 billion. Similar state taxes could help states close short-term budget gaps while laying the foundation for better population health over the long term. To avoid a net adverse impact on low-income households, some of the resulting revenue could finance increased food stamp allotments and support community-based initiatives that bring nutritious, relatively affordable foods to low-income communities that lack access to such foods today.

Of course, other strategies are also essential, including promoting physical exercise; changing subsidies to farmers and food manufacturers in order to favor the production of less expensive, healthy food rather than fattening foods; comprehensive, school-based anti-obesity programs; anti-obesity campaigns in the mass media; and limiting the sale of fattening food at schools, workplaces, and supermarket checkout counters. But if policymakers are serious about fighting obesity, they may need to pattern policy interventions after some of the tough approaches that have proved highly successful in combating tobacco use.

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Introduction

Policymakers widely acknowledge the role obesity plays in driving up health care costs. But the country's ever-increasing obesity epidemic has other consequences as well, including reduced productivity and heightened morbidity and mortality.

This report asks whether the fight against obesity—which the country is badly losing — would benefit from strategies that have dramatically reduced tobacco use during the past 45 years as well as new anti-tobacco strategies that have begun to show promise.

We begin by analyzing some of the consequences of obesity. We then explore how the country has dramatically reduced smoking since the mid-1960s and how federal policy is now changing with the goal of further cutting tobacco use. After noting some of the similarities and differences involving tobacco and fattening food, we conclude that, while many policy approaches are important in combating obesity—and this paper does not pretend to be exhaustive in cataloguing all promising anti-obesity initiatives—aggressive policy remedies like those used with tobacco deserve serious consideration, in view of the terrible and rising toll that obesity is taking on the United States.

Obesity sickens, kills, and creates significant societal costs

For the first time since the Civil War, American life expectancy is projected to decrease

(Olshankey et al. 2005). The reason: diseases related to obesity.

Obesity now affects one in six children and more than one in three adults (Dietz,

Benken, and Hunter 2009; Ogden et al. 2007). Obesity rates among adults have more than

doubled over the past 40 years, and the percentage of children age 6 to 11 who are obese has

quadrupled (Institute of Medicine 2006), climbing from 4.0 percent to 18.8 percent (figures 1

and 2). At the current trajectory of the obesity epidemic, 40 percent of American adults will be

obese by 2015⸺just six years from now (Ogden et al. 2006 as cited in Gabel et al. 2009).

Figure 1. Age-adjusted prevalence of obesity among adults age 20–74, 1960–2006
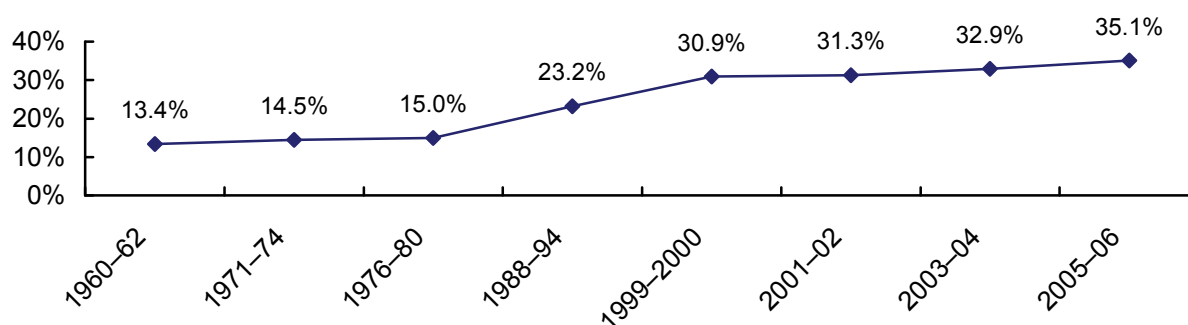
Source: National Center for Health Statistics (2008).

Notes: Obesity in adults is defined in terms of body mass index (BMI), expressed as weight in kilograms divided by height in meters squared. Adults with a BMI of 30 or above are classified as obese. This table shows obesity among adults age 20–74 because comparable data are available throughout the displayed period. Data for all adults age 20 and higher are limited to 1988 and afterward. The latter data show an increase from 22.9 percent in 1988–94 to 34.3 percent in 2005–06.

Figure 2. Prevalence of obesity among children and youth, by age: 1963-2004
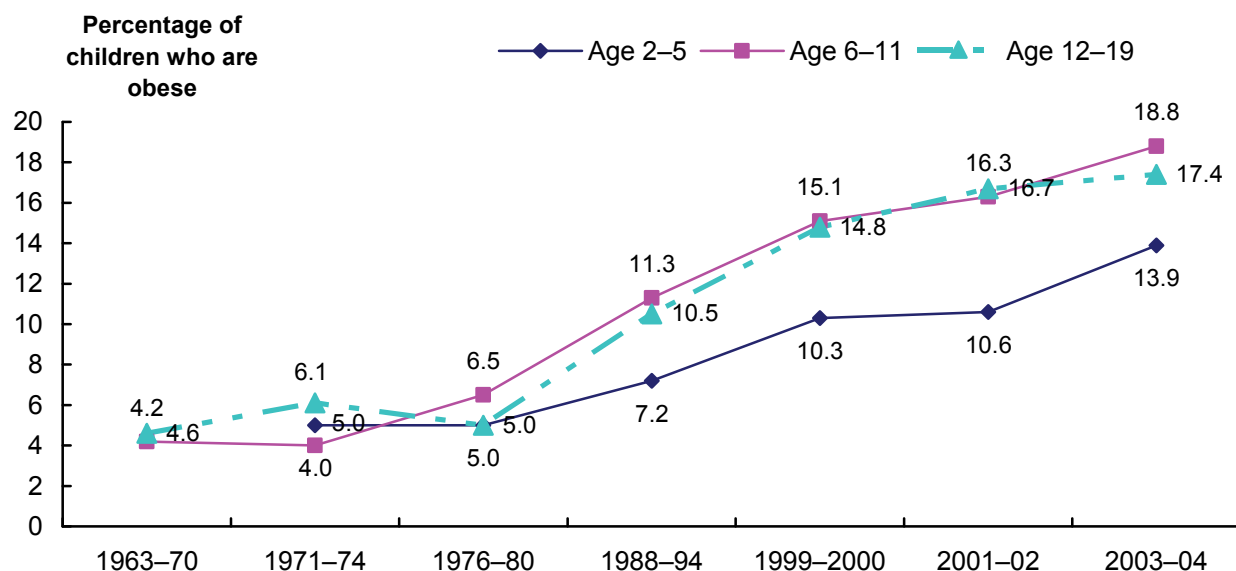
Source: National Center for Health Statistics (2006).

Notes: Obesity in childhood is defined as having BMI at the 95th percentile or above on age- and gender-specific CDC growth charts. Data shown for 1963–70 vary by age group. For children age 6–11, the data are from 1963–65. Data from 1966 to 1970 are for adolescents, but they are shown for those age 12–17. Data are not available for that time showing obesity rates among adolescents age 12–19, the age range captured in surveys conducted in later years.

Obesity and excess weight contribute to over 20 chronic illnesses, ranging from diabetes and hypertension to conditions with less well-known links to obesity, such as colon cancer (National Center for Health Statistics 2006). In 2000, obesity caused an estimated 112,000 excess deaths (Flegal et al. 2005); the number would probably be higher today, given the continuing increase in obesity.

What are obesity and overweight?

Individuals are typically classified as overweight or obese based on their body mass index (BMI), which shows the relationship between weight and height as an indicator of body fatness. BMI equals weight in kilograms divided by height in meters squared.

- Adults are classified as overweight if their BMI is between 25 and 29.9. They are obese if their BMI is 30 or higher.

- For children, body fat levels change with age and vary between boys and girls. Overweight and obesity thus have different thresholds, depending on age and gender. Based on growth charts developed by the Centers for Disease Control and Prevention (CDC) that show the distribution of heights and weights by age and gender, children at the 85th through 94.9th percentile of BMI are classified as overweight. Those at the 95th percentile or higher are obese.

The growing prevalence of obesity in adults translates into lower worker productivity, including both absenteeism and health-related limitations at work, sometimes called "presenteeism."[1] Adversely affecting productivity more than any other health problem, obesity is estimated to cost employers the equivalent of 20 average lost days of work a year for each obese employee.[2]

Rising obesity rates also affect health care spending (Thorpe 2006). According to the Congressional Budget Office (2008), per capita costs rise by 34 percent when an individual is obese and by 70 percent when someone is morbidly obese.[3] More than one-quarter of increased medical costs between 1987 and 2001 involved obesity-related expenditures (Thorpe et al. 2004).

One CDC-cited study[4] found that, in 1998, obesity and overweight were responsible for 5.3 and 3.7 percent, respectively, of American medical spending (Finkelstein, Flebelkorn, and Wang 2003). If those same percentages apply to 2009 spending[5]⸻and they are almost certainly higher, given obesity's increased prevalence since 1998⸻obesity will be responsible for $133 billion in health care spending in 2009, and obesity and overweight together will add $228 billion to the nation's health care bills.[6] Along similar lines, researchers at Emory University found that, if obesity were at the same level as in 1987, American health care spending would be approximately $200 billion a year below current amounts (Thorpe and Ogden 2008).

This issue affects all of us, including the nonobese. Through Medicare and Medicaid, taxpayers finance approximately half of all increased spending attributable to obesity and overweight (Finkelstein et al. 2003). Further, because obese and nonobese employees receiving employer-sponsored insurance are grouped together and charged common premiums, obesity increases health insurance premiums for the average nonobese worker by an average of $150 a year in 1998 dollars (Bhattacharya and Sood 2005). Based on increases in average health care spending per capita,[7] that amounts to a per capita cost-shift of $259 in 2009, totaling $25.6 billion in extra premium costs for all nonobese recipients of employer-sponsored insurance.[8]

Put simply, obesity is one of the country's gravest public health problems. For each affected individual, it has a significantly greater effect on health status and health spending than either tobacco use or heavy consumption of alcohol (Sturm 2002). Obesity causes death and illness on a massive scale and generates enormous costs for employers, taxpayers, workers,

and the health care system as a whole. Unless effective interventions are devised, this problem is projected to grow much worse over time.

The United States has achieved great progress on another public health issue of comparable importance—namely, tobacco use, which has declined substantially in recent decades. The remainder of this paper asks whether the success achieved by anti-tobacco measures furnishes a model for reducing the incidence of obesity.

Tobacco: What America is doing right

More than 40 years ago, the United States was faced with a major public health problem when smoking was linked with lung cancer and other diseases. Surgeon General Luther Terry convened an Advisory Committee on tobacco use, which reported, "Cigarette smoking is a health hazard of sufficient importance in the United States to warrant appropriate remedial action." [9] In 1965, the U.S. Congress adopted the Federal Cigarette Labeling and Advertising Act and, in 1969, the Public Health Cigarette Smoking Act. Both this and subsequent legislation required a health warning on cigarette packages, banned cigarette advertising in the broadcast media, led to major anti-tobacco public information campaigns, banned smoking in certain (mostly indoor) places, encouraged the development and coverage of nicotine patches and other new treatment modalities to facilitate smoking cessation, enacted and enforced measures to prevent children and youth from accessing tobacco products, and significantly increased excise taxes on tobacco.

As a result, fewer than half as many adults smoke today as when the country began its anti-tobacco work. The share of adults who smoke declined from 42.4 percent in 1965 to just 19.8 percent in 2007 (figure 3).

Figure 3. Percentage of adults who smoked cigarettes, 1965–2007, various years
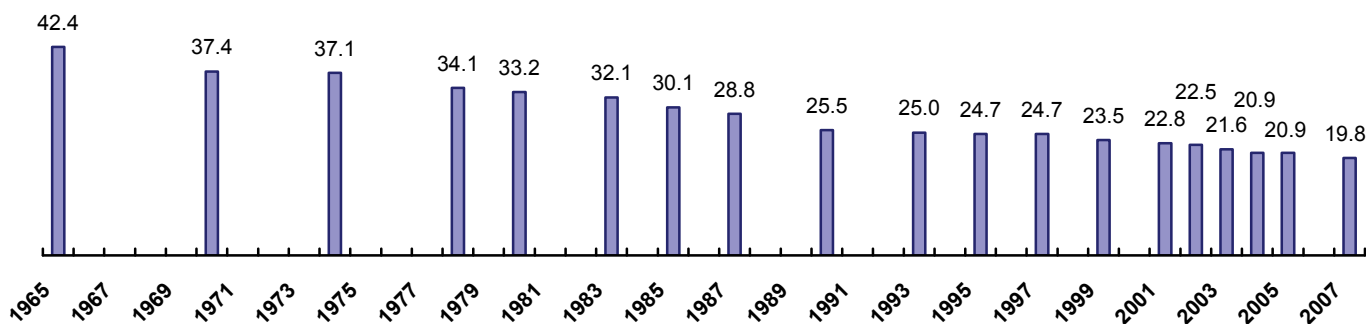
Source: Centers for Disease Control and Prevention, "Trends in Current Cigarette Smoking among High School Students and Adults, United States, 1965–2007,"
http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm.

