



Social Desirability Trait: Biases or Driver of Self-Reported Dietary Intake?

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THE ARTICLE BY DI NOIA AND COLLEAGUES¹ LEAVES us with an intriguing and important question. Is the relationship between social desirability and reported vegetable consumption in the population of women enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) the result of bias or a reflection of a relationship between underlying psychological traits and actual dietary intake?

MEASURING AND DISTINGUISHING TRUTH AND ERROR

It is widely believed that self-reports of health-related behaviors, such as diet, are prone to a wide variety of errors due to cognitive factors involved in formulating responses to interviews or questions on structured assessment instruments.²⁻⁷

Understanding how errors are distributed, how they may distort research results, and how they relate to truth is essential to fully understand risk factor–disease relationships in biomedicine. Until about 25 years ago, it was assumed that errors in dietary self-report were random. Typically, validation studies produced (and still do produce) correlation coefficients between nutrient intakes derived from comparison and standard methods that average around 0.5 to 0.7.⁸⁻¹⁵ This means that well under half of the variability in the comparison method, usually a structured assessment such as the food frequency questionnaire (FFQ), can be explained by the test method, usually 24-hour recall (24HR) interviews. Correlation coefficients of similar magnitude have been obtained when using recovery biomarkers to estimate dietary exposures (eg, doubly labeled water to estimate energy expenditure).¹⁵⁻¹⁷ It is clear that researchers knew for some time that errors must be large. However, they had not pinpointed sources of unique bias or how errors distribute

(or are expressed) across different self-assessment methods and in different populations.

IDENTIFYING SOURCES OF ERROR, ESPECIALLY SOCIAL DESIRABILITY BIAS

To understand the implications posed in the article by Di Noia and colleagues,¹ it is important to understand the role of bias in distorting self-reports of dietary intake. Of course, it has long been accepted that there could be information bias in dietary self-reports in the context of case-control studies in which individuals are asked, after they have been diagnosed with the disease under study, about exposure before the diagnosis.¹⁸⁻²⁰ Disease-differential reporting could just reflect recall bias, or a distortion of memory based on dietary modifications made in the more recent past in response to a disease diagnosis, or some combination of the two.

Beginning in the 1980s researchers at the University of Massachusetts Medical School and others began to explore the nature of biases in dietary self-report.²¹⁻²⁴ Predominant among likely biasers were response sets (ie, trait measures that are expressed in testing situations). The two main response sets that have been identified are social desirability (ie, the defensive tendency to present oneself in a more favorable light²⁵⁻²⁷) and social approval (ie, the tendency to seek approval²⁸). Despite the surface similarity of their names, typically, the two are not correlated.^{29,30}

The working hypothesis at the time this line of research began was that structured assessments such as the FFQ would be subject to larger biases than those observed in the 24HR. This is because the cognitive process of recall (ie, question comprehension, information retrieval, estimation or judgment, and response formulation) would be distorted more readily when people are asked about diet as a trait (indicative of long-term intake, and therefore a reflection of a more permanent state of being) than a state (indicating what was eaten yesterday or during the past 24 hours).^{7,11,31-33}

The early research revealed that there were distinct patterns in self-report on structured questionnaires versus multiple 24HRs that aligned with the original hypothesis. The first couple of studies conducted^{22,30} focused on the 7-day dietary recall (7DDR), an assessment instrument that was developed for use in a lipid intervention trial, the Worcester Area Trial for Counseling in Hyperlipidemia.¹¹ Because of its 1-week time frame, the 7DDR combines reliance on habitual memory (to report on average frequency) and episodic memory (for counting food exposures).¹¹ Although individuals, no doubt, bias the recall of past intake based on current habits,³⁴⁻³⁶ it was of some concern that the 7DDR mixes episodic and semantic memory. Therefore, it was

encouraging that subsequent research found similar, and somewhat stronger, effects for the FFQ (an instrument that is in some ways similar to the very abbreviated set of questions asked of WIC participants by Di Noia and colleagues in their study¹).^{22,30,37-39} Overall, the research revealed differences by gender in relation to education such that more highly educated women downward biased estimates of the intake of energy-dense foods on the structured instrument in relation to the 24HR.^{30,37,40,41} A very different pattern was observed in less educated men—in whom there was an upward bias in these same energy-dense foods according to social approval (ie, a response set that expresses the tendency to seek approval in a testing situation).³⁰ Of course, one would expect to see the opposite bias in the report of nutrient-dense foods that were the focus of the article by Di Noia and colleagues.¹

