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A Dietary Behaviors Measure for Use with Low-Income, Spanish-Speaking Caribbean Latinos with Type 2 Diabetes: The Latino Dietary Behaviors Questionnaire

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ABSTRACT
This study examines the validity of a Spanish-language dietary behaviors self-report questionnaire (The Latino Dietary Behaviors Questionnaire [LDBQ]) for Latinos with diabetes. The sample (n=252) was Spanish-speaking, female (77%), middle-aged (mean age 55 years), low education (56% <8th grade education), and low income (50% <$10,000 annual household income). Baseline and 12-month measures were collected as part of a randomized clinical trial. LDBQ reliability, validity, and sensitivity to change over time were evaluated using exploratory factor analysis; internal consistency analysis; and correlation analysis using baseline and change scores for LDBQ, 3-day 24-hour dietary recall nutrient mean, and clinical measures. Cronbach's αs were moderate. Four factors were identified at both time points. Significant baseline correlations (r) were found for LDBQ total scores; factor scores; and energy intake ($r=-0.29$ to -0.34), total dietary fiber ($r=0.19$), sodium ($r=-0.24$ to -0.30), percent energy from total fat ($r=-0.16$), fat subtypes ($r=-0.16$ to 0.15), and percent energy from protein ($r=0.17$). Twelve-month data produced a similar pattern. T tests of LDBQ change scores showed significantly greater change in dietary behaviors for the intervention group than for the control group, $t(135)=-4.17$, $P<0.01$. LDBQ change scores correlated significantly with mean 24-hour nutrient intake and a subset of clinical measures, but were not associated with clinical change scores (except high-density lipoprotein cholesterol). The LDBQ is a useful tool to assess and target behaviors for change and assess intervention effects.
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Dietary behaviors are essential components of interventions aimed at helping people achieve a healthy weight and preventing and managing chronic disease (eg, diabetes mellitus and hypertension) (1-4). Reduced energy intake; limited intake of high-fat foods, refined sugars, and sodium; and increased intake of fruits, vegetables, and whole grains can influence multiple health markers (eg, glycosylated hemoglobin [HbA1c] and low-density lipoprotein cholesterol) (2,4). The ability to identify and track dietary changes over time can be improved by accurate and cost-effective measurement of dietary behaviors, particularly in low-income Spanish-speaking Latino populations for which such measures are underdeveloped.

Methods of dietary assessment have typically included food frequency questionnaires (FFQs) and single or multiple 24-hour dietary recalls, which were designed to reduce study costs and respondent burden, and improve response rates relative to other methods (eg, multiday dietary records). They provide a comprehensive picture of diet, a fine-grained analysis of nutrient intake, and provide specific information on food intake and related behaviors to target interventions. However, they have not been used extensively to target wide-ranging, important aspects of dietary behavior that are associated with nutrient intake and disease risk (eg, food preparation practices, meals, and sources of food).

Previously developed dietary behavior measures include the Food Habits Questionnaire (FHQ) (5) and its modified versions (6,7), the Dietary Risk Assessment (DRA) (8), and a number of brief dietary screeners (9-13). Current data support the use of FHQ and DRA for assessing dietary behaviors (5-8,14,15), and are mixed regarding brief screeners. Limitations of screeners include their focus on one area of dietary behavior (only the DRA provides comprehensive assessment of eating behaviors), their validation in small samples (8,12,13), and limited generalizability due to lack of validation in ethnically diverse, low-income, low-literacy, or Spanish-speaking samples.

Among Latinos, dietary patterns include consumption of 65% of energy from carbohydrates (ie, grains, legumes, and starchy vegetables) (16) and introduction of more processed foods, meats, dairy, and sweets (16) resulting from increasing acculturation. Recent data highlight three dietary patterns found among Puerto Rican adults living in Massachusetts (17), two of which were associated with higher incidence of the metabolic syndrome (a traditional pattern high in rice, beans and oil, and a pattern high in sweets). A third pattern, a diet high in meat and french fries, was associated with higher blood pressure and waist circumference (17). Identifying behaviors associated with these dietary patterns can assist with targeting modifiable contributors to managing diabetes, high blood pressure, and metabolic syndrome factors.