Several comprehensive literature reviews[10] point to the following policies as key drivers

in achieving those results, for both the United States and other developed countries:

- excise taxes that raised the price of cigarettes[11] (the single most effective strategy);

- anti-smoking education in the media, the schools, and the community;

- pharmacological treatment and behavioral support in smoking cessation;

- bans on tobacco company advertising;

- clean air regulations (e.g., indoor smoking bans); and

- enforced restrictions on youth access to tobacco.

Notwithstanding this progress, American anti-smoking advocates grew concerned

recently that tobacco use seemed to be leveling off. However, further reductions may be

galvanized by this year's enactment of legislation authorizing the Food and Drug Administration

(FDA) to regulate tobacco products. Among its provisions, the new law directs the FDA to

outlaw forms of tobacco marketing that have hitherto been permitted.

In addition, the new anti-tobacco statute directs FDA to modify labels on cigarette

packages to follow the approach taken in Canada since December 2000—namely, combining

shocking visible images with simple, compelling warnings covering 50 percent of both sides of each cigarette package. Such labels are substantially more effective than the previous generation of text-only, black-and-white labels on the back of cigarette packages (Hammond 2007; Hammond et al. 2004, 2006; Kees et al. 2006; WHO 2009; Willemsen 2005). The year after large, front-of-the-pack, graphic warning labels were introduced in Canada, tobacco consumption fell by more than 5 percent, the largest one-year drop in a decade (Kees et al. 2006, citing other research). At least 26 other countries, the European Union, and now the United States have followed suit, and the World Health Organization has endorsed this approach internationally (WHO 2009). Figure 4 shows some examples of Canadian warning labels, which rotate regularly.

Figure 4. Canadian warning labels on cigarette packages

Source: Health Canada (Canada's health ministry), June 2009.

Can successful tobacco-control measures provide a model for fighting obesity?

Many observers have asked whether obesity, the other major preventable cause of death and disability in the developed world along with tobacco use, might also be reduced through efforts based on the tobacco control model.[12] Key similarities and differences between obesity and tobacco use are described in turn below.

Similarities

Both obesity and tobacco use are major risk factors for chronic disease and premature death, both generate significant health care costs, both involve aggressive marketing campaigns to consumers by industries that reap significant financial rewards, both are disproportionately represented among lower socioeconomic groups, both carry a social stigma, and both are difficult to treat clinically.

While fattening food does not contain a clearly addictive chemical like nicotine, there is significant and increasing evidence that the food industry adjusts food content, triggering hard-to-control cravings that increase consumption of fattening food, in some cases using the same neurological pathways involved with substance abuse and other classically addictive behaviors (Kessler 2009).[13] Although most of these efforts increase foods' levels of sugar, fat, and salt, a subtle but telling example is the addition of caffeine, which has a clear pattern of dependence, to foods like potato chips, breakfast cereal, and chocolate bars (Brownell and Warner 2009; Juliano and Griffiths 2004).[14]

Differences

Despite these similarities, there are also important differences between fattening food and tobacco.

Many obesity-causing foods provide some nutritional benefit

Tobacco consumption is not recommended, even in small quantities, as a regular part of one's lifestyle. By contrast, many foods that create obesity if eaten in large quantities are harmless or can even contribute to good health if they are eaten in small portions.

With fattening food, many thus advocate moderation, not complete suppression of consumption. But the quantity of fattening food eaten by Americans is so great that even a significant reduction would still leave many of us eating immoderate amounts. To achieve moderation will require effective public policy interventions that reduce the consumption of fattening food.

Some fattening foods, of course, contribute no nutritional value. Sugary soft drinks, candies, and many snack foods are examples. Most closely analogous to tobacco, these foods represent a potential target for tough anti-obesity interventions like the policies that have helped reduce tobacco use. But surely anti-obesity efforts will be severely hamstrung if policy interventions are limited to such foods that represent pure "junk."

This factor confronts anti-obesity analysts with two conceptual challenges: namely, finding objective and broadly framed standards that identify "junk" foods that increase obesity while contributing little or nothing to health; and both identifying and developing policy approaches to foods that are healthful if eaten in small quantities but, when over-consumed, contribute significantly to obesity.

Furnishing an instructive model is the Toxic Substances Control Act of 1976, which authorizes strict regulatory action (including prohibitions on manufacture and distribution) for products where "there is a reasonable basis to conclude" that they "will present an unreasonable risk of injury to health or the environment."[15]

The Institute of Medicine (IOM) has noted that, but for its statutory exclusion from this legislation, tobacco would fit this definition of a toxic substance (IOM 2007); and the same may be true for nutritionally worthless, obesity-inducing foods. As the Environmental Protection Agency explains, "unreasonable risk involves the balancing of the probability that harm will occur and the magnitude and severity of that harm against the effect of a proposed regulatory action on the availability to society of the expected benefits of the chemical substance."[16] Put differently, a substance is considered toxic if its unregulated use would cause harm to health that outweighs the substance's anticipated benefits to society. Applying this balancing test to nutrition, a food substance might be considered toxic or "junk" if its nutritional benefits are outweighed by its contribution to obesity.

Starting from a very different point, an expert panel in the United Kingdom arrived at a similar approach that evaluates each food item by balancing nutritional gain against health risks (Rayner, Scarborough, and Stockley 2004). Including nutrition scientists, representatives of industry and consumers, and policymakers, this expert panel was commissioned by England's Food Standards Agency (FSA) to define healthful and unhealthful foods for children, thus laying the groundwork for future regulation and voluntary efforts by industry.

The panel made the following observation, which cuts to the heart of the need to define a subset of foods that could be the subject of policy remedies like those that have applied to tobacco:

> Over the last few years there have been various initiatives around the world to raise awareness of the issue of marketing of foods to children. Generally speaking these propose either banning all food advertising targeted at certain age groups of children, or banning or restricting the marketing and advertising of "unhealthy" or "junk" foods. There is usually very little attempt to define what is meant by these terms, although specific foods are often mentioned. Restrictions are most frequently applied to products such as chocolate, sweets, soft drinks, snacks and "other similar products."

To move beyond such imprecision, the panel, led by Mike Rayner and colleagues at the British Heart Foundation Health Promotion Research Group at Oxford University, developed and tested a quantified model that evaluated the nutrients in each food item (Rayner model). The panel recommended further testing and refinement of the model and its extension to broader populations (including adults). Since then, the British government has conducted further research and development that resulted in slight changes to the model (FSA 2009; Rayner et al. 2004: Scientific Advisory Committee on Nutrition [SACN] 2005).

Put simply, the final version of the Rayner model analyzes each food item on a numerical scale by balancing, for each 100 gram serving, the food's nutritionally risky elements—calories, saturated fat, salt, and sugar—against the food's nutritional benefits, defined in terms of fruit and vegetable content, fiber, and protein. If the balance tilts strongly in favor of nutritional benefit, the food is classified as "healthier." If the food's ranking on the scale shows that nutritional risks clearly exceed nutritional gains, the food is classified as "less healthy." Foods that fall in the middle are classified as "intermediate."

The Rayner model has received extensive and repeated testing, confirmation, and validation, as applied to both children and adults (Arambepola, Scarborough, and Rayner 2007; FSA 2005; Lobstein and Davies 2008; Rayner, Scarborough, and Stockley 2005; SACN 2005, 2006, 2008; Scarborough et al. 2007).[17] The model is now used by the British government to identify the foods that may not be advertised to children, as explained below. Australia and New Zealand are likewise applying a slightly revised version of the model in a proposed regulation that limits the circumstances under which a food manufacturer can claim that a food product has health benefits.[18] Table 1 provides examples of how the Rayner model categorizes specific foods.[19]

Table 1. Sample foods under the Rayner nutrient profiling model

Healthier	Intermediate	Less healthy
Boiled potatoes, pasta, rice	Oven-baked potato chips, white bread	Non-baked potato chips, french fries, candy, cookies, doughnuts
Grilled chicken breast	Roast beef, fast-food filet of fish	Bacon, fast-food cheeseburgers
Low-fat yogurt	Whole-milk cottage cheese and yogurt	Camembert cheese, high-fat cheddar cheese
Nonfat milk, orange juice, apple juice, coffee, tea	Whole milk	Sugary sodas, milkshakes, sugar-sweetened lemonade
Shredded wheat, unsweetened oatmeal	Bran flakes	Chocolate-flavored cereals
Fruit	Plain popcorn	Candied popcorn

Sources: Garsetti et al. (2007); Rayner et al. (2004); Scientific Advisory Commission on Nutrition (2005).

American policymakers could make comparable use of the Rayner model to identify the foods that are targeted for policy interventions that reduce consumption.

Exercise can offset overeating

Another important difference between tobacco and obesity-inducing food is that, unlike with tobacco, exercise can offset the effects of eating fattening food. Accordingly, a comprehensive anti-obesity strategy should include major efforts to increase physical activity among children and adults.

However, the importance of exercise cannot serve as an excuse for inaction on the more consequential issue of food consumption. In the United States and other developed countries that are part of the Organisation of Economic Co-operation and Development (OECD), researchers estimate that 82 percent of adult obesity results from excess caloric intake and only 18 percent is caused by insufficient exercise (Bleich et al. 2007).

A similar analysis applies specifically to the United States. From 1988 through 2006, as the percentage of obese adults and children increased, average daily caloric consumption rose by 7.1 percent (from 2,445 calories per person in 1988 to 2,707 in 2006), but the proportion of adults who exercised during leisure time increased even more—by 9.4 percent, from 69.5 percent of all adults to 76.1 percent (figure 5). Exercise levels among adolescents have likewise remained fairly stable from 1993 through 2005, the period for which comparable data are available (figure 6). This pattern suggests that overeating, rather than too little physical activity, has been the primary driver increasing the prevalence of obesity in America.

Figure 5. Average per capita calorie consumption and percentage of adults who exercise during leisure time, 1988–2006
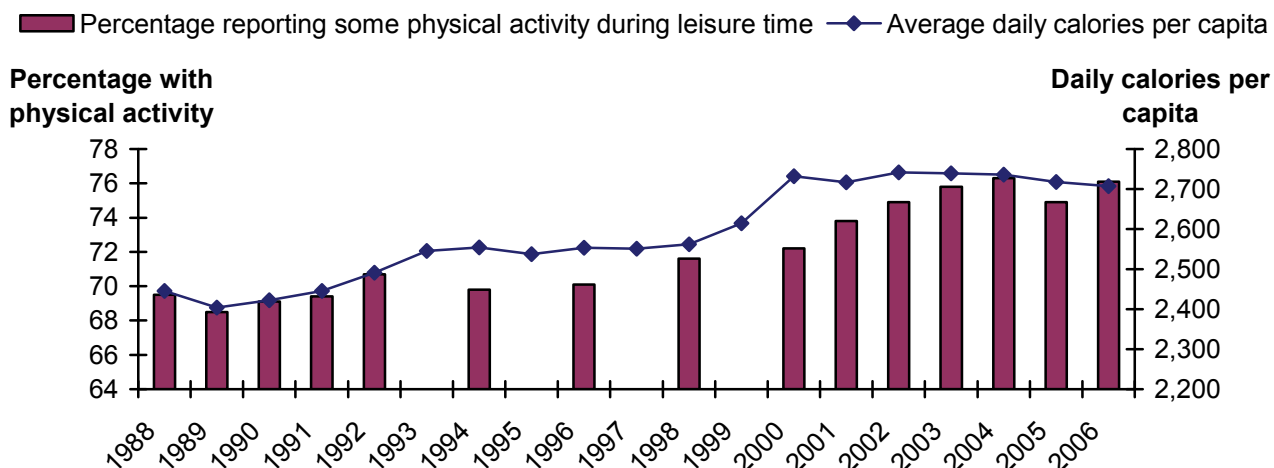
Sources: Centers for Disease Control and Prevention 2008 CDC, "1988–2007 No Leisure-Time Physical Activity Trend Chart," last updated March 5, 2008, http://www.cdc.gov/nccdphp/dnpa/physical/stats/leisure_time.htm; ERS/USDA, "Average daily per capita calories from the U.S. food availability, adjusted for spoilage and other waste," February 27, 2009, http://www.ers.usda.gov/Data/FoodConsumption/spreadsheets/foodloss/Calories.xls#Totals!a1.