Most of the studies up until the late 1990s focused nearly exclusively on European Americans—a group that would be less well represented among the WIC participants reported by Di Noia and colleagues.¹ When data from a multiracial/multiethnic population (in Boston) were examined the same social desirability bias was seen in well-educated women, regardless of race or ethnicity.³⁹ These results were confirmed in the first multicenter dataset from the National Cancer Institute-funded Behavior Change Consortium.³⁷

Also in the 1990s, the first study using a so-called objective measure of total energy intake was conducted.⁴¹ Total energy expenditure was measured using doubly labeled water in 81 women in Worcester, MA. Using total energy expenditure data, along with information on the food quotient of the diet in combination with careful measurement of body mass, it was possible to compute energy intake (E_{dlw}).⁴¹ The results from that study, which examined both the FFQ from the Women's Health Initiative and the 7DDR as comparison methods, corroborated the earlier findings; that is, highly educated women expressing high levels of social desirability underestimated total intake on both the FFQ and 7DDR relative to both E_{dlw} and 7 days of 24HR. It also showed that there was more bias in the FFQ vs the 7DDR (which, as noted, mixes habitual and episodic memory) and that there was an indication of bias, in the same direction but of much smaller magnitude, in the 24HR relative to E_{dlw} .⁴¹ The fact that similar biases have been observed in women's self-report of physical activity⁴² indicates that the motivation to misrepresent appears to be distributed across various health-related behaviors. Thus far it is known that education interacts with response sets and gender to produce these biases.^{30,37,43} In contrast to well-educated women who express social desirability bias, social approval predominates in individuals with less education, including women eligible for WIC. Researchers and others should monitor for changes that may be observed as new cohorts of women age into roles as parents.

HOW DO COGNITIVE PROCESSES LEAD TO BIAS AND DIET-RELATED DECISION MAKING?

With respect to deepening understanding of how these processes work, it might be worthwhile to reflect on the underlying reason why it was believed that structured questionnaires would be more prone to response set biases in the first place.^{22,30,41} In particular, it was hypothesized that most of the error would result from the final two phases in

the cognitive process of reporting; that is, estimation or judgment and response formulation. These are higher-level functions that go beyond simple comprehension and arithmetic reasoning. It would be interesting to disentangle and dissect the process of how misreporting occurs to understand how reporting bias relates to underlying psychological traits such as acquiescence.^{44,45} Of course, response formulation requires complex judgments that also could be related to the kinds of factors that would predispose individuals to be successful at making effective behavior change.

Without some kind of comparison measure, it is impossible to distinguish reporting error from true intake. In their study, Di Noia and colleagues¹ used a greatly abbreviated, 6-item structured questionnaire to assess intakes of fruits and vegetables. All of our previous research indicates that this type of instrument is particularly prone to response set biases because it focuses on diet as a trait and it provides a very short list of obvious so-called right answers. Although these new mothers may be particularly sensitive to the implications that these sorts of questions entail and, therefore, may be prone to expressing social desirability bias, it also is true that they could be particularly receptive to making dietary choices that they believe would improve their health and the health of their babies.

Although social desirability was described nearly 60 years ago as a response set that biases answers on tests,²⁵ it also maps to a variety of psychological traits, especially acquiescence.^{27,45} Indeed, acquiescence provides the substrate on which social desirability operates. However, it also could provide a mechanism through which actual change might occur. Also, there may be other traits that map to social desirability and that might enhance the probability of successfully making an actual change. In their study, Di Noia and colleagues¹ acknowledge that they have no comparison measure with which to make an informed judgment about relative bias. Future work should focus on exploring responses using alternative assessment methods. Such studies also should attempt to take into account (ie, measure) other psychological predispositions that might influence motivation, expectation, and self-efficacy in making dietary changes.

DETERMINING WHETHER AND HOW DIET AFFECTS HEALTH OUTCOMES

Attempts to assess the relationship between an exposure (eg, diet) and some health outcome are dependent on the size of the signal-to-noise ratio (ie, the actual effect size in relation to error). Essentially, the ability to detect diet–outcome relationships relies on the capacity to identify or create a relatively high signal-to-noise ratio. Random error consistently biases results toward the null hypothesis of no effect. Biases due to factors such as social desirability greatly complicate things because they may distort results in either direction. Because social desirability also may be related to underlying personality characteristics that are related to disease causation, they also have the potential to confound relationships.^{23,24} Therefore, it is important to identify likely causes of reporting error, make the necessary measurements as part of data collection, and use this information in well-designed and competently conducted statistical analyses.

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