

The Economic Cause of Obesity:

The Low Cost of Obesity-Causing Diets

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The 1999-2000 National Health and Nutrition Examination Survey (NHANES) revealed that approximately one-third of the United States population is obese (Obesity and the Environment). According to the *Journal of Public Health* and the World Health Organization, this obese population has an increased risk for chronic musculoskeletal problems, chronic skin problems, decreased quality of life, decreased productivity, premature death, hypertension, hypercholesterolemia, Type II diabetes, coronary artery disease, congestive heart failure, stroke, gallstones, pregnancy complications, irregular menstruation, infertility, irregular ovulation, gout, osteoarthritis, obstructive sleep apnea and other respiratory problems, depression, eating disorders, distorted body image, low self-esteem, breast cancer, endometrial cancer, prostate cancer, and colon cancer (Morrill 355). Given these health consequences, it is not surprising that, in 2003, obesity accounted for approximately 400,000 deaths and \$75 billion in direct medical costs (Morrill 355-56).

If we want to address the obesity epidemic, then we must first address its cause. The accepted cause of obesity is energy imbalance, a state in which energy intake exceeds energy expenditure. Also accepted is the belief that many genetic and environmental factors – including metabolism, physical activity, and diet – cause energy imbalance. In dispute, however, are the relative contributions of specific metabolic, physical activity, and dietetic factors – including hormones, access to recreation centers, specific diet composition, food marketing, portion size, and diet cost. Although I cannot thoroughly

address the many contributing factors in a single essay, I address the effect of relative diet costs, especially as they are created by domestic agricultural subsidies, on the obesity epidemic. Specifically, I compare energy-dense, nutrient-poor diets high in fats, added sugars, and refined grains and low in fruits, vegetables, and whole grains, with energy-dilute, nutrient-rich diets high in fruits, vegetables, and whole grains and low in fats, added sugars, and refined grains. For the purpose of this discussion, I refer to energy-dense, nutrient-poor diets as unhealthy diets and energy-dilute, nutrient-rich diets as healthy diets.

I argue that the low cost of unhealthy diets relative to healthy diets, largely created by domestic agricultural subsidies, is a significant cause of the obesity epidemic. Recent studies convincingly establish that unhealthy diets cost appreciably less than healthy diets. An abundance of authoritative analyses show that the current allocation of domestic agricultural subsidies is an important contributor to this diet cost difference. Although people choose various diets for many reasons, the low cost of unhealthy diets relative to healthy diets is a major reason people consume unhealthy diets. In turn, consumption of unhealthy diets is strongly associated with the obesity epidemic.

The BMI as a Measure of Obesity

Before we can accept the results of obesity studies, we must understand why the controversial BMI is an acceptable measure of fat accumulation for obesity studies. Obesity is a condition characterized by excess fat accumulation and commonly defined by a body mass index (BMI) – measured as weight in kilograms divided by squared height in meters – greater than 30 kilograms per meter squared. Figure 1 highlights heights in feet and inches and weights in pounds that correspond to BMIs greater than 30 kilograms per meter squared.

