Construct Validity of a Single-Item, Self-Rated Question of Diet Quality

Erikka Loftfield, MPH[1]; Stella Yi, PhD[2]; Stephen Immerwahr, MA[3]; Donna Eisenhower, PhD[3]

ABSTRACT

Objective: To provide evidence of the construct validity of a single-item overall diet question with a nomological network of self-rated and biometric measures of dietary intake and outcomes.

Methods: The authors conducted a secondary analysis of survey and biometric data from a cross-sectional sample of urban-dwelling adults. In addition to self-rated diet quality, they examined dietary behaviors, biomarkers of intake, and related outcomes. Self-rated diet quality was treated as a continuous variable to calculate *P* for trend using regression analysis.

Results: Self-rated diet quality was significantly associated with variation in both subjective and objective measures of dietary intake (fruit and vegetable intake, $P < .001$; sugar-sweetened beverage intake, $P < .001$; sodium to potassium ratio, $P < .001$), behavior (frequency of fast-food dining, $P < .001$), and related outcomes (systolic blood pressure, $P = .010$; diastolic blood pressure, $P < .001$; and body mass index, $P < .001$).

Conclusions and Implications: Evidence supports the construct validity of a single-item measure of diet quality. This single-item question may be a useful proxy for more burdensome measures of overall diet quality.

Key Words: public health, health surveys, diet surveys (*J Nutr Educ Behav*. 2015;47:181-187.)

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INTRODUCTION

Self-rated health is recognized in more than 100 studies as a strong predictor of mortality and to a slightly lesser extent, morbidity.[1] Despite a large body of research linking dietary intake to chronic disease, the associations of self-rated diet quality with dietary behaviors and related health outcomes are not well established. Current measures of diet quality, such as the Alternative Healthy Eating Index or the Recommended Foods Score, rely on lengthy food frequency questionnaires.[2] These instruments are time-consuming and burdensome to complete. In addition, they are prone to the measurement error associated with food frequency questionnaires[3] and are impractical to administer in certain settings. A simple method for assessing overall diet quality would be valuable for research and clinical use.

Establishment of the construct validity for a self-rated diet question would support the 2010 Dietary Guidelines for Americans, which emphasize a holistic approach to nutrition.[4] The 2010 Dietary Guidelines for Americans reflect a growing body of research that focuses on dietary patterns instead of a single food or food component as risk factors for chronic disease morbidity and mortality.[2,5,6] This research brief evaluates the construct validity of a single-item, self-reported measure of diet quality by constructing a nomological network of self-reported and objectively measured dietary behaviors and health outcomes.

Although prior studies have evaluated the relationship between self-reported diet quality and food consumption,[7,8] the current study makes a unique contribution in its use of 24-hour urinary biomarker data (sodium and potassium) and clinical measures (blood pressure and body mass index), which allow for a more comprehensive test of construct validity. The study hypothesis is that better diet quality ratings are associated with lower sodium, higher potassium, and lower sodium to potassium ratios, as well as more favorable dietary habits and clinical measures.

METHODS

Study Design

The researchers obtained demographic and self-reported data from the New York City (NYC) 2010 Community Health Survey (CHS), an annual health survey conducted by the NYC Department of Health and Mental Hygiene that recruits approximately 8,000 to 10,000 New Yorkers aged ≥ 18 years from all 5 boroughs of NYC. Sodium and potassium biomarker data were obtained from 24-hour urine collections, which were collected as a part of the Heart Follow-up Study (HFUS), a study of a subset of the 2010 CHS participants conducted to assess sodium intake in

[1]Yale School of Public Health, New Haven, CT
[2]NYU School of Medicine in the Center for the Study of Asian American Health, New York, NY
[3]New York City Department of Health and Mental Hygiene, New York, NY
Address for correspondence: Erikka Loftfield, MPH, Yale School of Public Health, 60 College St, New Haven, CT 06511; Phone: (240) 276-7310; Fax: (240) 276-7837; E-mail: erikka.loftfield@yale.edu

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a population-based, representative sample of NYC adults. Community Health Survey participants who met study inclusion criteria (not pregnant, not breastfeeding or lactating, and not receiving or having received dialysis) were invited to participate in HFUS after completing the CHS interview. The HFUS participants performed a 24-hour urine collection and had biometric measurements (systolic blood pressure [SBP], diastolic blood pressure [DBP], height, and weight) taken during the home visit to collect the urine sample. Detailed HFUS information has been described in a comprehensive Methods Report.[9] Data were collected with approval from the NYC Department of Health and Mental Hygiene Institutional Review Board.

