Less-energy-dense diets of low-income women in California are associated with higher energy-adjusted costs but not with higher daily diet costs

Dear Sir:

I have concerns about the relevance of the research and the accuracy of Townsend et al’s conclusion in their recent article (1). The article failed to show the usefulness or policy relevance of an inverse association between energy density and energy costs while prompting the perception that healthier diets cost more, when their own data show that the highest-energy-dense diets (“least healthy”) are actually associated with the highest daily diet costs.

Because both energy density and energy costs use calories in their definitions, the “finding” of an inverse association can be easily explained mathematically. The energy density measure uses calories in the numerator, whereas the energy cost uses calories in the denominator. Mathematically, then, higher calories would increase the energy density measure while simultaneously decreasing the energy cost. To illustrate, last night I priced a 2-lb container of strawberries and a 32-oz bag of tortilla chips. Both cost the same, $3.99. The strawberries provided about 280 kcal (US Department of Agriculture nutrient database; www.nal.usda.gov/fnic/foodcomp/search/), with an energy cost of $28.50/2000 kcal; the tortilla chips provided about 4480 kcal (nutrition label), with an energy cost of $1.78/2000 kcal. Although both products cost the same, the higher-energy-dense chips have a lower energy cost, whereas the lower-energy-dense strawberries have a higher energy cost. It is not clear how useful it is to know that the calories provided by the strawberries “cost” 16 times as much as the calories provided by the chips, especially because both packages cost the same amount of money.

Rather, it seems to me that the question of whether low-income consumers can afford a healthy diet requires a comparison of the monetary cost of different diets. Unfortunately, the article often misleads readers into thinking the authors are comparing the monetary cost of different diets. For example, consider the misleading conclusion that “healthier diets, as selected by participants, did indeed cost more,” rather than the more correctly worded title, which states that “less-energy-dense diets have higher dietary energy costs.”

Fortunately, the authors’ Table 3 allows us to estimate the daily diet costs for each of the 3 energy-density tertiles. Dividing the average dietary energy cost ($/2000 kcal) by 2000 provides the cost of each kilocalorie; multiplying that by the average energy content of the diet then provides the average daily diet cost for each tertile: $6.25/d for the lowest tertile (lowest energy density), $6.07 for the middle tertile, and $6.34 for the highest tertile. That is, among these low-income women in California, the highest-energy-dense diets are actually associated with the highest daily diet costs.

Although these differences are likely not statistically significant, they clearly refute Townsend et al’s conclusion that “healthier diets, as selected by participants, did indeed cost more.”

Furthermore, to the extent that consumers are taught to use fruit and vegetables to replace energy-dense foods, and not just as an addition to usual food intake, the reduced spending on the energy-dense foods would offset—perhaps entirely—the increased spending on fruit and vegetables. The anticipated nutritional benefits of such food substitutions would be increased intake of fruit and vegetables; increased intake of important vitamins, minerals, and fiber; and reduced intake of calories, fat, saturated fat, and added sugars—at little, if any, additional cost to the consumer.

The views expressed in this letter represent the views of the writer and do not necessarily represent the views of the Economic Research Service.

The author had no conflict of interest.

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REFERENCE


Reply to E Frazao

Dear Sir:

We thank Frazao for her interesting comments. She raises concerns about the relevance of our research on diet quality and diet costs and questions the value of showing that energy-dense diets were associated with more calories per dollar.

We would like to put to rest the argument that a simple mathematical artifact accounts for the fact that calories from added sugar are cheaper than calories from fresh vegetables and fruit. The dietary data from our study, this time with energy cost expressed as kcal/$ are replotted in Figure 1 (1). It is clear that higher-energy-dense diets also supplied the most calories per dollar (1), which is in agreement with our previous reports (2, 3). There is no question of any mathematical artifact because calories are now in the numerator in both the energy density (kcal/g) and in the energy cost measures (kcal/$). Rather, the realities of the current food supply are such that energy-dense foods, some high in added sugars and fats, cost less per calorie than do lean meats and fresh produce (2, 3).

Frazao asks whether it is useful to know that calories provided by strawberries cost 16 times more than calories provided by tortilla chips. The answer can be found in a recent policy paper by Frazao et al (4), which specifically noted that rising incomes resulted in an increase in the diet cost per calorie because consumers tended to purchase more expensive types of calories (4). In that study, Frazao et al adjusted diet costs for calories to show that dietary energy costs increased with incomes—and made points that were not that...
different from those made in our own California-based study (1). The policy paper by Frazao et al seems to counter the present concerns that calculations of energy costs or adjustment of dietary costs per calorie are irrelevant to science and public policy (4).

Our study did calculate the costs of clients’ entire diets, both per day and per calorie (1). Our study was not concerned with comparing an individual food, such as strawberries, with another food, such as tortilla chips, in terms of energy cost. We did consider the estimated monetary cost of different diets, as the article makes clear (1).

For the importance of calorie adjustment in epidemiologic research, we refer Frazao to a standard text (5). Nutrient variables are rarely expressed in grams or micrograms per day; rather the convention is to adjust for energy to make comparisons across groups. It is noteworthy that the current version of the US Department of Agriculture (USDA) Healthy Eating Index is calculated on the basis of energy adjustments (6). Our estimated diet costs, a measure of monetary exposure, were accordingly adjusted for energy (1). Although diets of men cost more per day than do diets of women, men also consume more energy per day than do women. A simple comparison of sex effects requires that costs as well as nutrients be adjusted for the energy consumed (7).

Frazao expresses the belief that significant changes in diet quality, including the replacement of energy-dense foods with fruit and vegetables, can be achieved at little, if any, additional cost to the consumer. We know from years of field work in low-income communities working with clients of the USDA’s food assistance and education programs (8, 9) that replacing chips, fries, fast-food items, and other energy-dense, nutrient-poor foods with fruit and vegetables is not a 1:1 trade in terms of food costs. In addition, past research would agree with our field experiences (7, 10). We hold that research on affordable nutrition has policy relevance for low-income consumers and is an important area of study for the USDA’s food assistance and education programs.

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REFERENCES


Reply to A Drewnowski et al

Dear Sir:

Thank you for allowing me the opportunity to address the comments made by Drewnowski et al in response to my initial criticisms of their article. I would like to emphasize that I fully agree with the authors that “research on affordable nutrition has policy relevance for low-income consumers and is an important area of study for USDA’s food assistance and education programs.” My objection relates entirely to the relevance and usefulness of the authors’ use of energy-adjusted cost as a measure of “affordable nutrition.”

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