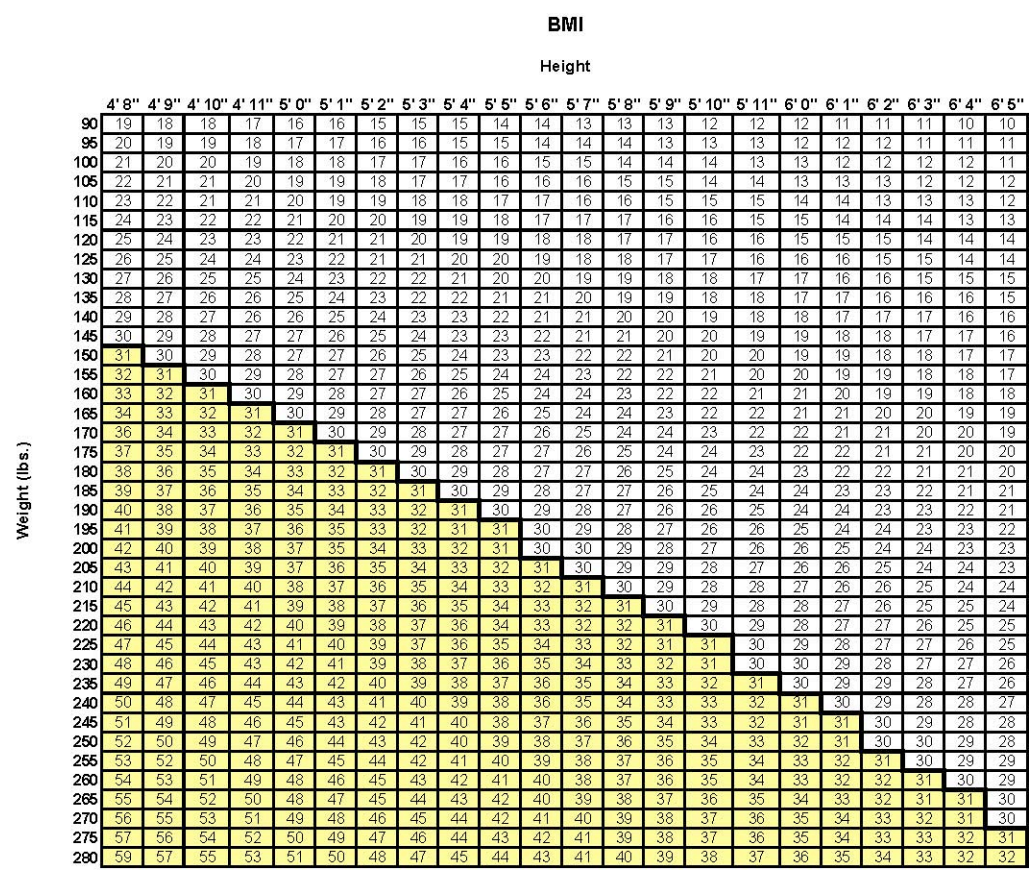


Figure 1. The yellow region of the chart highlights heights in feet and inches and weights in pounds that correspond to obesity, or a BMI greater than 30 kilograms per meter squared.

Many object to the BMI as a measure of obesity because it is a somewhat inaccurate *individual* measure of fat accumulation. Since the BMI is only a ratio of weight to squared height, it cannot measure the relative contributions of lean mass and fat accumulation to overall body mass and therefore does not necessarily measure fat accumulation. However, since many researchers establish the many causes and

consequences of obesity by analyzing their relationships to BMIs, accepted causes and consequences of obesity are actually causes and consequences of BMIs greater than 30 kilograms per meter squared. Further, a recent article in *International Journal of Obesity* affirmed that BMIs reasonably predict fat accumulation in *populations* (Flodmark 1191). This affirmation means that variation in *population* fat accumulation largely explains variation in *population* BMIs. Thus, if obesity studies' sample sizes are large and representative, then we can assume that causes and consequences of BMIs greater than 30 kilograms per meter squared are causes and consequences of excess fat accumulation. Further, unlike the tools necessary for procedures such as underwater weighing and x-ray, the tools necessary to measure height and weight are widely available and relatively inexpensive. Therefore, when researchers use the BMI as a measure of fat accumulation, they can collect and analyze measurement from a large sample within the limits, including time and financial, of their study. In turn, large sample sizes increase the likelihood that researchers will correctly find and report actual causes and consequences. The BMI is also a universal measure of fat accumulation used to compare the prevalence of obesity in populations around the world. Until more accurate, equally available and inexpensive, international measures of fat accumulation are available, BMIs are acceptable *population* measures of obesity.

Unhealthy Diets Cost Much Less Than Healthy Diets

Recent studies convincingly establish that unhealthy diets cost appreciably less than healthy diets. When Adam Drewnowski, Director of the Nutritional Sciences Program at the University of Washington, analyzed the relationship between energy density (kilojoules per kilogram) and energy cost (dollars per kilojoule), he found that the most

energy-dense foods, such as sugar, oil, shortening, margarine, fried potatoes, and refined grains, cost up to several thousand percent less per calorie than the least energy-dense foods, such as lean meat, fish, and fresh vegetables and fruit (Obesity and the Food Environment 155). I performed a similar analysis, depicted in Figure 2, in which I examined additional foods such as snacks and packaged meals.¹ Although some minor discrepancies exist between Drewnowski's and my data, the trends are the same; as energy per mass increases, cost per energy decreases.