Participation and Recruitment

Overall, the 2010 CHS response rates were 17% and 28% for landline and cellular telephone exchanges, respectively. Among those who were reached, 77% of landline contacts and 94% of cellular contacts agreed to participate in the survey. Of the 5,830 CHS participants who met HFUS inclusion criteria, 2,305 adults agreed to participate. Eligible CHS participants who agreed to participate in HFUS were slightly more likely to be Hispanic, aged < 65 years, of low income, and obese than eligible CHS participants who did not agree to participate in the follow-up study. However, no meaningful difference in either general health status or self-reported high blood pressure was found between CHS and HFUS participants.[10] Of those who agreed to participate in HFUS, 1,775 adults (30.4% of all eligible CHS participants) provided a 24-hour urine sample that could be analyzed at the laboratory. Participants whose urine collection values could not be normalized to 24 hours owing to missing data on collection duration (n = 3) or who did not meet all completeness criteria (n = 116) were excluded. Urine samples were not considered complete if a participant reported missing a urine collection (n = 55), provided a biologically implausible sample by volume (< 500 mL) (n = 16), or provided a biologically implausible sample by urinary creatinine (< 6.05 mmol creatinine in males and < 3.78 mmol creatinine in females) (n = 50); some participants were incomplete under multiple criteria.[9,11] Finally, those who failed to answer the self-rated diet quality question (n = 12) were excluded. The final analytic sample was 1,644. During data collection, study researchers discovered that 1 technician was consistently using a blood pressure cuff too large for participants' arms, which led to artificially low readings.[9,11] After removing these 86 participants, analyses with blood pressure as the outcome included 1,555 individuals.

Measures

Self-rated diet quality, like self-rated health, was measured on a 5-point Likert scale: *In general, how healthy is your overall diet? Would you say (1) excellent, (2) very good, (3) good, (4) fair, or (5) poor?* Information was also collected on demographics (age, sex, race/ethnicity, household income, and education) and dietary behaviors (consumption of fruits and vegetables, sugar-sweetened beverages, and fast foods). Race/ethnicity was categorized as non-Hispanic white, non-Hispanic black, Hispanic, Asian/Pacific Islander, or multi-racial/some other race. Education was a 4-category variable: less than high school, high school graduate, some college/technical school, or college graduate. Household annual income from all sources was divided into 4 levels: < 200%, 200% to 399%, and ≥ 400% of the federal poverty level (FPL), or do not know/refused. The number of servings of fruits and vegetables consumed on the previous day was measured by asking the following question:

> *Thinking about nutrition … how many total servings of fruit and/or vegetables did you eat yesterday? A serving would equal 1 medium apple, a handful of broccoli, or a cup of carrots.*

Self-reported intake based on this question is positively correlated with 24-hour urinary potassium ($\rho = 0.23$; $P < .001$), a biomarker of fruit and vegetable intake.[12] Consumption of 12 oz sugar-sweetened beverages (including soda but not diet soda or seltzer) was standardized to the number per day and treated as a continuous variable. Frequency of dining from a fast-food restaurant or chain such as McDonalds, KFC, Taco Bell, Golden Krust, or similar places was treated as a continuous variable standardized to frequency per week.[13]

The researchers determined the sodium and potassium contents of the 24-hour urine samples using the ion-selective electrode potentiometric method on a Roche DPP Modular analyzer (Hoffman-La Roche, Ltd, New York, NY). Laboratory values were normalized to a 24-hour period before analysis. The sodium to potassium ratio (milligrams/milligrams) was calculated by dividing individual sodium excretion (milligrams) by potassium excretion (milligrams). Body mass index (BMI) was calculated from measured weight in kilograms divided by measured height in square meters and used to categorize participants as overweight ($25\ kg/m^2 \leq BMI < 30\ kg/m^2$), obese ($30\ kg/m^2 \leq BMI$), or either overweight or obese ($25\ kg/m^2 \leq BMI$). A trained technician measured systolic and diastolic blood pressure during the home visit as per the National Health and Nutrition Examination Survey (NHANES) protocol; the average of 3-seated measurements was calculated and used for analysis.[14] Hypertension was defined as SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg or use of blood pressure–lowering medication.[15]

Statistical Analysis

Participants were weighted to the 2006–2008 American Community Survey Public Use Microdata Sample for non-institutionalized adults in NYC. Weights were calculated for random digit dial interviews to account for household and individual (ie, CHS respondent) probability of selection.[16] Additional weights were then created to match the HFUS sample to the demographics of NYC adults by age, race/ethnicity, marital status, and educational attainment[9]; iterative raking with constraints was used to prevent extreme case-level weights and resulting sample variance.[17] These HFUS-specific weights were used in all analyses. Weighted percentages of demographic characteristics for the adult NYC population