Fat and Sugar: An Economic Analysis

Adam Drewnowski

Center for Public Health Nutrition, University of Washington, Seattle, WA 98195

ABSTRACT As incomes rise, the share of income spent on food decreases. To Engel’s law should be added the observation that the diet structure changes as well. Incomes and the macronutrient composition of the diet are linked at the aggregate and—most likely—the individual level. People in higher income nations consume more added sugars and fats than do people in lower income nations. Lower income consumers within rich nations consume lower-quality diets than do higher income consumers. The lowering of energy costs ($/MJ) through technological innovation has been most marked for foods containing added sugars and fat. Although wealthier persons in poor nations are more likely to be overweight, obesity in the United States is associated with lower incomes. Obesity in the United States and similar societies may be a socioeconomic, as opposed to a medical, problem and one that is related to diet structure and diet costs. J. Nutr. 133: 838S–840S, 2003.

KEY WORDS: • incomes • diet structure • sugar • fat • energy costs • obesity

Rates of obesity and overweight in the United States have risen sharply over the past two decades (1). Because the genetic pool has remained stable, the explanation must involve altered eating habits or the increasingly sedentary lifestyles (2,3). The sharpest change in diet structure has involved added sugars and fat (4). Per capita availability of each has increased by at least 20% since 1977. Nutritionists have blamed the current obesity epidemic on excessive consumption of fast foods, snacks (5) and soft drinks (6–8) and the elevated energy density of the U.S. diet. Strategies for obesity prevention increasingly focus on fiscal and policy measures to limit the consumption of fats and sweets (9,10).

Obesity in the United States is a public health problem with many social and economic antecedents. Far from being a random “genetic lottery,” the burden of obesity and diabetes falls disproportionately on minorities and the poor. The economics of food choice may help explain why low income families have the highest rates of overweight. That explanation is based in part on high palatability and low energy cost ($/MJ) of added sugars and fats.

Fats and sweets are among the most palatable of foods (11,12). Animal studies show that prolonged consumption of fats and sweets may permanently affect the metabolic mechanisms of reward (11). Consumer food choices are shaped by taste, cost and convenience (13) and are predicted by past food purchases and eating habits. Fats and sweets provided in the form of snacks, beverages or fast foods are palatable, convenient and easy to use. Most important, their energy cost relative to other foods is low (14). Fats and sweets can be treated as an example of endogenous preferences in any economic model of consumer behavior.

The notion of endogenous preferences can be difficult to accommodate within the current economic theory. Much of traditional economics is based on the premise that rising prices will lead to decreased demand. The law of demand is held when current suggestions to augment the price of fats and sweets so consumers may allocate their resources toward the purchase of healthier foods (9,10). However, as suggested later, fats and sweets may prove to be an exception to the rule.

Energy costs of sugar and fat

Added sugars and fats provide dietary energy at minimal cost. Energy cost ($/10 MJ) of sucrose was $0.23/10 MJ in 1999, given that world prices for refined sugar averaged <$0.10/lb. Technological advances in fat chemistry have reduced energy cost of vegetable oils to $0.50/10 MJ or less (14). The lowering of food prices through technology, mentioned as a causal factor in the promotion of obesity (15), has been most effective for foods containing added sugars and fat (16).

Even though the cost of raw ingredients is rarely linked to retail food prices, energy cost of fats and sweets at the apex of the Food Guide Pyramid is low (16). Energy cost of potato chips is in the order of $2.00/10 MJ, and that for soft drinks is $2.20–$3.70/10 MJ. In contrast, energy cost is ~$9.50/10 MJ for fresh carrots and ~$14.00/10 MJ for frozen orange juice. This differential in energy costs is compounded by price increases. Retail price increases between 1982 and 1997 were lower for sugar/sweets (52%) and fats and oils (47%) than for vegetables and fruit (93%) (16). Not surprisingly, given the hierarchy of food prices, annual per capita consumption of sugar and fat remains near record-high levels (4). Added sugars...
and fats now account for >50% of energy in the typical American diet (4).