¹ I obtained energy density data from the USDA Nutrient Data Laboratory and energy cost data in March 2005 from the Elizabeth, CO Safeway (Nutrient Data Laboratory). When possible, I obtained energy cost data from Safeway's generic brand for consistency.

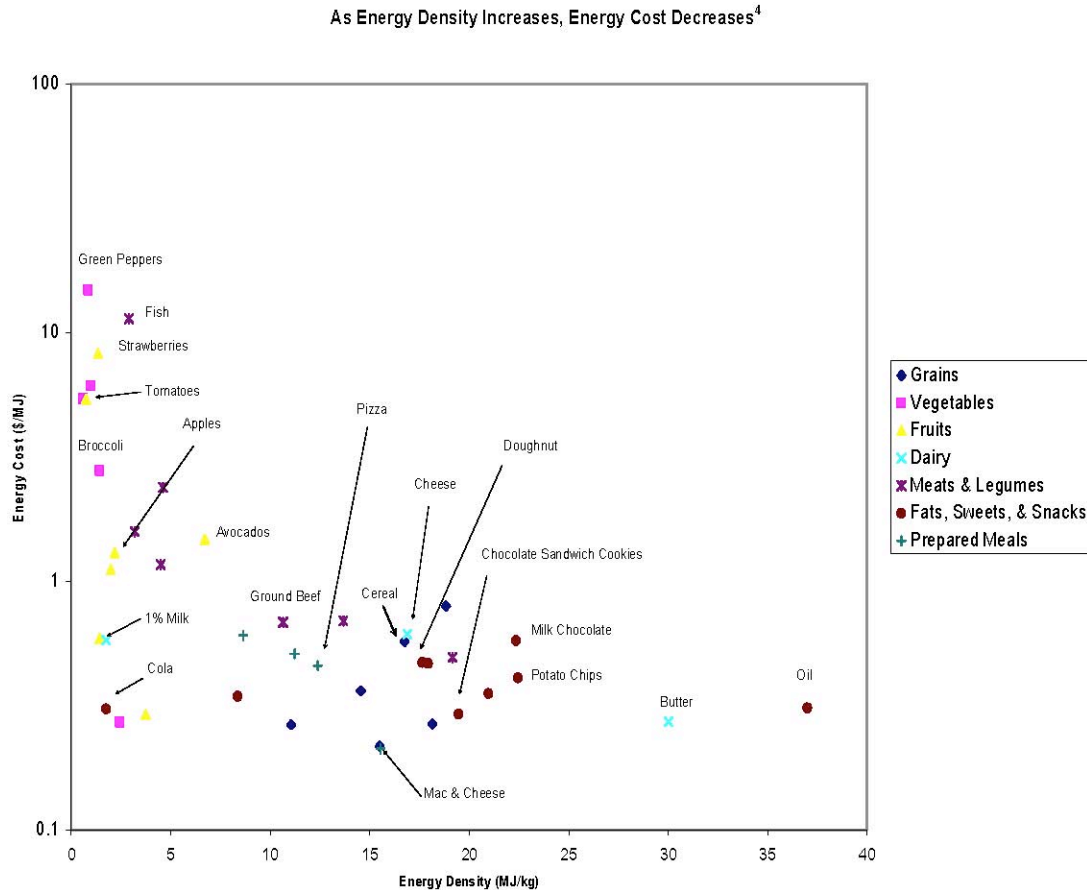


Figure 2. As energy density increases, energy cost decreases. Note that the energy cost of oil, the most energy dense food in this graph, is several thousand percent less than that of green peppers, the least energy-dense food in this graph.