Figure 6. Percentage of students in grades 9 through 12 who engage in regular, vigorous physical exercise, 1993–2004
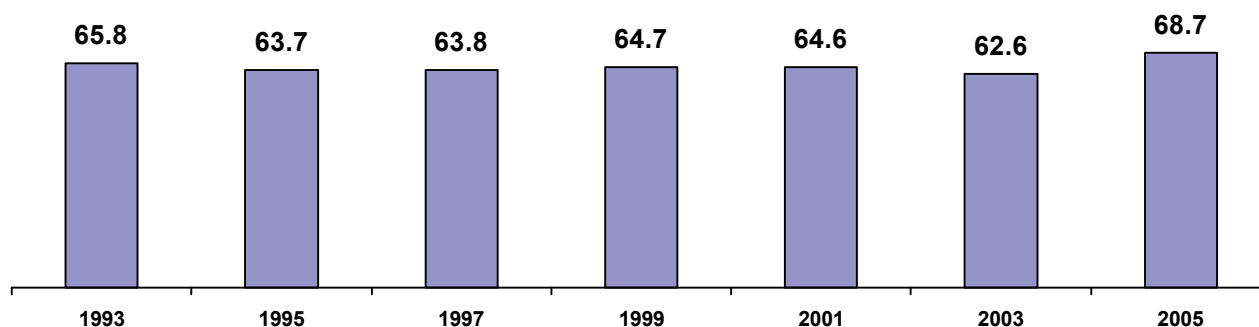
Source: Centers for Disease Control and Prevention 1995–2008.[20]
Note: This figure shows the percentage of students who engaged in activities that caused sweating and hard breathing for at least 20 minutes on at least three of the seven days preceding the survey.

Obesity needs to be prevented and reduced for adults as well as children

A third difference involves the age at which the problem begins. The vast majority of tobacco use begins in adolescence (National Institutes of Health 2006). By contrast, while obese and overweight children and adolescents frequently become obese adults,[21] more than half of obesity starts in adulthood.[22]

This difference has several implications. First, some arguments in favor of tobacco regulation are premised on the inability of adolescents to process the emotional appeals of advertising; that argument has less force with obesity. Second, many if not most anti-obesity efforts to date have focused on preventing childhood obesity. While such work is surely beneficial, it is equally important to implement strong and effective anti-obesity measures that target adults.

A changed environment for purchasing food can give the food industry incentives to develop and market healthier products

Many obesity researchers have concluded that the prime factor responsible for the explosion of obesity in the developed world is a "toxic" or "obesogenic" environment, involving an "unprecedented exposure to energy-dense, heavily advertised, inexpensive, and highly accessible foods" (Wadden, Brownell, and Foster 2002).[23] As a result, "Reliance on education and treatment strategies alone is unlikely to be sufficiently effective or sustainable to stem the obesity epidemic, and there is widespread agreement that major changes to the current obesogenic environments will also be necessary" (Sacks, Swinburn, and Lawrence 2008).

Accordingly, many anti-obesity interventions seek to change the environment in which consumers purchase food. Such efforts seek to make healthier choices easier and less costly than they are today while making fattening choices better informed, harder, and more

expensive. While the immediate goal is encouraging changes in consumer behavior, these efforts would also give food companies incentives to introduce and market healthier foods.

For example, when health claims about a product's beneficial impact on cancer and heart disease were allowed on cereal boxes, new products were introduced for which manufacturers could make such claims. Along similar lines, in anticipation of mandatory trans-fat labeling, the food industry developed and aggressively marketed products with low or zero trans-fat content (Golan, Kuchler, and Krissoff 2007).

In sum, notwithstanding these important differences, experience with smoking policy can yield important lessons for the control of obesity. With tobacco, the developed world has made and continues to make major progress through aggressive public policy interventions that change behavior on a massive scale. Facing the serious consequences of an uncontrolled obesity epidemic, America's state and federal policymakers may need to consider interventions every bit as forceful as those that succeeded in cutting adult tobacco use by more than 50 percent.

Combating obesity with public policy interventions patterned after anti-tobacco efforts

This section focuses on three strategies that seem particularly promising in their potential impact and that do not require an investment of new public dollars: namely, excise or sales taxes on fattening food; product labeling requirements; and a comprehensive marketing ban.

However, we begin by briefly noting two areas that we will not cover in detail. First, the country's anti-obesity efforts should not be limited to the measures we explore below. While we do not intend to provide an exhaustive catalog of other anti-obesity measures, which others have developed in great detail,[24] a few examples could be helpful to the reader:

• Policymakers could encourage and facilitate increased exercise and physical activity among children and adults.[25]

• Agriculture policy could be reformed to reduce subsidies for products that contribute to obesity, to increase subsidies for healthy food (structuring such subsidies to prevent the establishment of non-tariff trade barriers), and to help farmers transition from obesity-inducing to more health-promoting crops.[26]

• Schools could be funded to implement comprehensive anti-obesity programs.[27]

• As will be discussed in more detail below, policymakers could increase the availability and affordability of healthy food in low-income communities.

Second, even in the realm of learning from anti-tobacco efforts, we will be limited in our focus. We will not explore the many political and strategic lessons that anti-obesity

practitioners could draw from the history of tobacco control, including insights about industry involvement,[28] the need for long-term campaign strategies, the potential role for litigation and congressional hearings, and so on.

Further, we will not analyze in depth a number of policy approaches to obesity that could be based on tobacco control efforts, including prohibiting fast food restaurants from locating within a specified distance of schools;[29] removing fattening food from school environments; coupling intensive anti-obesity media campaigns with comprehensive school-based and statewide programs; and creating "no-junk-food" zones by banning the sale of fattening food in government offices, other public spaces, and supermarket locations (e.g., checkout stands) that prompt impulse buys.[30]

Excise or sales taxes on fattening food[31]

No less an iconic figure than Adam Smith found a policy link between smoking and fattening foods: "Sugar, rum and tobacco are commodities which are nowhere necessities of life, which are become objects of almost universal consumption, and which are therefore extremely proper subjects of taxation" (*The Wealth of Nations*, 1776, cited in Brownell and Freiden 2009). In this section, we follow Adam Smith's lead and briefly describe current taxation of obesity-causing foods, possible purposes for increasing such taxes, how such taxes could be structured, concerns policymakers may have about this approach, and revenue estimates at the state and national levels.

Current taxes

Presently, 40 states impose relatively modest taxes on sugared beverages and snack foods (Brownell and Freiden 2009; Chriqui et al. 2008). Other advanced countries levy more significant taxes on these foods. For example, the United Kingdom applies its 17.5 percent value-added tax (VAT) (temporarily reduced to 15 percent through December 2009) to particular food items, including "treats" like ice cream, sugared drinks, and candy as well as certain snacks and alcohol.[32] France's VAT is set at 19.6 percent for foods like sweets, chocolate, and margarine, while other foods are taxed at a 5.5 percent rate (Danish Academy of Technical Sciences 2007). Along similar lines, Canada levies a 5 percent goods and service tax on snack food items like candy, soft drinks, and chips.[33]

Rationale for taxing fattening food

Taxes on fattening foods have five basic justifications. First, raising the price reduces consumption. A recent literature review concluded that changing the relative prices of healthy and unhealthy foods affects both consumption patterns and obesity levels (Chaloupka et al. 2009). With proposed taxes on sugared sodas, for example, increasing the price by 10 percent has been estimated to cut consumption by an average of 8 percent, and a penny-per-ounce tax on sugared beverages is projected to reduce consumption by 10 percent (Brownell and Freiden 2009).[34] According to a study comparing states that repealed taxes on soft drinks and snack foods with states that retained such taxes, the repealing states were 13 times more likely to have a high relative increase in obesity (Kim and Kawachi 2006). Along similar lines, British researchers have found that extending the VAT to foods identified as less healthy by the Rayner model (described above) could produce modest changes in food consumption that would

reduce overall mortality, particularly if such taxation is accompanied by subsidies for the purchase of fruits and vegetables (Mytton et al. 2007; Nnoaham et al. 2009).

The second goal is to raise revenue. To continue with the example of a tax on sugary sodas, the same penny-per-ounce tax that would reduce consumption by 10 percent would raise approximately $10 billion a year.[35] Such a tax is accordingly under consideration to help fund national health care reform (Iglehart 2009), but the resulting revenue could also support anti-obesity efforts.

A third potential goal is to send a message about the dangers of fattening food (Caraher and Cowburn 2005). This message might be sent with particular clarity if the same items that are subject to taxation also have warning labels indicating their potentially harmful nature.

A fourth purpose is to correct a classic market failure involving "externalities." Neither the buyer nor the seller of fattening food pays the full increase in obesity-related health care costs that result from the purchase. Many such costs are financed by taxpayers, employers that pay insurance premiums, or workers whose wages are reduced to compensate for their companies' higher premiums. A fattening food tax would, in effect, shift these external costs to the purchasers of fattening foods, thus lessening the extent of this market failure.

A fifth and closely related rationale involves personal responsibility, argued as follows: People have the right to buy food that will make them obese. But they need to take responsibility for the costs they impose on the rest of us. They do this by paying a fattening food tax, which helps defray the publicly funded medical costs that result from obesity.

Policy design questions

If policymakers decide to impose such a tax, they need to resolve several policy design issues. The first concerns the food items subject to taxation. A narrowly framed tax on sugary sodas can be justified in terms of such sodas' significant impact on obesity and their absence of nutritional value. Not only do these beverages provide "empty calories" and promote weight gain if consumed in excessive quantities (Vartarian, Schwartz, and Brownell 2007),[36] the typical person now consumes 190 calories a day from sugared beverages, 120 calories more than in the late 1970s. According to the CDC, this 120-calorie increase represents 50 percent of Americans' daily average caloric increase during that period.[37]

Of course, sugary soft drinks are just one, narrow category of food product that contributes to obesity. Policymakers could levy excise taxes much more broadly, perhaps using the kinds of categories applied in Canada, France, and England—that is, taxing candy, sugared drinks, ice cream, packaged sweets, chips, and so on.

A more systematic approach would apply excise taxes to a broader and more objectively defined set of fattening foods, perhaps using a version of the above-described Rayner nutrient profiling model. Whether legislation applies the original Rayner model, a modified version of the Rayner model,[38] or an entirely new nutrient profiling model, policymakers interested in raising taxes to reduce the consumption of fattening food may need to tax the full range of such food items. With a more narrowly targeted tax, consumers could simply substitute one fattening food or beverage for another (Kuchler et al. 2005).

A second policy design question concerns whether the tax is levied at the point of production or the point of sale. With an "upstream" excise tax imposed on producers or

distributors, higher prices are seen on the shelves of stores rather than first appearing at the cash register. Since consumers make their purchasing decisions when they see items on the shelves, before sales taxes are added, a production-based tax may cause a greater drop in consumption (Brownell and Freiden 2009). Such an upstream tax also avoids administrative complications for (and potential opposition from) stores, which otherwise might need to impose different sales tax amounts for different items. To rise with inflation, excise taxes could be defined either as (a) a percentage of dollar sales; or (b) a specified cost per volume of product sold (e.g., per ounce of sugary soda or per gram of sugary breakfast cereal), indexed for inflation.[39]

On the other hand, a sales tax has countervailing advantages. Facilitating implementation, a sales tax collection infrastructure is already in place in most states. In addition, since sales taxes are a percentage of the price of the product, revenue will rise with inflation automatically, without any need for statutory indexation.[40] Compared to a more upstream levy, a sales tax may be more likely to be reflected in the price that consumers pay (Kuchler et al. 2005). Finally, a sales tax would permit a short-term tax exemption (for example, lasting two years) in low-income communities without good access to fresh produce and other healthy foods, perhaps defined based on work conducted by the Institute of Medicine and the U.S. Department of Agriculture to analyze so-called "food deserts" (Institute of Medicine and National Research Council 2009; Ver Ploeg et al. 2009).[41] During that interim period, measures described below could improve such communities' access to relatively affordable, healthy food not subject to the excise tax.

The problems with a sales tax can be minimized through careful policy design. To provide consumers with good information before they decide what to purchase, items subject to additional taxation could be identified with appropriate labels on food packages and restaurant menus. Such labels could also educate the consumer about the problematic nutritional content of the food in question, combining a price signal with a health warning delivered at the moment when the consumer is deciding what to buy. As noted in the discussion of labeling below, it would be important for the warning to be simple and graphic— for example, a red "traffic light" signal on packaged items combined with the words, "fattening food—extra tax."

