We Agree That Self-Reported Energy Intake Should Not Be Used as a Basis for Conclusions about Energy Intake in Scientific Research[1–4]

Dear Editor:

The valuable article by Subar et al. (1) on self-reported food data is commendable for both its erudition and collegial tone. Because their study was prompted, in part, by one of our own (2), we write to correct one factual point, to clarify substantial points of agreement between our groups, and to suggest where there is room for additional dialogue.

With regard to the clarification, Subar et al. state, "Recent reports have asserted that, because of energy underreporting, dietary self-report data suffer from measurement error so great that findings from all dietary surveillance and observational studies are useless for informing public health policy or investigating diet-health relations" and cite 5 references, including ours (2). However, in our article, we limited our conclusions about the value of self-reported food intake data only to the invalidity of self-report estimates of energy intake (SREI) as bases for conclusions about actual intakes.

With regard to points of agreement, we were delighted that Subar et al. recommend that investigators "do not use self-reported energy intake as a measure of true energy intake." This is equivalent to our article's central thesis, which stated, "It is time to move from the common view that self-reports of EI [energy intake] …are imperfect, but nevertheless deserving of use, to a view commensurate with the evidence that self-reports of EI … are so poor that they are wholly unacceptable for scientific research on EI…." The conclusions of Subar et al. and our conclusions about the nonvalue of SREI are in agreement. We also agree with Subar et al. that the field should "continue to develop, evaluate, and further expand methods of dietary assessment, including dietary biomarkers and methods using new technologies" (1).

We also endorse the suggestion by Subar et al. that, "Currently, the optimal method for estimating EI distributions at the population level is to administer DLW [doubly labeled water] in at least a subset representative of the population to permit measurement error adjustment" (1). It is plausible that if this approach is combined with multiple imputation methods (3), where the "true values" (or DLW-derived values as proxies) of EI are treated as missing data for the subjects for whom only SREI is available and if those chosen to receive the DLW are chosen at random, then it may be possible to obtain reasonably accurate answers about EI. More study to optimize this and related approaches (4, 5) is warranted.

There are other points on which we do not agree. We do not agree with Subar et al. when they state, "What does it mean if an association with a health outcome for a nutrient or food group is or is not found? Usually, dietary measurement error causes associations to be underestimated, and although a certain amount of residual confounding can occur, this is usually not sufficient to create spurious associations. A strong signal, therefore, is likely to be true, especially when consistent across studies" (1). First, there is clear empirical evidence that residual confounding can indeed create the kind of associations typically observed in nutrition epidemiology studies (6). Second, we know of no evidence to show generally that, "Usually, dietary measurement error causes associations to be underestimated." Although true under some specific circumstances (e.g., when measurement error is random and associations are linear and estimated via bivariate linear correlations), more generally measurement error can create, diminish, exaggerate, or change the sign of associations depending on its magnitude, its association with other factors, and the nature of the statistical model fit. Third, consistency across studies can occur because a bias induced by measurement error, confounding, or other factors is consistently replicated.

We also disagree with some broad statements about the demonstrated value of self-report data, because those statements assume facts not in evidence and make logical leaps. For example, Subar et al. offer that there is "amassed evidence that shows that self-report dietary intake data can be successfully used to inform dietary guidance and public health policy" and that findings of "associations between dietary patterns and health outcomes indicate the relevance of self-report dietary data for assessing intakes and relating them to important health outcomes." Such statements assert that the mere act of having used the data to influence policy serves as justification for the continued use of such data. Tradition is not evidence of accuracy or value. In contrast, if success and relevance entail some aspect of accuracy, we are unclear what the empirical evidence for the purported success is. These statements of the utility of self-report data are therefore ipse dixit assertions rather than logically sound arguments whose empirical components are established. We conclude by noting our fundamental point of agreement: that the use of self-report–based estimates of EI as measures of true EI should be discontinued.

[1] AWB and DBA are supported in part by grant P30DK056336 from the NIH/National Institute of Diabetes and Digestive and Kidney Diseases. The opinions expressed are those of the authors and not necessarily those of the NIH or any other organization.
[2] Author disclosures: NV Dhurandhar, AW Brown, D Thomas, and DB Allison, no conflicts of interest
[3] NVD, AWB, DT, and DBA drafted the letter; all current Working Group members were given an opportunity to provide edits for or to abstain from the letter.
[4] The **Supplemental Appendix** contains a list of members and their affiliations and is available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at http://jn.nutrition.org.

Nikhil V Dhurandhar
Andrew W Brown
Diana Thomas
David B Allison
for the Energy Balance Measurement Working Group

From the Department of Nutritional Sciences, Texas Tech University, Lubbock, TX (NVD); the Nutrition Obesity

Research Center (DBA, e-mail: dallison@uab.edu) and Office of Energetics (AWB), University of Alabama at Birmingham, Birmingham, AL; and the Department of Mathematical Sciences, Montclair State University, Montclair, NJ (DT).