Drewnowski also conducted a French study that revealed that these food cost differences translate to diet cost differences. Freely chosen diets high in added fats, added sugars, and refined grains – including fats, oils, candy, chocolate, and soft drinks – cost significantly less than diets high in fruits, vegetables, lean meats, and fish. Specifically, when the researchers controlled for total caloric intake, they found that 100-gram increases in fats and sweets are associated with six to forty cent decreases in daily diet costs, and

100-gram increases in fruits and vegetables are associated with twenty-two to thirty-five percent increases in daily diet costs (Replacing Fats and Sweets 1557). Although the study was conducted in France, the researchers expect not only that their findings apply to the United States, but also that diet cost differences are greater in the United States than in France (Replacing Fats and Sweets 1558). My calculations based on the study's figures indicate that, if each member of an average family of four replaced the calories of three chocolate sandwich cookies with the calories of approximately two medium apples every day for a month, then the family would incur seventy-six to one hundred thirty-two dollars in added dietary expenses. As Drewnowski said, "Given the current food price hierarchy in the United States and in France, there is no question that refined grains, added sugars, and added fats provide dietary energy at the lowest-cost sources of dietary energy to the consumer" (Obesity and the Food Environment 160).

Why Unhealthy Diets Cost So Much Less Than Healthy Diets

An abundance of authoritative analyses show that the current allocation of domestic agricultural subsidies is an important contributor to the low cost of unhealthy diets relative to healthy diets. Domestic agricultural crops do not receive equal support. According to a recent article in *Environmental Health Perspectives*, corn, wheat, and soybeans are among the most heavily subsidized domestic crops (Fields A821). In 2003 alone, corn, wheat, and soybeans subsidies totaled \$2,812,727,118, \$1,372,937,961, and \$1,141,506,239, respectively (Farm Subsidy Database). In contrast, fruits and vegetables are among the least supported domestic crops. Barry Popkin, a nutrition professor at the University of North Carolina at Chapel Hill, noted that at most one-tenth of one percent of all domestic agricultural subsidies supports fruit and vegetable crops (Fields A822). In 2003, subsidies

for apples, the most heavily supported domestic fruit or vegetable, totaled \$92,333,902 (Farm Subsidy Database), a mere three percent of the support that corn received that same year. Although we cannot infer the reasons for the current allocation of domestic agricultural subsidies, we can see that corn, wheat, and soybeans receive substantially more support than fruits and vegetables.

The *Environmental Health Perspectives* article presented the authoritative argument that, since allocation of domestic agricultural subsidies largely determines the types and quantities of crops that farmers produce, the current allocation of domestic agricultural subsidies causes selective overproduction of corn, wheat, and soybeans and, in turn, the low price of corn, wheat, and soybeans relative to fruits and vegetables (Fields A821). James Tillotson, professor of food policy and international business at Tufts University, and Bruce Gardner, professor and interim dean of the College of Agriculture at the University of Maryland, both corroborate the role of domestic agricultural subsidies in relative food costs. According to Gardner, domestic agricultural subsidies are major factors “leading to Americans today having such a low-cost, dependable, and plentiful food supply” (Tillotson 628). In the 2004 *Annual Review of Nutrition*, Tillotson wrote, “Successful government agricultural policies have resulted in the availability of relatively inexpensive basic agricultural commodities (grains, meats, fats and oils, and dairy products) to American food-processing industries. In turn, this has lowered food purchase costs for individuals and has created an environment of economical and plentiful daily food” (Tillotson 624).

Marion Nestle, professor of nutrition, food studies, and public health at New York University, noted that, because corn, wheat, and soybeans are relatively inexpensive, food products derived from these staples are also relatively inexpensive (Fields A822).

Although corn, wheat, and soybeans are available as healthy foods, they are disproportionately available as unhealthy foods such as high fructose corn syrup from corn, refined grains from wheat, and partially hydrogenated oils from soybeans. For example, in 2002, thirty-three percent of the corn used for food and industry was available as added sugars, especially high fructose corn syrup, while less than eight percent was available as whole corn (Food and Industrial Corn Use). Further, last year, eighty percent of the fats and oils consumed in the United States were from soybeans (Domestic Utilization). Thus, since corn, wheat, and soybeans are disproportionately available as unhealthy foods, unequal subsidization of domestic agricultural crops is a significant cause of the low cost of unhealthy foods relative to healthy foods.