And while requiring stores to distinguish among foods in imposing sales taxes would be a burden, the resulting costs may not be excessive. Already, transactions at cash registers sometimes vary with product type. For example, many states exempt food from sales taxes; receipts from drug store cash registers sometimes flag the items that qualify for reimbursement through flexible spending plans; and many supermarket chains discount special items for consumers who sign up as members. That said, a tax on fattening food could impose an administrative burden on smaller retailers that are not well computerized. Accordingly, some of the initial revenue from such a tax could finance short-term tax credits to help those companies with necessary transition costs.

This raises a third broad policy design question, which involves how the revenue is spent. Along with some modest, short-term help to grocers, two promising candidates for ongoing revenue use are (a) subsidizing low-income Americans to obtain health coverage as part of health care reform; and (b) financing other anti-obesity efforts. As will be explained

below, we suggest that both are appropriate and the latter component could prominently feature efforts to improve low-income communities' access to relatively affordable, healthy food.

A fourth policy design question involves the level of the tax. Some observers suggest that, to have a major effect on consumption, such a tax should be high.[42] A high level of taxation would be consistent with the World Health Organization's recommendation for tobacco products that excise taxes should represent between two-thirds and three-quarters of the total retail cost.[43] Along similar lines, analysts with the U.S. Department of Agriculture (USDA) suggest that, for fattening food taxes to change behavior, they may need to equal at least 10 to 30 percent of the price of the food (Kuchler, Tegene, and Harris 2004).

A fifth issue involves whether the tax should be accompanied by a subsidy that lowers the price of fruits and vegetables. Adding such a subsidy would more strongly shift food purchases towards healthy, rather than fattening food, potentially deepening the desired reduction in obesity (Powell et al. 2009; Dong et al. 2009). In addition, it would prevent a possible reduction in consumption of vegetables and fruits that otherwise might result from increasing the price of fats, oils, and high-fat milk products (Nnoaham et al. 2009; Mytton et al. 2007).

Potential disadvantages

A potential disadvantage of taxing fattening foods is that low-income households would bear a disproportionate burden. Not only are sales and excise taxes inherently regressive, this particular tax is harder to avoid for low-income than for higher-income people. The most important reason involves price. The same items tend to have higher prices in low-income than

in higher-income areas (Leibtag and Kaufman 2003). Above all, fattening food can cost less than

healthier food in dollars per calorie (Drewnowski and Darmon 2005; Drewnowski and Specter

2004); put simply, it is often cheaper to fill the bellies of hungry children with fattening than

with healthy food.

Another contributing factor is the lack of access to affordable, healthy food in many low-

income communities (Cassady, Jetter, et al. 2007; Franco et al. 2008).[44] However, it is easy to

exaggerate barriers to food purchase. According to a recent USDA analysis, only 5.4 percent of

American households live more than a half-mile away from a grocery store and do not own a

car; because of urban density, supermarkets tend to be closer to low-income than to other

households (median distances of 0.76 and 0.87 miles, respectively); 87 percent of food stamp

benefits are redeemed in superstores, supermarkets, or large grocery stores, with only 4

percent redeemed in convenience stores; and low-income households are more likely than

higher-income households to buy their food at superstores with low food prices (Ver Ploeg et

al. 2009). According to other research, eating at fast food restaurants is more common among

higher-income than low-income households (Paeratakul et al. 2003), and the very lowest-

income households consume, on average, the least amounts of unhealthy, salty snacks (Kuchler

et al. 2004).

To prevent low-income families from losing ground in their ability to buy enough food to

ward off hunger, policymakers could use revenue from the fattening food tax to increase food

stamp allotments. A portion of the revenue could also fund initiatives to improve access to

healthy, affordable food in low-income communities. Resources could be targeted efficiently

based on above-referenced work that has already taken place to define the "food deserts" that

lack such access today (Institute of Medicine and National Research Council 2009; Ver Ploeg et al. 2009). These efforts could include community-based initiatives,[45] tax incentives for stores, zoning changes, (Andreyeva et al. 2008), and revising federal nutrition programs to increase the subsidies they provide for the purchase of healthy, nutritious food, including in farmers' markets.[46]

It is important to place this issue in context. Policymakers could ensure that low-income households disproportionately **benefit** from a fattening food tax. If the revenue is used primarily to subsidize low-income households' purchase of health coverage or to help such households gain access to affordable, healthy food, the net benefit received by low-income Americans would exceed the costs they incur; they would pay only some of the taxes but receive most of the benefits.[47]

Furthermore, if low-income households gain access to relatively affordable, healthy food, taxing fattening food can yield particularly positive health outcomes, especially if coupled with subsidies for the purchase of fruits and vegetables, since consumption responds more strongly to price changes among low-income than other households. One study thus found that, for children in the bottom quintile of income, a 10 percent reduction in the prices of fruits and vegetables was associated with a 1.4 percent reduction in average BMI, and a 10 percent increase in fast food prices was associated with a 2.6 percent reduction (Powell and Bao 2009).

A second potential disadvantage involves the political feasibility of raising taxes on fattening foods. Maine passed a beverage tax in 2008 to help finance that state's Dirigo Health Plan, but voters overwhelmingly voted to repeal the tax in a referendum six months later (State Coverage Initiatives 2009). In spring 2009, New York Governor David Paterson proposed an 18

percent tax on sugary drinks along with other new taxes to help fill a large state budget gap; he later retracted the proposal when his approval rating plummeted (in part because of the proposed taxes) and federal stimulus funding reduced the state's need to raise revenue to solve the budget crisis.[48]

Public opinion research on this question is mixed.[49] Much depends on how the tax is described and how the revenue is used. For example, while only 31 percent of New Yorkers support an "obesity" or "fat" tax, 52 percent support a soft drink tax, and 72 percent support such a tax if the revenue is dedicated to obesity prevention (Friedman 2009). Along similar lines, a recent national poll found that 53 percent of Americans favored "increasing taxes on soda and sugary soft drinks to help pay for health care reform."[50] Among those who opposed such taxation, 63 percent switched to support if the tax "would raise money for health care reform while also tackling the health problems that stem from being overweight."

More broadly, public support for taxing fattening foods seems to be growing over time (Friedman 2009). Analysts can view campaigns to tax fattening food as part of a longer-term strategy, not just work that seeks an immediate, short-term result.

Approximate amounts of federal and state revenue

If federal policymakers imposed a 10 percent sales or excise tax on fattening foods, defined based on their classification as "less healthy" by the above-described Rayner model, and the tax went into effect on October 1, 2010—the start of federal fiscal year (FFY) 2011—the resulting revenues, conservatively estimated, would equal roughly $240 billion over five years and $522 billion over ten (table 2). If such a tax were partially offset by a 10 percent tax subsidy for purchasing fruits and vegetables, the net amount raised over ten years would be $356 billion

(table 3). If the Congressional Budget Office evaluates a fattening food tax as a potential revenue source for national health care reform, it will project effects through FFY 2019. During that period, a 10 percent fattening food tax, alone and combined with a 10 percent subsidy for fruits and vegetables, would yield $462 billion and $315 billion in revenues, respectively. Increasing the rates of taxation and subsidy above 10 percent would raise larger amounts (tables 2 and 3).

Of course, state policymakers, no less than federal lawmakers, are engaged in addressing obesity. State-level excise or sales taxes on fattening food could be an important part of such initiatives. While funding anti-obesity efforts and defraying state health care costs that result from obesity and overweight, such taxes could also help states address current budget deficits, whether or not the federal government takes action. For each state, tables 4 and 5 show the approximate amount of revenue that would be raised in calendar years 2010 and 2011 by various sales tax levels applied to fattening food, both alone and partially offset by subsidies for fruits and vegetables.

These estimates are best viewed as indicating the general magnitude of potential revenues, rather than precise amounts that are sure to be raised. At the federal level and in most states, revenues may exceed the amounts listed below. For a full explanation of the methodology through which we developed the estimates, along with key limitations of our analysis, see the appendix to this paper.

Table 2. Estimated revenue from a national sales or excise tax, at various rates, on fattening foods, defined based on the Rayner model, federal fiscal years 2011–2020 (billions)

Tax rate	FFY 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2015	2011–2020
10%	$45	$46	$48	$50	$51	$53	$55	$56	$58	$60	$240	$522
15%	$63	$66	$68	$71	$73	$75	$78	$80	$83	$86	$341	$743
20%	$80	$83	$86	$89	$92	$95	$98	$101	$105	$108	$431	$937

Note: For methodology, see appendix.

Table 3. Estimated net revenue from the taxes shown in table 2, offset by proportionate tax subsidies for the purchase of fresh and processed fruits and vegetables, federal fiscal years 2011-2020 (billions)

Tax and subsidy rate	FFY 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2015	2011–2020
10%	$30	$32	$33	$34	$35	$36	$37	$38	$40	$41	$164	$356
15%	$41	$43	$45	$46	$48	$49	$51	$53	$54	$56	$224	$487
20%	$50	$52	$54	$56	$58	$60	$61	$63	$65	$68	$269	$587

Notes: The policies analyzed in this table show the net revenue from, for example, combining a 10 percent tax on fattening food with a 10 percent tax subsidy for fruits and vegetables. For methodology, see appendix.

Table 4. Estimated revenue, by state, from various levels of state sales tax on fattening foods, defined based on the Rayner model, calendar years 2010–11 (millions)

State	10% tax rate		15% tax rate		20% tax rate	
	2010	2011	2010	2011	2010	2011
Alabama	$600	$600	$800	$900	$1,100	$1,100
Alaska	$100	$100	$200	$200	$200	$200
Arizona	$1,000	$1,100	$1,500	$1,600	$1,900	$2,000
Arkansas	$400	$400	$500	$500	$600	$700
California	$5,700	$6,000	$8,200	$8,500	$10,300	$10,700
Colorado	$800	$900	$1,200	$1,200	$1,500	$1,600
Connecticut	$600	$600	$800	$800	$1,000	$1,100
Delaware	$100	$100	$200	$200	$200	$200
District of Columbia	$100	$100	$100	$100	$200	$200
Florida	$2,600	$2,700	$3,700	$3,900	$4,700	$4,900
Georgia	$1,200	$1,300	$1,700	$1,800	$2,200	$2,300
Hawaii	$200	$200	$300	$300	$400	$400
Idaho	$200	$200	$300	$300	$400	$400
Illinois	$1,800	$1,800	$2,500	$2,600	$3,200	$3,300
Indiana	$800	$900	$1,200	$1,200	$1,500	$1,600
Iowa	$400	$400	$600	$600	$700	$800
Kansas	$400	$400	$500	$600	$700	$700
Kentucky	$500	$600	$800	$800	$1,000	$1,000
Louisiana	$500	$500	$700	$800	$900	$1,000
Maine	$200	$200	$300	$300	$400	$400
Maryland	$900	$900	$1,200	$1,300	$1,500	$1,600
Massachusetts	$1,000	$1,100	$1,500	$1,500	$1,800	$1,900
Michigan	$1,400	$1,400	$2,000	$2,000	$2,500	$2,600
Minnesota	$800	$800	$1,100	$1,200	$1,400	$1,500
Mississippi	$300	$300	$500	$500	$600	$600
Missouri	$800	$800	$1,100	$1,200	$1,400	$1,500
Montana	$200	$200	$200	$200	$300	$300
Nebraska	$200	$200	$300	$400	$400	$400
Nevada	$500	$500	$600	$700	$800	$900
New Hampshire	$200	$200	$300	$300	$400	$400
New Jersey	$1,400	$1,400	$1,900	$2,000	$2,400	$2,500
New Mexico	$300	$300	$400	$400	$500	$600
New York	$2,800	$2,900	$4,000	$4,100	$5,000	$5,200
North Carolina	$1,200	$1,300	$1,700	$1,800	$2,200	$2,300
North Dakota	$100	$100	$100	$100	$200	$200
Ohio	$1,600	$1,600	$2,200	$2,300	$2,800	$2,900
Oklahoma	$500	$500	$600	$700	$800	$800
Oregon	$600	$700	$900	$900	$1,100	$1,200
Pennsylvania	$1,800	$1,900	$2,600	$2,700	$3,300	$3,400
Rhode Island	$200	$200	$200	$200	$300	$300
South Carolina	$600	$600	$800	$800	$1,000	$1,000
South Dakota	$100	$100	$100	$200	$200	$200
Tennessee	$800	$800	$1,100	$1,200	$1,400	$1,500
Texas	$2,900	$3,100	$4,200	$4,400	$5,300	$5,500
Utah	$400	$400	$500	$600	$700	$700
Vermont	$100	$100	$100	$100	$200	$200
Virginia	$1,100	$1,200	$1,600	$1,700	$2,000	$2,100
Washington	$1,100	$1,200	$1,600	$1,700	$2,000	$2,100
West Virginia	$200	$200	$300	$300	$400	$400
Wisconsin	$800	$800	$1,100	$1,200	$1,400	$1,500
Wyoming	$100	$100	$100	$100	$200	$200

Notes: Totals are rounded to the nearest $100 million. This table assumes no federal tax is levied on these items; such a tax would reduce state revenue by lowering consumption. For methodology, see appendix.

