Author's response to reviews

Title: Food availability of glucose and fat, but not fructose, increased in the US between 1970 and 2009: Analysis of the USDA Food Availability Data System

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RESPONSE TO REVIEWERS

Referee 1: M. Daniel Lane

Comment 1: “The paper, however, fails to deal with a segment of the population that is known to be the highest consumers of fructose (and probably the most susceptible to its effects), i.e. the youth segment of the population. If data/results are available on this aspect of the fructose issue, its inclusion in the paper would add greatly to the impact of the paper.”

Response: We understand the reviewer’s concern that fructose consumption may vary among specific demographic groups. However, the USDA does not track food availability for specific subpopulations. The USDA Loss-Adjusted food availability data are given as mass/day per capita using the annual U.S. census bureau’s data for total population counts. Even though the data include residents of all ages, it was not possible to parse the data according to just the youth segment. While we agree with the reviewer that more research is needed on the youth segment, we are bound to consider only the data for the whole population. We feel it would be inappropriate to make assumptions about specific demographic groups in the absence of relevant data. To clarify this point, we have added the following statement to the Discussion section: “The data do not provide information on specific demographic groups, but rather the entire U.S. population on a per capita basis. The analysis is strengthened by our ability to track trends over several decades using data collected annually.”

Comment 2: “It should be noted that recent studies with rodents and humans have shown definitively described direct effects of fructose per se (administered directly or in the diet) on the brain that enhance appetite. On the other hand glucose similarly administered, suppresses appetite. These facts should be mentioned in the Discussion.”

Response: Fructose metabolism is indeed an important area of research and we appreciate the list of references provided by the reviewer. However, our paper does not address fructose metabolism, nor have we attempted to speculate on this topic. We acknowledge the fact that fructose elicits different metabolic
responses than glucose, but this is not the topic of our paper. We feel it is more appropriate (and more objective) to stay on topic and restrict our discussion to food and nutrient availability.

Referee 2: Peter Havel

Comment 1: “The authors often discuss the percent energy from different macronutrients. The percent energy is not really meaningful compared with the total amount of energy. For example, if the percent energy of fat in the diet does not change (which some such as Gary Taubes have argued has even decreased), but total fat intake and therefore total energy per person from fat increases, then increased fat intake could contribute to weight gain and obesity without the percent energy from fat changing.”

Response: We completely agree with the reviewer. In fact, the data are presented as “kcal/d per capita” throughout the manuscript, not “percent energy.” We believe the reviewer may have been confused by the data in Tables 1 and 2, in which we show “percent change” in energy availability (i.e., the percent change in kcal/d per capita over time).

Comment 2: “Food availability and disappearance data are an inadequate way to assess or even imply intake patterns since these measures do not account for food wastage and not all types of food are likely to be wasted equally...”

Related comment: “They later draw conclusions based on the erroneous assumption that availability is indicative of intake.”

Response: As noted throughout the manuscript, our analysis specifically focused on food and nutrient “availability” to estimate trends over time. We have made no attempt to present the data as measures of actual intake, as clearly stated in the Introduction, Methods, and Discussion sections. We agree with the reviewer that wastage is an important variable to be considered. That is precisely why we utilized the “loss-adjusted” food availability database to include an estimate of food spoilage and plate waste. The USDA database considers three categories of loss: (1) losses at the primary level-farm to retail weight, (2) losses at the retail level, and (3) losses at the consumer level. Detailed descriptions of these categories and other useful facts may be found in the dataset’s documentation at http://www.ers.usda.gov/data-products/food-availability-%28per-capita%29-data-system/loss-adjusted-food-availability-documentation.aspx.

Using the USDA Food Availability Data as a proxy for food intake is well documented in the literature. Studies using these datasets have been conducted to estimate intake of fructose (1), refined carbohydrates (2), fatty acids (3), environmental toxins (4) and many others nutrients and food components. The USDA Food Availability Data have even been used to calculate an objective measure of the overall quality of the American food supply (5), and the USDA Economic Research Service uses those same data for direct comparisons with food pyramid recommendations to assess Americans’ adherence to nutritional guidelines (6). While we acknowledge that “food availability” is not a direct measure of “intake,” we believe the USDA Food Availability Data are a
reasonable estimate of intake. Further validation of the USDA database was achieved by comparison with the NHANES data presented in Figure 3, which documents similar trends in energy availability.


Another important aspect of our analysis was the emphasis on “change over time.” The USDA loss-adjusted food availability database is ideally suited for this type of analysis because the data are collected annually using the same methods that have been used for decades, thus providing the highest level of confidence when analyzing trends in food and nutrient availability. This type of stability and consistency in the dataset over long periods of time is an important feature of our analysis.

Comment 3: “Most importantly, the vast majority of evidence in which intake is assessed indicates that sugar consumption has increased and therefore fructose intake must have increased. For example, the per capita intake from sweetened beverages has increased by 170% from 70 kcal/day in 1977-1978 to 190 kcal/day in 1990-2000 http://www.nejm.org/doi/full/10.1056/NEJMp0902392.”

Response: We agree with the reviewer that fructose availability increased during the dates cited, but to a relatively small degree that is overshadowed by the much larger increase in glucose availability. As mentioned in the Results section, “Fructose availability was 63.2 g/d in 1970; it decreased to its lowest point at 58.2 g/d in 1982, increased to its highest point at 69.5 g/d in 1999, then decreased to 62.4 g/d in 2009.” If we focus only on the dates between 1977 and 2000 indicated by the reviewer, then one must conclude that fructose availability increased, as we clearly showed in Figure 5. However, the reviewer may not be aware that sugar and sweetener (and hence fructose) availability has declined since 2000, accounting for the 0% change in fructose availability for the entire
period between 1970 and 2009.

Referee 3: John S. White

Comment 1: “My only concern is that it doesn’t appear possible to verify the calculations in Tables 1 and 2, since they rely on AUC data that are not available in the paper. I would consider this a discretionary revision.”

Response: It is not clear what additional information we could provide that addresses the reviewer’s concern. We believe the Methods section provides all the necessary details and calculations that would allow for replication. We are very willing to provide more details if the Editor feels it necessary and can give us some direction.