The Low Cost of Unhealthy Diets Causes Consumption of Unhealthy Diets

Given the existence and major underlying causes of relative diet costs, can we assume that people consume unhealthy diets because they cost much less than healthy diets? Since many factors – including economy, convenience, health, variety, and, most importantly, taste – influence diet, isn't it possible that unhealthy diets are consequences of other considerations? Various correlations, behavioral nutrition models, and anecdotes link the consumption of unhealthy diets to the low cost of unhealthy diets. For instance, a USDA analysis revealed that low-income households consume less lettuce, fewer lettuce-based salads, melons, berries, other fruits and vegetables, and high-quality meats, and less seafood than high-income households (Obesity and the Food Environment 159). A similar analysis in Europe confirmed that low-income households consume less variety and fewer fruits than high-income households (Obesity and the Food Environment 159). Several

other studies generalized that low-income households have lower-quality diets than high-income households (Obesity and the Food Environment 159).

In addition, a tested behavioral nutrition model developed by Peter Basiotis, Economist and Director of the Nutrition Policy and Analysis Staff at the USDA's Center for Nutrition Policy and Promotion, predicts that households faced with decreased income maintain steady caloric intakes by consuming more energy-dense diets and thus diets higher in fats, added sugars, and refined grains (Poverty and Obesity 7). An analogous linear programming model predicts that cost constraints result in decreased consumption of fruits, vegetables, meats, and dairy products – decreased nutrient density – and increased consumption of fats, sweets, and refined grains – increased energy-density (Darmon 3766). According to Drewnowski, “For FSP (Food Stamp Program) participants, obtaining sufficient dietary energy at low cost was the overwhelming concern. The most important factor in choosing and preparing foods was to ensure that no one would complain they were still hungry.” Not surprisingly, Drewnowski found that most of the approximately 17.2 million FSP participants consumed unhealthy diets (Obesity and the Food Environment 154). This evidence strongly suggests that people consume unhealthy diets because they cost less than healthy diets.

However, since correlations, models, and anecdotes do not necessarily causally link diet consumption to diet cost, we must turn to experiments as conclusive evidence that cost significantly influences what people eat. In one experiment, French et al. reduced the prices of low-fat snack foods relative to the prices of high-fat snack foods in 12 workplace and 12 secondary school vending machines. Relative price reductions of ten percent, twenty-five percent, and fifty percent produced sales increases of nine percent, thirty-nine percent, and ninety-three percent, respectively, compared to baseline sales (French 842S).

In a supporting study, French et al. found that fifty-percent price reductions in fresh fruit and baby carrots in two elementary schools (one middle-income and the other mixed socioeconomic status) caused four-fold and two-fold increases in sales, respectively, compared to baseline sales (French 842S). Katherine Horgen and Kelly Brownell conducted a corroborating experiment at a restaurant that served mostly upper-middle-class customers (Horgen 506). Horgen and Brownell decreased the price of three low-fat restaurant foods – a low-fat grilled chicken sandwich, a low-fat salad with grilled chicken, and a low-fat vegetable soup – twenty to thirty percent. Compared to both baseline sales and sales of three high-fat alternatives, the sales of the three low-fat target foods significantly increased. Figure 3 shows the price elasticities – percent change in consumption per percent price change – for these experiments.² Taken together, these experiments conclusively demonstrate that food choice strongly responds to relative food costs for a variety of foods and consumer populations. Thus, we can now confidently conclude that people consume unhealthy diets largely because they cost less than healthy diets.

² I calculated price elasticities by dividing the reported changes in consumption by the reported price changes. Since Horgen et al. reported twenty to thirty percent price decreases rather than exact price decreases, I based my Horgen et al. calculations on twenty-five percent price decreases.