Table 5. Estimated net revenue from taxes in table 4, offset by proportionate subsidies for the purchase of fresh and processed fruits and vegetables, calendar years 2010-2011 (millions)

State	10% tax/subsidy		15% tax/subsidy		20% tax/subsidy	
	2010	2011	2010	2011	2010	2011
Alabama	$400	$400	$600	$600	$700	$700
Alaska	$100	$100	$100	$100	$100	$100
Arizona	$700	$700	$900	$1,000	$1,100	$1,200
Arkansas	$200	$300	$300	$300	$400	$400
California	$3,800	$4,000	$5,200	$5,400	$6,200	$6,500
Colorado	$600	$600	$800	$800	$900	$900
Connecticut	$400	$400	$500	$500	$600	$600
Delaware	$100	$100	$100	$100	$100	$100
District of Columbia	$100	$100	$100	$100	$100	$100
Florida	$1,800	$1,900	$2,500	$2,600	$3,000	$3,200
Georgia	$900	$900	$1,200	$1,200	$1,400	$1,500
Hawaii	$100	$100	$200	$200	$200	$200
Idaho	$200	$200	$200	$200	$200	$300
Illinois	$1,200	$1,300	$1,700	$1,800	$2,000	$2,100
Indiana	$600	$600	$800	$800	$1,000	$1,000
Iowa	$300	$300	$400	$400	$500	$500
Kansas	$300	$300	$400	$400	$400	$500
Kentucky	$400	$400	$500	$500	$600	$600
Louisiana	$400	$400	$500	$500	$600	$600
Maine	$100	$100	$200	$200	$200	$200
Maryland	$600	$600	$800	$900	$1,000	$1,000
Massachusetts	$700	$700	$900	$1,000	$1,100	$1,100
Michigan	$1,000	$1,000	$1,300	$1,400	$1,600	$1,700
Minnesota	$600	$600	$800	$800	$900	$1,000
Mississippi	$200	$200	$300	$300	$400	$400
Missouri	$500	$600	$800	$800	$900	$900
Montana	$100	$100	$100	$100	$200	$200
Nebraska	$200	$200	$200	$200	$300	$300
Nevada	$300	$300	$400	$400	$500	$500
New Hampshire	$100	$100	$200	$200	$200	$200
New Jersey	$900	$900	$1,200	$1,300	$1,500	$1,500
New Mexico	$200	$200	$300	$300	$300	$300
New York	$1,800	$1,900	$2,500	$2,600	$3,000	$3,100
North Carolina	$800	$900	$1,200	$1,200	$1,400	$1,500
North Dakota	$100	$100	$100	$100	$100	$100
Ohio	$1,100	$1,100	$1,500	$1,500	$1,800	$1,800
Oklahoma	$300	$300	$400	$400	$500	$500
Oregon	$400	$400	$600	$600	$700	$700
Pennsylvania	$1,200	$1,300	$1,600	$1,700	$2,000	$2,000
Rhode Island	$100	$100	$100	$200	$200	$200
South Carolina	$400	$400	$500	$600	$600	$700
South Dakota	$100	$100	$100	$100	$100	$100
Tennessee	$600	$600	$800	$800	$900	$1,000
Texas	$2,000	$2,100	$2,800	$2,900	$3,400	$3,600
Utah	$200	$300	$300	$300	$400	$400
Vermont	$100	$100	$100	$100	$100	$100
Virginia	$800	$800	$1,100	$1,100	$1,300	$1,400
Washington	$700	$800	$1,000	$1,100	$1,200	$1,300
West Virginia	$200	$200	$200	$200	$300	$300
Wisconsin	$600	$600	$800	$800	$900	$1,000
Wyoming	$100	$100	$100	$100	$100	$100

Notes: See notes to tables 3 and 4. For methodology, see appendix.

Clear and simple labels conveying the health risks of fattening foods

Labeling issues arise in two distinct contexts: packaged foods sold in stores and restaurant meals.

Labels on packaged foods

Since the 1990 enactment of the Nutrition Labeling and Education Act, the FDA has required packaged foods to contain certain information about nutrients. A "nutrition facts" box thus appears on food packages, listing the amounts of various nutrients per serving, along with a definition of serving size. This labeling requirement appears to have shifted consumption towards a healthier mix of products.[51]

However, while consumers often report using such labels to guide their food purchases, considerable research shows that actual use is much less than reported, fewer consumers are using labels than in the past, and labels frequently leave shoppers confused and misinformed (Cowburn and Stockley 2005; Rothman et al. 2006).[52] According to one synthesis of existing literature, "Consumers often feel overwhelmed by the amount of information on food labels."[53]

To address this problem, much of the rest of the developed world, including Great Britain, the European Union, Australia, and New Zealand, is considering initiatives related to "front-of-package" (FOP) "signpost" labeling. Supplementing detailed, numerical labels like those required in this country, FOP signpost labeling uses simple, graphic symbols to convey the health risks and benefits of packaged food items. It has already become widespread in Europe and England, on a voluntary basis. Considerable research shows that this approach significantly

increases consumers' ability to understand and use nutritional information (Gorton et al. 2008; Grunert and Wills 2007).

A recent, comprehensive study commissioned by the British government found that the proliferation of FOP formats was confusing many consumers (Malam et al. 2009). The commission therefore recommended that the government establish a single, common format. After testing different FOP methods, the commission found that the most effective method combined, for each of four key nutritional components (fat, saturated fat, sugar, and salt), a traffic light indicator (red, yellow, or green), a corresponding word (high, medium, or low), and an indicator of the percentage of daily nutritional requirements met by the food. A recent study by Australian researchers found that consumers were five times as likely to correctly identify healthy food when they were exposed to such traffic-light labels rather than black-and-white, nongraphic numerical boxes like those used in the United States.[54] Figures 7 and 8 provide examples of traffic-light labeling.

Figure 7. International examples of traffic-light labeling for the front of a food package
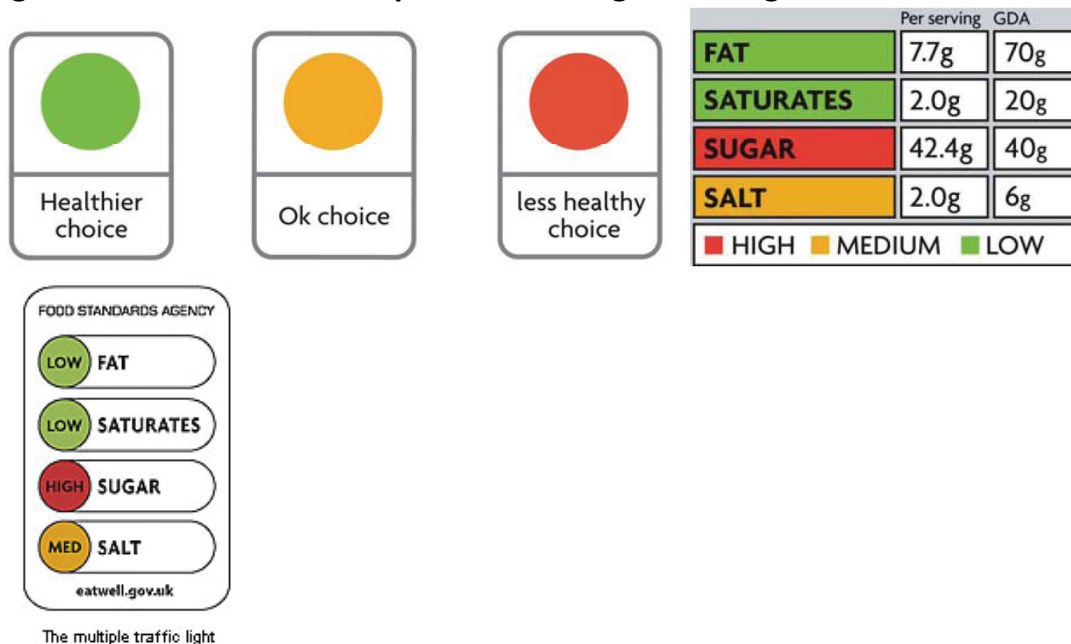
Figure 8. Traffic light labels for vending machines, University of Virginia

FOP signpost labeling has changed consumers' buying habits:

- In 2004, the University of Virginia (UVa) applied simple traffic-light signpost labels to the 120 vending machines in the UVa Health System, as illustrated in Figure 8, above. Each snack and beverage received a single, color-coded label of red, yellow, or green, depending on fat and calorie content, with green the healthiest and red the least healthy. Large signs explaining the program were placed on or near each vending

machine, and a five cent "tax" (representing approximately 8 percent of the value of the product) was added to the cost of each red item. The extra charges were donated to the UVa Children's Fitness Program. After one year, red item sales decreased 5.3 percent, yellow increased 30.7 percent, and green rose 16.5 percent. Overall sales increased 8.3 percent. State officials have expressed interest in reproducing both the vending-machine and the related cafeteria programs in schools throughout Virginia (Garson and Engelhard 2007).[55]

- When the English supermarket chain Tesco's began implementing FOP signpost labels, sales of prepared meals and sandwiches with above-average fat and salt levels dropped by up to 41 percent, while similar products with better nutritional profiles saw sales more than double. Investment analysts at Citibank concluded, "The magnitude of the sales impacts is such that we are left with the inescapable conclusion that the increased prevalence of front-of-pack signposts may lead to marked changes in consumer buying habits."[56]

- In the United States, the Hannaford Supermarket chain implemented a three-star labeling system in September 2006. Out of more than 25,500 rated food items, 28 percent received one, two, or three stars indicating good, better, or best nutritional value, respectively. Each food item was classified based on Hannaford's proprietary formula, developed by a team of nutritional experts, which, much like the Rayner model, credits a food for vitamins and minerals, fiber, and whole grains and debits a food for trans-fats, saturated fats, cholesterol, added sugars, and added sodium. The stores worked hard to educate consumers about the meaning of the star system. After a

year, consumers' selection of packaged foods and frozen entrees with stars grew at 2.5

and 4.5 times, respectively, the rate of similar items without stars. Meat and chicken

with stars (generally signifying low fat content) experienced sales increases of 7 and 5

percent, respectively, compared with 5 and 3 percent declines for meat and chicken

without stars.[57] Consumers reported support for this initiative, and the program has

been expanded to include more than 1,300 stores.[58]

These promising approaches could be implemented much more broadly through

legislation. For all packaged food that now must bear a "nutrition facts" label, state or federal

law could require that the manufacturer also place a simple, graphic label on the front of the

package to convey the most important nutritional information about the product. Consumer

confusion like that observed in Britain is beginning to emerge in the United States around the

multiple FOP nutritional labeling systems.[59] To end such confusion, either legislation or an

administrative agency would need to select a uniform format for all products (e.g., British-style

multiple traffic lights, UVa-style single traffic lights, etc.). The administrative agency might also

be delegated the responsibility to specify the precise nutritional characteristics that place a

food into each graphic category (e.g., red, yellow, or green); and to establish requirements for

minimum label size and placement of the label on the package to maximize consumer use and

comprehension. Future research could help lay the groundwork for finished policy by testing in

stores the impact on consumer decisions of various FOP graphic formats.

The food industry would need some lead time to comply with new labeling

requirements, but the time required should not be exaggerated. The above-described Canadian

graphic tobacco labels, for example, were in place less than a year after legislation passed.

Policymakers concerned about the impact on manufacturers could give a longer lead time to smaller than to larger companies.

Borrowing even more closely from tobacco-type graphic labels, future research could also explore an additional food labeling initiative that, on the front of fattening food packages, would place large labels featuring simple, hard-hitting words and powerful images. For example, one label might say, "Fattening food can give you diabetes," and an accompanying photo would graphically illustrate symptoms of diabetes.

Labels on restaurant food

Approximately half the average American food budget is devoted to meals and snacks outside the home (Silverglade 2004), which average 5.8 a week, representing approximately 20 percent of all meals (Berman and Lavizzo-Mourey 2008). Fast-food restaurants alone account for more than 33 percent of American calorie consumption.[60] On days when a meal is eaten at a restaurant, consumption rises by up to 800 added calories a day (Berman and Lavizzo-Mourey 2008).