**Engel’s law and diet structure**

Wealth and poverty have profound effects on diet structure, nutrition and health. A law of economics formulated by Engel in 1857 holds that the proportion of income spent on food diminishes as incomes increase. Engel’s law applies to aggregate as well as to individual data. The percentage of personal consumption expenditures spent on at-home foods diminished as per capita gross domestic product (GDP) rose (Fig. 1). U.S. residents spent the lowest amount (<8%) of disposable income on at-home food, followed by Canada and the United Kingdom (17). Among the high income nations, low energy costs were associated with higher energy intakes (Fig. 2). Economic Research Service (ERS)/U.S. Department of Agriculture (USDA) analyses of estimated energy intakes and energy costs ($/10 MJ) for high-income nations (GDP <$10,000) show that energy costs were substantially lower for the United States and the United Kingdom ($2.40/10 MJ) than for Japan ($9.40/10 MJ) (17).

Nations spending the lowest proportion of the GNP on food (i.e., high income nations) derive the most dietary energy from added sugars and fat. As incomes rise and populations become more urban, countries go through predictable stages of the nutrition transition (18). Traditional grain-based diets are replaced by diets containing more animal produce and added sugars and fats. Analyses of FAO food balance sheets for 85 countries in 1962 first showed this relationship between incomes and changing diet structure (18). Subsequent analyses of food balance sheets for 133 countries confirmed that the diets of wealthier countries in 1990 were higher in both sugar and fat (18). However, the relationship between incomes and fat consumption has begun to unravel. Since 1962, global availability of inexpensive vegetable oils has led to greatly increased fat intakes among low income nations. The shift to a higher fat diet now occurs at lower GNP levels than previously and appears to be accelerated by high urbanization rates (18). Similarly, sugar consumption has risen substantially even among the poorest nations.

**Incomes and diets in the United States**

Within the United States, rising incomes have been associated with a lower share of food spending at home (16). Total percentage share has fallen by more than half since 1950, with spending on at-home foods affected more than spending on other goods. Based on ERS/USDA time trends, Americans spent only 7.4% of disposable income on at-home food in 1998 and an additional 4.2% on away-from-home foods (16) (Fig. 3). Foods consumed away-from-home are typically higher in fat, sugar and salt than foods prepared and consumed at home.

Consistent with Engel’s law, poor U.S. households devoted a far greater share of their disposable income to food compared with rich households (19–21). Households in the top quintile by income (mean income, $77,311) spent $1,997 per person for food in 1992 compared with $1,249 spent by those in the bottom quintile (mean income, $6,669). USDA studies showed that low income families purchased lower cost items and spent their limited resources on fats, sweets and alcohol (19). Food stamp recipients consumed more added sugars, meats and fats than they would in the absence of the program, whereas their consumption of fruits, vegetables, grains and dairy products remained about the same (19). In other words, the provision of additional resources failed to shift consumption toward healthier foods.

Consumers spending the highest proportion of disposable income on food (i.e., low income consumers) may also derive most dietary energy from sugar and fat. For low income families, obtaining sufficient dietary energy at low cost is the...
Food Insufficiency, defined as “sometimes” or “often” not having enough to eat (23), has been associated with higher rates of overweight (24, 25). The USDA put forward a behavioral model by which household members faced with diminishing resources first consumed less expensive foods to maintain energy intakes at lower cost (26). Only when incomes diminished even further was the amount of energy ration reduced to less than that needed. A proposed “energy-density model” links dietary energy density with food expenditures. A reduction in food expenditures is likely to be associated with higher energy-density diets and with increased consumption of starches, added sugars and fat. Recent studies based on a linear programming model suggest that imposing a constraint on diet costs forces dietary choices in the direction of more cereals, sugars and fat (27). Perceived food insecurity may drive consumers toward low cost, energy-dense foods.

Obesity: An Economic Hypothesis

Studies on obesity and food choices have stressed the role of physiological and metabolic variables in the consumption of sugar and fat (28). Environmental studies have addressed the availability and accessibility of fast foods, snacks and soft drinks, food advertising and food marketing (2, 5–9). The present economic hypothesis suggests that the low energy cost of refined grains, added sugars and fats may be another key variable. Fats and sweets are the lowest cost dietary option available. Replacing them with more “prudent” food choices is likely to be associated with higher diet costs for the consumer (27).

Americans have become more obese as the percentage of fat in the diet declined (28). An analogous point can be made with regard to diet costs. Americans are becoming more obese while spending a lower share of disposable income on food (Fig. 4). The amount of sugar and fat in the typical diet continues to rise. As primary prevention strategies related to nutrition, obesity and diabetes are put in place, lower socioeconomic groups continue to lag behind (29). There is support for the argument that obesity in the United States is not primarily a medical problem and cannot be controlled by primarily medical approaches (30).

LITERATURE CITED