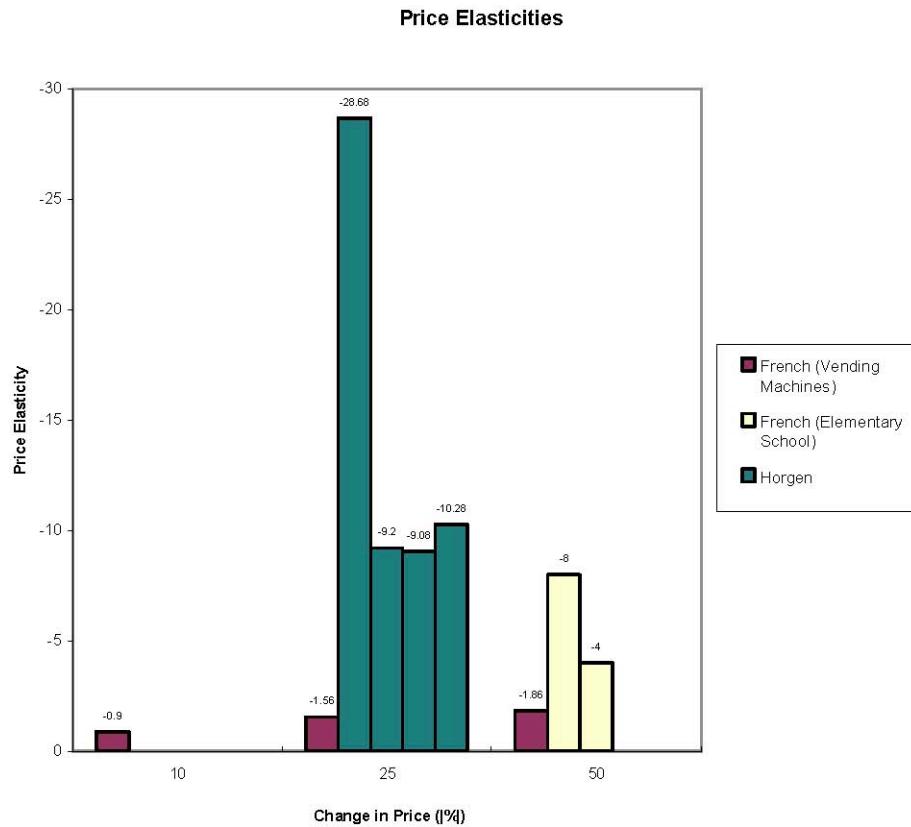


Figure 3. Price elasticity is a measure of consumer response to price changes. Note that the magnitudes of all but one of the nine price elasticities are greater than one, which indicates that consumers strongly respond to food price changes.

Unhealthy Diets Are Associated with Obesity

The conclusion that people consume unhealthy diets largely because they cost less than healthy diets is important because unhealthy diets are strongly associated with the obesity epidemic. One study found that unhealthy diets low in grains, vegetables, fruits, milk, and meats as well as variety and high in total fat, saturated fat, cholesterol, and sodium intake are associated with obesity (Guo, X. 1583). Another study reported that healthy diets high in fruits, vegetables, reduced-fat dairy, and whole grains and low in red and processed meat, fast food, and soda are associated with the lowest rates of fat

accumulation (Newby 1422). In a study cited by Drewnowski, the average woman with enough but nutrient-poor and thus likely energy-dense food was ten pounds heavier than the average control (Obesity and the Food Environment). Scientists who conducted a meta-analysis of epidemiological studies concluded that unhealthy diets contribute to obesity (Swinburn 123). One likely reason that unhealthy diets contribute to obesity is that, according to a study by Ashima K. Kant, nutritional epidemiologist at Queens College, they are associated with high energy intakes (Kant 929). In turn, a meta-analysis conducted by the Dietary Guidelines Advisory Committee supported the widely acknowledged belief that high energy intakes lead to energy imbalance and thus obesity (Nutrition and Your Health). Thus, we can see that unhealthy diets, consumed largely because they are less expensive than healthy diets, are a significant cause of obesity.

In Defense of the Causal Association between Unhealthy Diets and Obesity

Some critics argue that, in the absence of true experiments, we cannot prove causation. For example, Steven Milloy, a policy analyst for the Cato Institute, maintains that associations cannot sufficiently prove causes of disease (Junk Science Cheat Sheet). However, we cannot dismiss the causal association between consumption of unhealthy diets and the obesity epidemic merely because ethical considerations, human complexity, and freely chosen diets prevent researchers from experimentally linking diet and obesity. We cannot deny that every disease, including obesity, has at least one cause. When we cannot experimentally establish causation, we must either (1) accept factors logically and strongly associated with the disease as causes of the disease or (2) reject all possible causes of the disease. If we accept factors logically and strongly associated with the disease as causes of the disease, then we can attempt to treat the disease. Obviously, if we reject all

possible causes because we cannot prove causation, then we cannot treat the disease. Imagine you are suffering from a terminal disease, perhaps one of the health problems related to obesity. Do you want your doctors, policy makers, and the rest of society to reject all causes of your disease? Do you want treatment to be unavailable until an unlikely experiment determines with at least ninety-five percent confidence the cause of your disease? If we want to treat a disease, then accepting factors logically and strongly associated with a disease is far more rational than rejecting all causes of a disease.