References

1. Subar AF, Freedman LS, Tooze JA, Kirkpatrick SI, Boushey C, Neuhouser ML, Thompson FE, Potischman N, Guenther PM, Tarasuk V, et al. Addressing current criticism regarding the value of self-report dietary data. J Nutr 2015;145:2639–45.
2. Dhurandhar NV, Schoeller D, Brown AW, Heymsfield SB, Thomas D, Sørensen TI, Speakman JR, Jeansonne M, Allison DB; Energy Balance Measurement Working Group. Energy balance measurement: when something is not better than nothing. Int J Obes (Lond) 2015;39:1109–13.
3. Cole SR, Chu H, Greenland S. Multiple-imputation for measurement-error correction. Int J Epidemiol 2006;35:1074–81.
4. Thomas DM, Schoeller DA, Redman LA, Martin CK, Levine JA, Heymsfield SB. A computational model to determine energy intake during weight loss. Am J Clin Nutr 2010;92:1326–31.
5. Sanghvi A, Redman LM, Martin CK, Ravussin E, Hall KD. Validation of an inexpensive and accurate mathematical method to measure long-term changes in free-living energy intake. Am J Clin Nutr 2015;102:353–8.
6. Fewell Z, Davey Smith G, Sterne JA. The impact of residual and unmeasured confounding in epidemiologic studies: a simulation study. Am J Epidemiol 2007;166:646–55.

doi:10.3945/jn.115.227017.

Reply to NV Dhurandhar et al.

Dear Editor:

The letter from Dhurandhar et al. regarding our recent publication, "Addressing current criticism regarding the value of self-report dietary data" (1), advances an important conversation about the value of self-reported dietary intake data by identifying areas of agreement specifically with respect to energy. We reply to 3 points raised.

First, we respond to the comment regarding our citation of Dhurandhar et al. (2) as an example of a publication implying that all self-report dietary data are useless. Although that article focuses on energy, it was cited because it states, "Subjective methods of consumption are not only used for studies related to energy balance and body weight, but also to draw conclusions that inform clinical practice and dietary recommendation for conditions such as chronic kidney disease, cancers, heart disease, diabetes and Alzheimer's disease . . . . Despite the published cautions and limitation of subjective measures of food intake for numerous health conditions, studies using SREB [self-reported energy intake]… continue to reach varying and often conflicting conclusions about the associations of various food components with specific disease risk." Although the authors may have meant to limit their conclusions to self-reported energy intake, these sentences appear to make conclusions beyond energy alone.

Second, Dhurandhar et al. do not agree with our statement, "Usually, dietary measurement error causes associations to be underestimated, and although a certain amount of residual confounding can occur, this is usually not sufficient to create spurious associations." They assert that, "there is clear empirical evidence that residual confounding can indeed create the kind of associations typically observed in nutrition epidemiology studies," citing an article by Fewell et al. (3). However, that article is *1*) a computer simulation study, not an empirical example; *2*) does not specifically focus on nutrition studies; and *3*) assumes that errors in different exposure measures are uncorrelated with each other, an assumption that does not apply to self-reported dietary intake data where errors among nutrient and food group estimates are usually strongly correlated, as one would expect given that they often derive from the same foods, for example, the consumption of vitamin C and citrus fruits.

They also write, "we know of no evidence to show generally… dietary measurement error causes associations to be underestimated." Our statement to this effect was based on work from the OPEN (Observing Protein and Energy Nutrition) study (4), a validation study of self-report instruments that used recovery biomarkers as reference instruments conducted in 484 healthy volunteers. Those data allowed estimation of the size of the attenuation of relative risks as well as the potential impact of residual confounding. Residual confounding is considerably reduced when the measurement errors of the variables are correlated at approximately the same level as the variables themselves, and this indeed appears to occur with dietary self-reports. Thus, the study found that, even in models with 3 or 4 error-prone dietary variables, the attenuation effect dominated the residual confounding effect. We found similar results (LS Freedman, unpublished results, 2015) among studies within the Validation Studies Pooling Project (5). Although these studies were only able to assess a limited number of nutrients with recovery biomarkers, the evidence to date indicates that attenuation is a much more serious problem than residual confounding. Dhurandhar et al. also state that "consistency across studies can occur because a bias induced by measurement error, confounding, or other factors is consistently replicated." We would argue that this is unlikely considering uniform findings across studies that use different study designs and methods of dietary assessment to evaluate associations such as between alcohol and breast cancer risk (6) or meat and cancer risk (7).

Third, Dhurandhar et al. claim that we made "broad statements about the demonstrated value of self-report data." They cite 2 examples from our article, which, if taken alone and out of context, may be seen as insufficient arguments. These sentences, however, were woven into our article either in the Introduction to forecast upcoming evidence or at the end of a paragraph to summarize. Our justification for the continued use of self-report data was not simply that they have been used in the past or, worse, because we said so (as they say, "ipse dixit"). We cited several instances that showed the importance, value, and utility of self-report data. One example showed how national dietary intake data were used to examine Americans' diets in relation to recommended intakes. Although the data no doubt include bias, all indications are that this bias would make diets appear to be more, rather than less, concordant with dietary guidelines. The overwhelmingly consistent findings that US diets are far from meeting guidelines for fruit, vegetable, whole-grain, and empty-calorie intakes are sufficient to warrant public health action.

A point we did not make explicitly in our article, perhaps assuming it was understood, is that self-report data are insufficient to provide everything we want to know about associations between diet and disease. Other types of data from clinical trials,