Implausible Data, False Memories, and the Status Quo in Dietary Assessment[1–3]

Dear Editor:

In their recent article, Hébert et al. (1) ask their readers to consider the value of self-reported dietary data (SRDD) in informing public health policy while stating that our challenge to the validity of these data (2) is due to "ignorance" and is "reminiscent of protests by the tobacco industry and its allies" (1). These opinions notwithstanding, we think that in science, value and validity are best determined by data and empirically supported arguments.

Hébert et al. reference our article (2) as they seek "to identify specific issues raised by these authors with respect to putative flaws in dietary assessment…." Although we reiterated the well-established flaws of the NHANES SRDD (e.g., intractable systematic biases, inconsistent trends in misreporting), our main finding was that both over- and underreporting were sufficiently pervasive to conclude that these data are not valid for any inferences regarding energy intake and the etiology of the obesity epidemic. Remarkably, on this point, Hérbert et al. are utterly silent. They provide no data to challenge our findings that "[a]cross the 39-y history of the NHANES, [energy intake] data [for] 67.3% of women and 58.7% of men were not physiologically plausible" (2). Nevertheless, a recent editorial in the *British Medical Journal* concurred with our results by suggesting that the NHANES data are "incompatible with life" (3). These reports (2, 3) and others (4, 5) support the conclusion that the ability to generate empirically supported public policy from implausible data is extremely limited. This commonsense position is reinforced by a large body of research that demonstrates that nutrition surveys suffer from severe, intractable systematic biases (5, 6) that cannot be overcome with statistical techniques, however sophisticated. For example, energy adjustments were demonstrated to be inadequate to correct for differential recall bias (7).

Importantly, SRDD are based on the naive assumption that human memory and recall provide literal, accurate, and precise reproductions of past ingestive behavior. This assumption is indisputably false (8, 9). In fact, SRDD methods require participants to submit to protocols that mimic procedures known to induce false recall (10). As such, it is impossible to quantify what percentage of the recalled foods and beverages represent completely false reports, are grossly inaccurate, or are somewhat congruent with actual consumption. Given these facts, post hoc statistical machinations are merely number-generating exercises that improve correlations without improving the actual data.

Recently, strong proponents of SRDD protocols provided data that demonstrate the futility of these methods (11). In Freedman et al. (11), the squared average correlation between "true" energy intake and self-reported energy intake ranged from 0.04 to 0.10. The trivial relations between the proxy estimates (i.e., self-reported energy intake) and its referent (i.e., actual energy intake) provide unequivocal evidence that SRDD offer an inadequate basis from which to draw scientific conclusions (6). Importantly, energy intake is the foundation of dietary consumption, and therefore all nutrients must be consumed within the quantity of food and beverages needed to meet minimum energy requirements (12). As such, with mixed diets it is an analytic truth that dietary patterns (i.e., macro- and micronutrient consumption) are differentially misreported when total energy intake is misestimated [e.g., protein (13), fiber (14), cholesterol (14), calcium (15), iron (16), zinc (17), and sodium (18)]. Given these results, the assumption that SRDD can be used to examine dietary patterns is not logically valid.

There are errors of fact in the article by Hébert et al. that warrant correction. Their assertion that we incorrectly applied the "Goldberg cut-off" (19) is patently false. In Table 6, page 577 of the article by Goldberg et al. (19), the suggested Energy intake/Basal metabolic rate (EI/BMR) cutoff is 1.50 for a single 24-h dietary recall (24HR) when BMR is "predicted from the Schofield equations" with a sample size of $\geq$300 (19). As we reported (2), the 1.35 cutoff we used was more liberal than what Goldberg et al. suggested, and given the reduced sensitivity, we captured fewer under-reporters. With the suggested cutoff of 1.50, the underreporting increased to ~70% for the entire sample and ~76% and ~83% for obese men and women, respectively. These results demand the question, What is the value of NHANES dietary data when >80% of obese women's self-reported energy intakes are physiologically implausible? The second factual error is the erroneous statement that additional 24HRs improve estimates. In our analyses, the mean estimates for the second 24HR in every NHANES wave from 2001 to 2010 exhibited a significantly greater level of underreporting than the first. These results are well known and in agreement with the Observing Protein and Energy Nutrition study that "showed greater underreporting" in the second administration (13). Given the totality of our empirically supported arguments, we find Hébert et al.'s defense of the status quo an impediment to both scientific progress and empirically supported public nutrition policy.

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Reply to E Archer and SN Blair[1,2]

Dear Editor:

We thank Drs. Archer and Blair for commenting on our article (1), which was motivated in part by commentary by them (2) and others (3, 4) that dismissed an entire field of research based almost completely on the concern that a single 24-h dietary recall (24HR) provides inaccurate estimates of energy intake that are not "physiologically plausible." In our article, we outlined 9 points that can be considered in judging the utility of dietary assessment data, in assessing diet-disease relations, and in drawing inferences from research results. In their response, Archer and Blair allege that there are "intractable systematic biases" in the NHANES data. However, they have not presented evidence to establish the nature of these alleged systematic biases. As we noted under the seventh point in our article, knowing the specific nature of biases provides essential information regarding their effect and offers opportunities for improving methods of risk estimation.

Far from being silent on the matter of drawing inferences based on these kinds of data (and not just from a single 24HR, as in the NHANES), we quoted directly from Archer et al. (2) and then responded to their and others' criticisms of self-report dietary data in a systematic manner. Under our first point, we readily acknowledged errors in dietary self-report and provided a variety of solutions that we and others have devised and applied. Whole sections of our article were devoted to acquainting readers with understanding the nature of errors and describing methods for adjustment that, in turn, allow for predicting "hard" biological endpoints (i.e., "constructs").

We also questioned the specific cutoffs that Archer and Blair used to judge implausibility and pointed out the statistical properties of repeat, as opposed to single, measures of daily dietary intake. When taken into account, repeat measures can provide estimates of intraperson variability that can be used to inform analyses using these 24HR-derived data. It is well known to methodologists in this field that a single 24HR is not adequate to characterize an individual's usual diet (5). This is due to the relatively large day-to-day variation in dietary intake of most people. Beaton and colleagues (6–8) demonstrated that between 42% and