Further, unlike coincidental associations, such as the widely cited association between ice cream sales and murder rates, researchers analyze associations between disease causes, disease states, and disease consequences because they have reason to believe *before* they collect and analyze data – whether because of past education, past research, or similar causal links – that a causal relationship exists. They also control for other factors that might interfere with their findings. Consider the relationship between UV radiation and skin cancer. Ethical considerations and human complexity prevent scientists from experimentally linking UV radiation and skin cancer in humans. However, scientists know from controlled laboratory experiments that UV radiation can cause genetic damage. Similarly, they know that genetic damage can cause uncontrolled cell growth, a characteristic of cancer. Therefore, when scientists analyze the association between exposure to UV radiation and incidence of skin cancer in humans, they have reason to believe *ahead of time* that the association is causal. Further, since scientists are aware of other risk factors for cancer, such as family history, smoking, and diet, they control for other risk factors by comparing people similar in all risk factors but exposure to UV radiation. The approach to unhealthy diets and obesity is similar. Scientists know that many unhealthy foods are rich in energy. They also know that cells store much of the

excess energy from food as fat. Therefore, they have reason to believe *ahead of time* that a causal association exists between unhealthy diets and obesity. Scientists also control for other known risk factors such as family history and exercise. Thus, we can see that associations between disease causes, disease states, and disease consequences are by no means unfounded.

Once scientists find logical and strong associations, other experts review the associations and comment on the likelihood that the association is causal. In the case of obesity, experts who reviewed the epidemiological studies on unhealthy diets and obesity agree that unhealthy diets are a significant cause of obesity. For example, the World Health Organization concluded, “The key causes (of obesity) are increased consumption of energy-dense foods high in saturated fats and sugars, and reduced physical activity” (Obesity and Overweight). The International Obesity Task Force (IOTF) concurred that “the causes of the obesity epidemic are twofold: an abundance of energy-dense foods and drinks, leading to a pervasive ‘passive over-consumption’ of energy; and an environment that limits opportunities for physical activity, leading to an almost universal sedentary state” (Lee 489). Tommy Thompson, former US Secretary of Health, speaking on behalf of the Department of Health and Human Services (HHS) and the United States Department of Agriculture (USDA), promised Americans that they will lose weight if they follow the 2005 Dietary Guidelines for Americans, which recommend diets high in nutrients and low in saturated and *trans* fats, cholesterol, added sugars, salt, and alcohol – healthy diets (Butler 794). Although influential opponents such as Milloy argue that correlations cannot sufficiently prove causation, we can reasonably infer that unhealthy diets are major causes of obesity.

Where Do We Go From Here?

Obesity is not merely an individual concern. On the contrary, obesity is also a population concern that warrants far-reaching research and intervention. Because diet costs are factors over which we have control, the causal association between diet costs and obesity presents an opportunity to treat the obesity epidemic. Our current understanding of diet costs and obesity indicates that, if we reverse the relative diet costs of unhealthy and healthy diets, then people will consume healthier diets and, in turn, we will decrease the prevalence of obesity. Brownell and Horgen proposed taxing unhealthy foods to subsidize healthy foods (Kuchler 2), while Richard Atkinson, professor of medicine and nutritional sciences at the University of Wisconsin-Madison and president of the nonprofit American Obesity Association, proposed more heavily subsidizing fruits and vegetables (Fields A823). We should not dismiss these actions because they require government oversight; as we learned, government policy is already largely responsible for current diet costs. Rather, we should seriously consider implementing these or similar proposals in the near future. Now is the time to make the healthy choice the least expensive choice. Now is the time to halt the current obesity epidemic and prevent obesity epidemics in future generations.

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[Contents](#)

[Occasions Home](#)

[PWR Home](#)