Unfortunately, additional information is limited on behaviors that are associated with self-reported dietary intake among low-income Latinos, a group known to experience significant health disparities in chronic disease (18). Thus, this study sought to develop, validate, and explore the psychometric properties of a dietary behaviors questionnaire in a low-income, Spanish-speaking sample of adults with type 2 diabetes, via comparison and association with nutrient data averages from three 24-hour dietary recalls, and clinical parameters (eg, high-density lipoprotein cholesterol and HbA1c).

METHODS
Study Design and Setting
Data were collected as part of a randomized controlled trial of a behavioral intervention for diabetes self-management in low-income, Spanish-speaking Latinos with type 2 diabetes: The Latinos en Control trial. Participants were recruited from five community health centers in Massachusetts between September 2005 and April 2007. Data were collected at baseline, 4 months, and 12 months. All recruiters and assessment staff were bilingual, and study protocol was approved by the institutional review boards at the University of Massachusetts Medical School and Baystate Medical Center.

The intervention was a theory-based, culturally tailored, literacy-sensitive, group diabetes self-management program for low-income Caribbean Latinos. It targeted diabetes-related knowledge, self-efficacy beliefs, and self-management behaviors (including dietary change) through an intensive phase of eight weekly sessions and follow-up phase of eight monthly sessions. A more detailed description of the intervention and study methodology can be found elsewhere (19).

Population
Patients were eligible if they were: Latino, aged 18 years or older, and had a documented diagnosis of type 2 diabetes, HbA1c ≥7.5 in the previous 7 months, and physician approval to participate.

Exclusion criteria included inability to provide informed consent; a cognitive, mental health, or medical condition that could affect participation or for which the dietary intervention could be contraindicated (eg, documented dementia, diagnosis of hepatitis C or end-stage renal disease, or inability to walk); intermittent use of glucocorticoid therapy within the prior 3 months; acute coronary event (eg, myocardial infarction or unstable angina) within the prior 6 months; participation in a formal diet or physical activity program; pregnancy or plans to become pregnant; no telephone or access to one; and plans to move out of the area within the 12-month study period.

Participant Recruitment
Potential participants were identified through administrative databases, screened for eligibility by review of medical records, invited to participate through a letter (in English and Spanish) from their primary care providers, and were then contacted to determine interest. Eligible and interested participants signed informed consent before completing study assessments.

Measures
Data collected by rigorously trained assessors at baseline and 12-month follow-up assessments were used in this study. Measures included a demographics survey (eg, age, sex, and employment status), clinical measures (eg, HbA1c, body mass index [BMI], and blood pressure), the Latino Dietary Behaviors Questionnaire (LDBQ) (Figure), and three 24-hour dietary recalls (20-22).

The dietary recalls were unannounced, computer-assisted, and telephone-based. A trained bilingual registered dietitian, blinded to study condition, used the multiple-pass technique to assess intake on 2 weekdays and 1 weekend day. Multiple-day independent 24-hour dietary recalls are the gold-standard method for assessing dietary intake and accounting for individuals' dietary variability, and have been validated to assess both individual and population level absolute food and nutrient intakes, as well as changes in intake (23,24).

Dietary intake data were collected, and final calculations completed, using Nutrition Data System for Research software (versions 2005 to 2008, Nutrition Coordinating Center, University of Minnesota, Minneapolis). The Nutrition Coordinating Center database contains values for 160 nutrients, nutrient ratios, and food components, and includes more than 18,000 foods (including ethnic foods) and more than 7,000 brand products. Ingredient choices and preparation methods provide more than 160,000 food variants (25-27). As is recommended (25), a food portion visuals booklet (available at http://www.ncc.umn.edu/services/foodamountreportingpostersandbooklets.html) was given to participants to facilitate portion size estimation. Bilingual auditors, blinded to study condition, listened to recorded calls at multiple time points to ensure quality of dietary data collection.

The LDBQ was developed by one of the authors (M.C.R.) to include constructs represented in existing measures of eating behaviors (5,28), based on an original pool of 16 items representing dietary behaviors qualitatively observed among the target population (29). It was designed for oral administration, and was interviewer administered during an in-person assessment visit.

LDBQ items ask frequency of eating behaviors in several domains (eg, healthy dietary changes, use of artificial sweeteners in drinks, number of meals per day, and fat