Consumers are often unaware of the additional caloric intake. In one study, when asked how many calories were contained in a high-calorie restaurant meal they had just eaten, participants underestimated the caloric content by 500 to 1000 calories (Berman and Lavizzo-Mourey 2008). When menus provide this nutritional information, consumers may be less likely to choose obesity-causing food.[61]

Accordingly, for chain restaurants above a threshold size, laws requiring nutritional information to appear on menus have been adopted in Philadelphia, New York City, California, Maine, Massachusetts, and Oregon.[62] In the proposed federal Menu Education and Labeling

Act,[63] and in national health care reform legislation approved by the Senate Committee on

Health, Education, Labor, and Pensions,[64] federal lawmakers have likewise proposed requiring

restaurant chains with at least 20 outlets to place on their menus the calories for each standard

menu item. The latter health care reform provisions have been endorsed by the National

Restaurant Association, in an effort to ensure a single, nationwide standard for nutrition

disclosure.[65]

Legislation along these general lines appears to hold significant promise. It may be

important for future research to explore the most effective methods through which nutritional

information is conveyed to consumers. Such research would include both content and format,

carefully tracking the impact on food purchases. For example, while it is clear that very simple

nutritional messages will be much more effective in shifting consumer behavior than the kinds

of complex, multidimensional nutrition information now included on American back-of-the-

package labels, it is not obvious whether a calorie count or a traffic-light signal would have a

greater impact on consumer food choices.

Banning advertising of fattening food

As of 2004, the food industry spent over $30 billion a year on advertising—more than any other

industry (Chopra and Darnton-Hill 2004). Over $10 billion in annual marketing focuses

specifically on children and adolescents (Institute of Medicine, Committee on Food Marketing

and the Diets of Children 2006), who view an average of 12 and 21 commercials, respectively,

for food or beverages each day (Robert Wood Johnson Foundation 2008, citing other research).

An estimated 97.8 percent and 89.4 percent of such advertisements seen by children and

adolescents, respectively, are for products classified as having poor nutritional content because of high sugar, high saturated fat, or high salt levels (Powell et al. 2007). Much evidence shows that exposure to food advertisements significantly and directly affects consumption of fattening food by both children[66] and adults.[67]

One recent study found that food advertising causes between one-seventh and one-third of obesity among American children (Veerman et al. 2009). Another study estimated that banning fast food advertising alone would reduce the number of overweight American children age 3–11 and 12–18 by 18 and 14 percent, respectively (Chou, Rashad, and Grossman 2008).

These trends are not limited to the United States. However, many other countries have taken vigorous action to address the problem. At least 50 countries regulate television advertising aimed at children (Nestle 2006). For example:

- Australia bans food advertisements aimed at children age 13 and younger;

- The Netherlands forbids advertising sweets to children under age 12;

- For foods that the Rayner model (described above) classifies as "less healthy," which are high in saturated fat, salt, or sugar, the United Kingdom forbids any advertising in or around programs aimed at or likely to appeal to children age 15 and younger (Magnusson 2008); and

- Sweden, Norway, and Quebec ban all advertising aimed at children, regardless of the product involved (European Heart Network 2005; Food and Drink Advertising 2007).

Given the extensive impact of the obesity epidemic, American policymakers could likewise consider banning mass-media advertising and otherwise limiting the marketing of obesity-promoting foods to children and adults alike.[68]

If lawmakers decide to pursue this approach, a key policy design challenge involves the breadth of marketing media subject to a ban. In terms of tobacco, a study of 22 countries in the Organisation of Economic Cooperation and Development (OECD) found that a significant reduction in tobacco use resulted from comprehensive bans on tobacco advertising that involved at least five of seven media (television advertising, radio advertising, print advertising, outdoor advertising, point of purchase advertising, movie advertising, and sponsorships; see Saffer and Chaloupka 2000). The data from the study indicate that comprehensive advertising bans in all OECD countries would cause a 5.4 percent reduction in tobacco use and a 7.4 percent reduction in cigarette use. A similar ban on marketing fattening food would likewise need to encompass multiple media, potentially including the Internet as well.

In the United States, such a ban would confront a likely constitutional challenge under the First Amendment's freedom-of-speech clause. Although the First Amendment provides less protection to commercial than to political expression, limits on advertising and marketing can be struck down as unconstitutional unless they directly advance a substantial governmental interest,[69] with a reasonable "`fit between the legislature's ends and the means chosen to accomplish those ends, ... a means narrowly tailored to achieve the desired objective.'"[70]

Accordingly, current restrictions on broadcast advertising of tobacco have not been struck down as unconstitutional. As noted above, new legislation directs the FDA to prohibit other forms of marketing, and it will be important to monitor how the courts evaluate the constitutionality of such restrictions.

But with obesity posing an enormous and growing public health risk, a ban on marketing fattening food through mass media clearly warrants further analysis. Among the constitutional

issues to research are the factual record that Congress or a state legislature would need to establish for a restriction to pass constitutional muster; whether legislative goals should focus on marketing to children or marketing to adults;[71] and policy options for tailoring any advertising ban narrowly to fit the objectives chosen by lawmakers.

Conclusion

Noting that worldwide obesity has reached "pandemic proportions," and observing that "no country has managed to reduce the burden of obesity using public health approaches," Boyd Swinburn, director of the World Health Organization Collaborating Centre for Obesity Prevention, noted, "Tackling many other public health epidemics and threats in the past has required a backbone of hard policies around which the softer options can work to amplify their effectiveness. Tobacco control is the classic case where taxation, advertising bans, and smokefree environments legislation served as the drivers for change with quit programs, social marketing and education providing added value" (2008).

Dr. Swinburn went on to make a key distinction about applying "hard" and "soft" policy approaches to obesity: "Virtually all of the hard policy options are directed at the environment (making the healthy choice the easy choice) and virtually all of the policies that directly target the population are softer options (encouraging people to make the healthy choice)."

Recent decades' astonishing increase in obesity throughout the developed world was not caused by a change in human nature. It resulted from a change in the environment in which people make food choices. Like it or not, policymakers serious about changing the course of the obesity epidemic will need to modify that environment so healthy choices become easy and

decisions to eat fattening food become more difficult. Such interventions are only part of a comprehensive anti-obesity strategy, but they are an essential part.

Policy changes needed to protect the public health will interfere with profits now enjoyed by many industries, which can be expected to fight against these reforms using every tool at their command. As with tobacco, the battle against food-related industries is uphill, and it will surely be prolonged. But those who care about the public health, the productivity of America's workers, or the ever-rising cost of American health care have no realistic choice but to engage in this struggle with patience, creativity, strategic and tactical wisdom, and unflagging commitment.

Appendix: Calculation of revenue estimates

National estimates

To derive the national revenue estimates in the text of the paper, we began with the amount of consumer spending for food, as found by the U.S. Department of Agriculture (USDA) for 2008.[72] We then estimated future food expenditures based on USDA's projections for real growth in aggregate food consumtion (Blisard, Variyam, and Cromartie 2003) and future changes to the Consumer Price Index for food (Office of the Chief Economist 2009).

We then estimated that 33 percent of such expenditures would be for foods classified as "less healthy" by the Rayner model. This applies the finding by Mytton and colleagues (2007) that, in Britain, extending the VAT to food purchased for home consumption that was classified as less healthy by the Rayner model would affect 33 percent of such food expenditures.[73] Subsequent research suggests that, in fact, the proportion could be significantly higher, although a precise estimate is not yet available (Nnoaham et al. 2009).

To determine the impact of this excise tax on consumption, we derived 0.931 as the weighted average of "own-price elasticities"—namely, the percentage by which expenditures to purchase a food decline in response to a 1 percent increase in the price of that food—for specific processed foods (e.g., non-diet soft drinks, candy and mints, muffins and rolls, ice cream and yogurt, etc.) likely to be classified as "less healthy" by the Raynor model (Bergtold et al. 2004). We did not apply the much lower own-price elasticities that apply to broad food categories, which range from 0.04 for breads and cereals to the highest level of .108 for beverages and tobacco (Seale et al. 2003).

In estimating the cost of subsidizing the purchase of fruits and vegetables, we again

began with the USDA estimate of total food purchasing in 2008. We then determined the

proportion of such expenditures that were for fresh and processed fruits and vegetables based

on the U.S. Census Bureau's Consumer Expenditure Survey (CES) for 2007.[74] We projected real

aggregate spending growth and CPI changes by applying USDA estimates that were specific to

fruits and vegetables, rather than applicable to all foods. In calculating the impact of each

subsidy level on the volume of consumption, we applied elasticity estimates for fruits and

vegetables published by USDA (Dong et al. 2009).

This analysis has several limitations. First, the 33 percent estimate was in the context of

foods bought for home consumption. The estimates in the text also apply this percentage to

purchases of food in restaurants, where unhealthy, fattening food is far more prevalent, as

discussed in the body of the paper.[75] A more accurate estimate for restaurant food would, in all

likelihood, be considerably higher than 33 percent.

Second, in estimating the total volume of American food consumption, we used the

USDA estimate, rather than the higher number produced by the Commerce Department's

Bureau of Economic Analysis.

Third, our short-term revenue estimates do not take into account the possible impact of

the current economic downturn on food purchases, but it is unclear how that will play out in

the purchase of fattening food. USDA anticipates that the total dollar value of food purchases is

likely to drop, but the volume of food purchased will remain stable; U.S. households will shift to

less costly products and eat out less (Shane et al. 2009). The shift to less costly products may

increase the share of fattening foods in the American diet, but a reduction in restaurant eating is likely to reduce that share.

Another limitation involves our application of elasticity estimates. Ideally, one would estimate the impact of an excise tax on consumption levels by working through all pertinent cross-elasticities. Such analysis would take into account the impact of the price of one food item on the consumption of other food. For example, a higher price on bread may decrease consumption of both bread and margarine while increasing consumption of rice. Using own-elasticities for fattening foods should provide a reasonable general estimate of the impact of excise or sales taxes on consumption, but subsequent work in this area would benefit from a more detailed analysis of the effect of all relevant cross-elasticities.

As another limitation, the estimate that 33 percent of food purchases are for items classified as "less healthy" by the Rayner model is based on British food consumption, which differs from ours. But if, as may be the case, fattening food plays a larger part in American than in British diets, the applicable percentage would be higher in this country, and this limitation would bias our revenue estimates downward. According to estimates from the Food and Agriculture Organization of the United Nations, average per capita food consumption in 2002 and 2003 was higher in the United States than in Great Britain by 9.0 percent in calories, 9.1 percent in total volume of food consumed, and 14.8 percent in average daily consumption of fat.[76] Along similar lines, OECD reports that 34.3 percent of Americans were obese in 2006, compared to 24.0 percent of British residents (OECD Directorate for Employment, Labour and Social Affairs 2009).

Finally, policymakers may decide to exempt from taxation food sold by non-chain restaurants and (for a temporary period) in low-income areas without good access to supermarkets. Further, if policymakers label foods subject to excise taxes with graphic warnings, consumption could decline more than would take place based on price increases alone. If lawmakers pursue these approaches, less revenue would be raised.

Appendix Table 1 illustrates some of the effects of varying two key assumptions—namely, the percentage of food purchases that would be taxed and the own-price elasticity of fattening foods (that is, the percentage by which the purchase of such foods would decline in response to a 1 percent increase in price).

Appendix Table 1. Estimated revenue from a 10 percent national sales or excise tax on fattening foods, defined based on the Rayner model, federal fiscal years 2011–2020, varying key parameters (billions)

		Percentage of food purchases subject to taxation	
		33 percent	**45 percent**
Elasticity	**0.1**	$570	$778
	0.5	$547	$746
	0.93	$522	$712
	1.5	$490	$668

State estimates

Neither the USDA nor the Commerce Department reports the amount spent to purchase food in each state. However, the CES provides regional estimates of average 2006-2007 food

consumption by household unit and income, along with the number of household units for each region and income level.[77]

We estimated the number of household units in each state at each income level as follows. We began with the number of CES-reported household units in the applicable region at a given income level. We distributed those households, by state within the region, in proportion to American Community Survey estimates of the number of households in each state at the applicable income level in 2006.[78] We then applied, for each income level, CES-estimated food expenditures per household in 2006-2007 within the applicable region to the estimated number of CES households in the state, adjusting each state's totals proportionately to be consistent with USDA's national expenditure estimates for total food purchases. We updated total expenditures to calendar years 2010 and 2011 based on USDA's national projections of real per capita food consumption and the consumer price index for food as well as Census Bureau projections for the total population of each state.[79]

We estimated purchases of food and vegetables in each state using a similar method, applying, instead of CES estimates of total food consumption, CES estimates of household spending on fruits and vegetables for each region and income level. As with our analysis of national subsidy costs for fruits and vegetables, we applied USDA elasticity estimates for fruits and vegetables.

One limitation to our state but not our national estimates is that little available data show food consumption patterns by state (other than CES regional averages). Dietary differences between states, even for similar-income households living in a single region, may

affect the proportion of food purchases that would be classified as "less healthy" by the Rayner model, hence the tax revenues that would be generated.

Another limitation is that revenues would initially be offset by the cost of developing necessary infrastructure for taxation, including a method through which foods were classified as subject or not subject to taxation. The classification process should not be unduly onerous, since every element of the Rayner model except the percentage of the product comprised of fruits and vegetables is already listed in the nutrition facts for packaged foods. Nevertheless, a system needs to be developed, which will require "up front" costs. While such costs would also be incurred for a federal system of taxation, they are likely to offset a larger proportion of initial revenues for a state, given national economies of scale that do not apply at the state level.

Such infrastructure development would be particularly costly for states that lack a statewide sales tax—namely, Alaska, Delaware, Montana, New Hampshire, and Oregon. Public-sector administrative costs would be accompanied by large private-sector transition costs, as merchants would need to gear up to collect sales taxes. Policymakers could use some of the revenue to defray those transition costs, but that would further reduce net revenue gains in these states.

Finally, in a state that taxes fattening food, some residents who live near a border may do their grocery shopping in other states, to avoid the tax. While the extent of this effect is not clear, it would lower the amount of revenues received.

Given these limitations and the factors described above in connection with our national estimates, the state estimates in the text are best viewed as a reasonable, relatively conservative first approximation that can provide a starting point for further analysis.

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The WellPoint Foundation, Inc. is a private, non-profit organization wholly funded by WellPoint, Inc. Through charitable contributions and programs, the Foundation promotes WellPoint's inherent commitment to enhance the health and well-being of individuals and families in communities that WellPoint's affiliate health plans serve. The Foundation focuses its funding on strategic initiatives that promote the Healthy Generations Program, a multi-generational initiative that targets specific disease states and medical conditions. These disease states and medical conditions include: prenatal care in the first trimester, low birth weight babies, cardiac morbidity rates, long term activities that decrease obesity and increase physical activity, diabetes prevalence in adult populations, adult pneumococcal and influenza vaccinations and smoking cessation. The Foundation also coordinates the company's annual associate giving campaign and provides a 50 percent match of associates' campaign pledges. To learn more about the WellPoint Foundation please visit www.wellpointfoundation.org.

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Notes

[1] In a study looking at obesity in the workforce, the frequency of circulatory and metabolic conditions was three times higher for obese workers than for normal-weight employees, and increased body weight was associated with a higher rate of arthritis, back pain, and injuries. For moderately or extremely obese workers, health-related losses in productivity were found to be twice as high as for all other employees (Gates et al. 2008).

[2] Marybeth Stevens, "Present Dangers: Presenteeism Is the Next Area of Focus as Companies Seek to Maximize Their Investment in Human Capital by Improving Productivity and Promoting Employee Health and Wellness – Disability," *Risk & Insurance*, March 2004. http://www.injurynet.com.au/resource/Present_Dangers.pdf.

[3] Morbid obesity, also known as clinically severe obesity, involves a BMI of 40 or more.

[4] Centers for Disease Control and Prevention, "Economic Consequences of Obesity and Overweight," last updated May 28, 2009. http://www.cdc.gov/obesity/causes/economics.html.

[5] Finkelstein and colleagues found that, combined, obesity and overweight cause 9.1 percent of U.S. health care spending. For projections of 2009 health care expenditures, see Centers for Medicare and Medicaid Services (2009).

[6] In analyzing the long-term implications of obesity for Medicare costs, a leading study found that, once someone reaches the age of 70, life-span is roughly equal among the obese and non-obese; but subsequent lifetime health care costs are $39,000 higher, on average, for obese beneficiaries, discounted to present value (Lakdawalla, Goldman, and Shang 2005).

[7] Centers for Medicare & Medicaid Services, Office of the Actuary, "Table 1. National Health Expenditures Aggregate, Per Capita Amounts, Percent Distribution, and Average Annual Percent Growth, by Source of Funds: Selected Calendar Years 1960–2007," http://www.cms.hhs.gov/NationalHealthExpendData/downloads/tables.pdf.

[8] This calculation assumes that, as with the overall adult population, 66 percent of recipients of employer-sponsored insurance (ESI) are not obese and that an estimated 150 million Americans will receive ESI in 2009 (Holahan et al. 2009).

[9] National Library of Medicine, Profiles in Science, The Reports of the Surgeon General, "The 1964 Report on Smoking and Health," http://profiles.nlm.nih.gov/NN/Views/Exhibit/narrative/smoking.html.

[10] Syntheses and reviews of existing literature are included in U.S. Department of Health and Human Services (2000) and National Institutes of Health (2006).

[11] To provide examples of the impact of excise taxes, in California and Massachusetts, tobacco tax increases of 25 cents per pack have been linked to 6 to 9 percent declines in smoking (Biener et al. 1998; Flewelling et al. 1992). Another study found that the 70 percent increase in the real price of cigarettes from 1997 through 2003, which resulted from settlement of a major, multi-state tobacco lawsuit, caused most of the 12 percentage point reduction in cigarette smoking during that period (Grossman 2004, 2005). Other research has concluded that, for every 10 percent increase in price, cigarette consumption decreases 4 percent for adults and 7 percent for youth (Campaign for Tobacco-Free Kids, "Congress, President Deliver Historic Victory for Children's Health by Increasing Tobacco Taxes to Fund SCHIP program, press release, February 4, 2009, http://www.tobaccofreekids.org/Script/DisplayPressRelease.php3?Display=1128). Internationally, the World Health Organization reports that a 70 percent increase in the price of tobacco could prevent up to as quarter of all smoking-related deaths worldwide (WHO 2008).

[12] See, for example, Chopra and Darnton-Hill (2004); Yach et al. (2005); and Brownell and Warner (2009).

[13] British researchers have shown that chocolate acts on the brain in a way similar to addictive drugs. Using functional magnetic resonance imaging, areas of the brain known to be involved in habit-forming behaviors and drug addiction were activated when persons who craved chocolate viewed pictures of the confection (Rolls and McCabe 2007). Davis and colleagues likewise described prior research results as follows: "Of relevance is research showing that sweet foods, like certain addictive drugs, can produce significant analgesic effects. Excessive food intake can also induce physiological responses that mimic those seen in drug addiction—viz. down-regulation, sensitization, and withdrawal. One study has demonstrated that repeated and high intake of sugar causes behavioral and neurochemical signs of withdrawal in rats when its availability is restricted. In addition, the fact that binge eating is often triggered by the ingestion of small amounts of a palatable food parallels the 'priming' effect of drugs in addicts, whereby the initial ingestion of the drug tends to elicit a strong 'craving' or compulsion for further

use" (Davis et al. 2004, 929–35). Citing other research, Brownell and Warner note, "Animal studies have shown similarities in the way the brain responds to classic drugs of abuse (e.g., morphine, alcohol, nicotine) and to sugar. Human studies have shown similar findings and have examined how the same reward pathways affect the intake of food and drugs" (2009, 259–94).

[14] See also Shirley Perryman, "Drink Your Caffeine and Eat It, Too!," Colorado State University Extension, March 20, 2008, http://www.ext.colostate.edu/Pubs/columnnn/nn080320.html; and Condé Nast Digital, "Nutrition Data, Foods Highest in Caffeine, 2009," based on USDA food ingredient data, http://www.nutritiondata.com/foods-00013100000000000000000.html.

[15] 15 U.S.C. §2605(a).

[16] Environmental Protection Agency, "Making a Finding on Unreasonableness of Risk," http://www.epa.gov/oppt/newchems/pubs/unrerisk.htm.

[17] See also FSA, "FSA's Nutrient Profiling Model: 'scientifically robust and fit for purpose'," press release, July 7, 2008.

[18] The proposed regulation would change the Rayner model's thresholds for edible oils, spreads, and certain cheeses (Food Standards Australia New Zealand, Proposal P293, Nutrition, Health & Related Claims, Consultation Paper for First Review, March 20, 2009, Attachment 6). While several aspects of the proposed regulation are undergoing further review, the nutrient profiling component has apparently gained acceptance.

[19] For an explanation of how the current version of the model can be applied to determine whether any particular food or drink is "less healthy," see Food Standards Agency, "Guide to Using the Nutrient Profiling Model," http://www.food.gov.uk/healthiereating/advertisingtochildren/nutlab/nutprofmod.

[20] The data are presented in Child Trends, "Vigorous Physical Activity by Youth," http://www.childtrendsdatabank.org/pdf/16_PDF.pdf.

[21] The U.S. Surgeon General notes that 70 percent of overweight adolescents become overweight or obese adults (U.S. Surgeon General, "Fact Sheet: Childhood Overweight and Obesity Prevention Initiative," http://www.surgeongeneral.gov/obesityprevention/factsheet/index.html). See also studies cited in Food and Drink Advertising and Marketing Practices State and Territory Jurisdictional Working Party (2007) and Trust for America's Health (2008).

[22] According to one researcher, 70 percent of obesity begins after age 20 (Bray 2002). However, 80 percent of obese individuals at age 35–37 were already obese by age 20–22 (McTigue, Garrett, and Popkin 2002). Further suggesting the importance of late adolescence is that the relationship between childhood and adult obesity grows increasingly strong as adolescence progresses, so 18-year-olds in the 95th percentile of weight have more than a 98 percent chance of being obese in their mid-30s, leading researchers to identify "adolescence as one of the significant 'critical periods' in the development of adult obesity" (Guo et al. 2002, 657).

[23] See also Cohen and Farley (2008).

[24] See, for example, Trust for America's Health (2008); WHO (2004); and Silverglade (2004).

[25] Robert Wood Johnson Commission to Build a Healthier America, "Physical Activity, Recommendations," http://www.commissiononhealth.org/PhysicalActivity.aspx. This could take place within a rich activity environment that includes basketball hoops, soccer goals, and other equipment, which has been shown to increase the level of physical activity (Sallis et al. 2001). Land-use planning and public safety measures are also important in promoting a built environment that is conducive to physical activity (Trust for America's Health 2008).

[26] The manufacturing and pricing of sugared beverages are heavily influenced by government subsidies given to farmers under the Food, Conservation, and Energy Act, known as "The Farm Bill." The Farm Bill directly influences the price of food and has a great impact on the nation's food supply (Dietz, Benken, and Hunter 2009). Because these subsidized crops are comparatively inexpensive, they are more widely used in food production and encourage the production of the high-fructose corn syrup that is used as a cheap sweetener in soft drinks. Foods like cookies and soda, which are made from subsidized crops, cost five times less per calorie than unsubsidized foods like carrots or orange juice. This cost disparity encourages low-income people to consume cheaper, energy-dense foods that are nutritionally poor. Energy dense foods made with subsidized crops like soybean oil and high-fructose corn syrup have been linked to obesity-related conditions such as heart disease and diabetes. See, S. Mussenden, "Subsidies Encourage Unhealthy Eating, " General Media News Service, November 13, 2007, http://www.mgwashington.com/index.php/news/printer_friendly/subsidies-encourage-unhealthy-eating/49.

[27] School environments have a large impact on children's dietary intake, and the promotion of healthy eating requires both federal and sub-national policies, including national nutritional standards and the local availability of healthy foods. The School Nutrition Policy Initiative was a two-year multilevel anti-obesity intervention in select urban schools in which over half the children in grades 4 through 6 were eligible for free or reduced-price meals. The initiative included school nutrition policies like removing unhealthy foods from vending machines, menu planning, nutrition education, increased physical activity, social marketing, and parent outreach. At the end of the two-year intervention, 50 percent fewer children in the target schools became overweight compared to other similar schools in the region, thus demonstrating the potential of comprehensive school- and community-based anti-obesity interventions. See Foster et al. (2008).

[28] For example, one study recommended extreme caution in reaching agreements with the tobacco industry. Internal industry documents found that tobacco firms would make modest agreements that gave very little ground to anti-tobacco advocates. Such agreements successfully achieving the tobacco companies' goal of forestalling much more vigorous anti-tobacco efforts (Wander and Malone 2006). Research into the international food industry suggests that few companies are taking any significant responsibility to address the obesity epidemic (Lang, Rayner, and Kaelin 2006). See also Brownell and Warner (2009).

[29] One study found that among 9th grade children, a fast food restaurant within a tenth of a mile of a school was associated with at least a 5.2 percent increase in obesity rates (Currie et al. 2009). Along similar lines, another recent study found that, when a fast-food restaurant was located within a half-mile of a middle school or high school, adolescents at the school were 7 percent more likely to become obese (Davis and Carpenter 2009).

[30] Reducing quick and easy access to fattening food may be an effective strategy. Considerable evidence suggests that consumption of fattening food is dramatically affected by ease of access to such food (Cohen and Farley 2008).

[31] In discussing policy strategies to reduce the consumption of fattening products, we often use the word "food" to include both food and beverages.

[32] HM Revenue and Customs, "VAT - Value Added Tax," http://www.direct.gov.uk/en/MoneyTaxAndBenefits/Taxes/BeginnersGuideToTax/DG_4015895.

[33] Government of Canada, "Canadian Sales Tax," http://www.goingtocanada.gc.ca/CIC/display-afficher.do?id=0000000000023&lang=eng.

[34] For a contrary perspective, see Goldman, Lakdawalla, and Zheng (2009).

[35] Citing statistics from the Center for Science in the Public Interest in Robert Greenstein (2009).

[36] In one study, women who consumed one or more soft drink servings a day were twice as likely to develop diabetes during the eight-year study as women who consumed less than one serving a month. See Schulze et al. (2004).

[37] Centers for Disease Control, MMWR Weekly, "Trends in Intake of Energy and Macronutrients – United States 1971–2000," published February 6, 2004, http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5304a.3.htm. Another study reported that, after adults have lost weight by lowering their overall calorie intake, successful maintenance of weight loss is directly associated with reduced consumption of sugar-sweetened beverages (Chen et al. 2009). However, the research is not unequivocal; for example, one study found little conclusive evidence of a causal relationship between weight gain and the consumption of sugared beverages (Allison and Mattes 2009).

[38] Just as policymakers in Australia and New Zealand made modest changes to the original model based on their proposed use of it for a new purpose—that is, validating health claims about food, rather than (as in the model's original application) determining the foods that cannot be advertised to children because they are high in saturated fat, sugar, or salt—so too American policymakers might choose to adjust the model for the purposes discussed in the text—namely, identifying foods and beverages that would be the focus of specific anti-obesity interventions. For example, different numerical thresholds might apply.

[39] One common such measure is the Consumer Price Index for All Urban Consumers, or CPI-U. Alternatively, the tax could be indexed based on changes in food prices, which are a component of CPI-U.

[40] See discussion in Friedman (2009).

[41] Some may be concerned about the feasibility of such local variation. However, multiple sales tax rates already apply in different municipalities within some states. For example, in California, a statewide sales tax is supplemented within various local districts, which sometimes overlap. Accordingly, three different sales tax rates

are charged in different cities within Los Angeles County ("California City & County Sales & Use Tax Rates," http://www.boe.ca.gov/sutax/files/city_rates.xls, rates effective July 1, 2009).

Others may worry about the incentive for people to escape taxation by buying fattening food in areas where the tax does not apply. However, it seems doubtful that large numbers of middle-class people will drive to low-income neighborhoods to get lower prices on candy bars and cheeseburgers. And if this does take place, such activities could provide a short-term economic boost in low-income areas (albeit while reducing the revenue and public health gains of a tax on fattening food).

[42] In order to reduce consumption 10 percent at a taxable rate of a penny-per-ounce, 12 cents (or 12% of a $1.00 drink) would have to be added to the cost of a 12-ounce drink (citing statistics from the Center for Science in the Public Interest in Greenstein 2009).

[43] WHO, "Key Elements of Tobacco Control Legislation," Tobacco Free Initiative, http://www.who.int/tobacco/research/legislation/key_elements/en/.

[44] See also Eric Hansen, "Getting to the root of America's obesity epidemic," CapitolHillTimes.com, February 12, 2009; Carla Williams, ABC News, November 1, 2007, "Eating Healthy Might Prove Too Expensive for Poor," http://abcnews.go.com/Health/Diet/Story?id=3807128&page=1.

[45] Efforts to date have included a New York City initiative that brings food carts selling fresh fruits and vegetables to low-income neighborhoods; statewide efforts in Pennsylvania to bring grocery stores, farmers' markets, and supermarkets to underserved urban and rural communities; mass transit changes that gave low-income residents of Austin improved access to supermarkets; and cooperative markets in Milwaukee and Oakland at which local farmers can sell their produce, including (in Milwaukee) to consumers who pay with food stamps (Andreyeva 2008). Other efforts have targeted small community stores to increase their offerings of healthy food (Institute of Medicine and National Research Council 2009).

[46] See, e.g., Katie Zezima, "Food Stamps, Now Paperless, Are Getting Easier to Use at Farmers' Markets," *New York Times*, July 19, 2009.

[47] Such a net gain would be even greater if policymakers applied a "progressive" tax on fattening food through which a lower tax rate applied to, for example, lower-priced items or food disproportionately purchased by low-income households.

[48] WCBSTV.com, "Paterson Abandons 'Nuisance' Tax Plan," http://wcbstv.com/politics/david.paterson.taxes.2.956197.html

[49] One recent survey reported that 6 in 10 Americans would favor raising taxes on "items that are thought to be unhealthy, such as soda, alcohol, junk food, and cigarettes," Kaiser Health Tracking Poll, April 2009, http://www.kff.org/kaiserpolls/upload/7891.pdf. On the other hand, a different survey from the same time (April 2009) reports widespread opposition to taxes on food and drink deemed unhealthy, with 59 percent of adults opposed to taxes on sugary drinks and 55 percent opposed to taxes on junk food. Tax Foundation Poll, http://www.taxfoundation.org/press/printer/24600.html

[50] Kaiser Family Foundation, "Chartpack," Kaiser Health Tracking Poll: June 2009, http://www.kff.org/kaiserpolls/7924.cfm.

[51] See, for example, studies cited in Muth et al. (2009). For a summary finding mixed evidence on this question, see Kuchler et al. (2005).

[52] For broad, international research reviews, see Grunert and Wills (2007); "Impact Assessment Report on Nutrition Labeling Issues," Commission Staff Working Document, accompanying the Proposal for a Regulation of the European Parliament and of the Council, on the provision of food information to consumers, 2008; Magnusson (2008); Gorton et al. (2008); and Todd and Variyam (2008).

[53] "Impact Assessment Report on Nutrition Labelling Issues," Commission Staff Working Document, accompanying the Proposal for a Regulation of the European Parliament and of the Council, on the provision of food information to consumers, 2008.

[54] The 17th European Congress on Obesity, "Consumers more likely to identify healthy food using traffic light nutrition labels," May 6–9, 2009, poster session. http://www.iotf.org/documents/Foodlabellingrelease-Thursday.pdf.

[55] The cafeteria program referenced in the text labeled foods sold in the cafeteria based on sodium and fat content alone. It did not change consumer buying behavior in the program's original form, but it is being restructured.

[56] Elaine Watson, "Front-of-Pack Nutrition Labels Prompt Surprise Swing in Sales," *Food Manufacture*, May 2, 2006, page 8.

[57] Hannaford Supermarkets, "Grocery Shoppers Are Following Stars to More Nutritious Choice," September 6, 2007, http://www.bio-medicine.org/medicine-news-1/Grocery-Shoppers-Are-Following-Stars-to-More-Nutritious-Choices-633-1/.

[58] Hannaford Supermarkets, "Hannaford Supermarkets to License Guiding Stars: Nation's First Storewide 'Star' Nutrition Rating System could be available in early 2008," November 29, 2007; Carol Angrisani, "Guiding Stars to Appear in Schools, on Product Packaging," *Supermarket News*, November 18, 2008, http://supermarketnews.com/news/guiding_stars_1118/; John Eldredge, "Helping consumers make nutritious choices by pioneering the first-ever nutrition navigation system," Food Technology & Innovation Forum 2009, May 12–14, 2009 (synopsis at http://www.thefoodsummit.com/programme.asp).

[59] Julie Deardorff and Steve Mills, "Food rating systems: Grocery stores roll out nutrition rankings," *Chicago Tribune*, July 7, 2009.

[60] Studies cited in Center for Science in the Public Interest, "Research Review: Effects of Eating Out on Nutrition and Body Weight," October 2008, http://cspinet.org/new/pdf/lit_rev-eating_out_and_obesity.pdf.

[61] See studies cited in Center for Science in the Public Interest, "Summary of Findings: Influence of Nutrition Information Provision. Literature Review, accessed May 21, 2009, at: http://cspinet.org/new/pdf/lit_review-nutrition_info_studies.pdf. For a study to the contrary, see Harnack et al. (2008). For a more general literature review finding that, while menu labeling influences consumers' intentions to purchase more or less healthy food, only a small amount of research, which is not fully conclusive, examines actual consumer behavioral responses to menu labeling, see Larson and Story (2009). For a recent study finding that menu labeling could have a significant effect reducing food consumption, see Kuo et al (2009). For a recent policy analysis, including a useful summary of prior research, see Ludwig and Brownell (2009).

[62] Center for Science in the Public Interest, "Menu-Labeling Legislation Gains Support from Chain Restaurants," June 10, 2009, http://cspinet.org/new/200906101.html. See also Trust for America's Health (2008).

[63] S. 1048, H.R. 2426.

[64] See description of Section 325 in Majority Staff, Senate Committee on Health, Education, Labor, and Pensions, "In Historic Vote, HELP Committee Approves the Affordable Health Choices Act," July 15, 2009, http://help.senate.gov/Maj_press/2009_07_15_bBAI09A84_xml.pdf.

[65] National Restaurant Association, "National Restaurant Association Backs Bipartisan Senate Agreement to Empower Consumers Nationwide with More Nutrition Information," June 10, 2009, http://www.restaurant.org/pressroom/pressrelease.cfm?ID=1820.

[66] See, for example, Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth (2006); Food and Drink Advertising and Marketing Practices State and Territory Jurisdictional Working Party, Submission to the ACMA Review of Children's Television Standards, August 2007; Nestle (2006); Brownell and Freiden (2009); and Barr-Anderson et al. (2009).

[67] One Australian study, controlling for multiple factors, found that watching three or more hours of television per day was associated with consumption of fast food meals and snacks more than any other factor, including socioeconomic status, education, age, gender, and residence in an urban or rural area (Scully, Dixon, and Wakefield 2008). See also Thomson et al. (2008) and Spagnoli et al. (2003).

[68] For an example of observers recommending such restrictions for adults as well as children, see Chopra and Darnton-Hill (2004). France, for instance, requires a nutritional warning message to accompany any advertisements of foods high in fat and added sugar, whether to children or adults, unless the advertiser pays a penalty (Wilde 2009).

[69] *Central Hudson Gas & Elec. Corp. v. Public Serv. Comm'n of N. Y.*, 447 U. S. 557 (1980).

[70] *Lorillard Tobacco Co. v. Reilly*, 533 U. S. 525 (2001), citing earlier cases.

[71] It may be easier to justify a ban that seeks to protect children, since they lack the adult cognitive skills needed to resist advertising appeals. On the other hand, it may be harder to tailor a ban to achieve that objective, since many restrictions that would protect children would, at the same time, limit the advertisements that extend to adults. Some observers have thus criticized as insufficiently broad Britain's ban on advertising unhealthy food at programs aimed at children, since many children (even under age 10) watch adult television shows, which have continued to

advertise candy and sugary cereal. House of Commons Library, Research Paper 08/35, 16 April 2008, Food Products (Marketing to Children) Bill, Bill 19 of 2007-08, http://www.parliament.uk/commons/lib/research/rp2008/rp08-035.pdf.

[72] ERS/USDA, Food CPI and Expenditures: Food Expenditure Tables, "Table 1—Food and alcoholic beverages: Total expenditures," last updated June 17, 2009.

[73] This paper analyzed the effect of taxing foods identified as less healthy based on their SSCg3d score (Mytton et al. 2007). As noted in the text, the FSA has made modest adjustments to the original SSCg3d model, primarily to simplify its application and reduce the potential for industry manipulation. The current model is sometimes termed, "WXYfm."

[74] Census Bureau, Current Expenditure Tables, "Age of reference person: Average annual expenditures and characteristics," Consumer Expenditure Survey, 2007.

[75] See also Larson and Story (2009); and Variyam (2005).

[76] Food and Agriculture Organization of the United Nations, tables generated on July 6, 2009, at http://faostat.fao.org/site/609/default.aspx#ancor.

[77] Census Bureau, Current Expenditure Tables, "Region of residence: Average annual expenditures and characteristics, Consumer Expenditure Survey, 2007."

[78] Census Bureau, 2006 American Community Survey, Table B19001, Household Income in the Past 12 Months. Income breaks were slightly different for the ACS and the CES data. For ACS, income breaks were as follows: under $10,000; $10,000-$29,999; $30,000-$49,999; $50,000-$74,999; and $75,000 and higher. For CES, the latter two income breaks were divided at $70,000 rather than $75,000 in annual income.

[79] Census Bureau, Population Division, Interim State Population Projections, 2005, Interim State Projections of Population by Sex: July 1, 2004 to 2030.