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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 (LDBQ)

Senaida Fernandez, Ph.D.,
Research Assistant Professor of Medicine, New York University School of Medicine, Department of Medicine, Division of General Internal Medicine, 423 E. 23rd St, 15N-028D, New York, NY 10010, Phone: (212) 263-4249, Fax: (212) 263-4201, Senaida.Fernandez@nyumc.org

Barbara Olendzki, R.D., MPH, and
Assistant Professor of Medicine, University of Massachusetts Medical School, Division of Preventive and Behavioral Medicine, 55 Lake Avenue North, Shaw 2, Worcester, MA 01655, Phone: 508-856-5195, Fax: 508-856-2022, Barbara.Olendzki@umassmed.edu

Milagros C. Rosal, Ph.D.
Associate Professor of Medicine, University of Massachusetts Medical School, Division of Preventive and Behavioral Medicine, 55 Lake Avenue North, S7-755, Worcester, MA 01655, Phone: 508-856-3173, Fax: 508-856-3840, Milagros.Rosal@umassmed.edu

Abstract

This study examines the validity of a Spanish-language dietary behaviors self-report 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, three day 24-hour dietary recall nutrient mean, and clinical measures. Cronbach's alphas were moderate. Four factors were identified at both time points. Significant baseline correlations (*r*) were found for LDBQ total scores, factor scores and: caloric intake (*r* = −.29 to −.34); total dietary fiber (*r* = .19); sodium (*r* = −.24 to −.30); percent calories from total fat (*r* = −.16); fat subtypes (*r* = −.16 to .15); and percent calories from protein (*r* = .17). Twelvemonth 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, $t(135) = -4.17$, $p < .01$. 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 HDL). The LDBQ is a useful tool to assess and target behaviors for change and assess intervention effects.

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Corresponding Author (including reprints requests): Dr. Milagros C. Rosal, University of Massachusetts Medical School, Division of Preventive and Behavioral Medicine, 55 Lake Avenue North, S-7-755, Worcester, MA 01655. Milagros.Rosal@umassmed.edu.

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Keywords

Assessment; Dietary behaviors; Latinos; Diabetes

Introduction

Dietary behaviors are essential components of interventions for achieving a healthy weight and preventing and managing chronic disease (e.g. diabetes mellitus, hypertension) (1–4). Reduced caloric intake; limited intake of high-fat foods, refined sugars, and sodium; increased intake of fruits, vegetables, and whole grains can impact multiple health markers (e.g. HbA1c, LDL 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 (e.g. multi-day 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 (e.g. food preparation practices, meals, sources of food, etc.).

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 calories from carbohydrates (i.e. 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, 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 (e.g. HDL, HbA1c).

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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 to April 2007. Data were collected at baseline, 4-month, and 12-month follow-up. 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 8 weekly sessions and follow-up phase of 8 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 impact participation or for which the dietary intervention could be contraindicated (e.g. documented dementia; diagnosis of hepatitis C or end-stage renal disease; inability to walk); intermittent use of glucocorticoid therapy within the prior 3 months; acute coronary event (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 prior to 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 (e.g. age, gender, employment status), clinical measures (e.g. HbA1c; BMI; blood pressure), the Latino Dietary Behaviors Questionnaire (LDBQ; see appendix) 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 two weekdays and one 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).

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Dietary intake data were collected, and final calculations completed, using Nutrition Data System for Research (NDSR) software (versions 2005 to 2008, Nutrition Coordinating Center (NCC), University of Minnesota, MN). The NCC database contains values for 160 nutrients, nutrient ratios and food components; includes over 18,000 foods (including ethnic foods) and over 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 assure quality of dietary data collection.

The LDBQ was developed by one of the authors (MCR) 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 (e.g. healthy dietary changes, use of artificial sweeteners in drinks, number of meals per day, fat consumption). Example items include: “How often do you change your foods to make them healthier?” (healthy dietary changes); “How often do you drink coffee or tea without sugar OR with artificial sweeteners (like Splenda, Equal, or Sweet & Low)?” (use of artificial sweeteners in drinks); “How many complete meals do you eat during the day almost every day? (not counting snacks or what you pick at during the day)” (number of meals per day); “How often do you eat fried foods per week?” (fat consumption).

LDBQ total score and factor scores are calculated by summing across individual items. A higher score reflects healthier eating behaviors. Response options include: “Never” to “2 or more times per day” for items 1–4; “Rarely or never” to “All of the time” for items 5–11; “One” to “Three” for item 12; and number of times per month for item 13. Responses to items are assigned point values as follows: 0–5 for items 1–4; 0–3 for items 5–11; 1–3 for item 12. Items 1–4, 8, and 13 are reverse scored (i.e. “never” response indicates healthier eating behavior and is assigned the higher point value). The measure is included as an appendix.

Analytic overview

LDBQ total and factor scores, 24HR nutrient mean scores, and clinical measures (e.g. HbA1c; BMI) were calculated, as were change scores (baseline to 12 months) for these variables. Proxy “behavioral items” indicating number of servings per food group (fruits, vegetables, grains, meats, dairy, fats, sweets, and beverages) were calculated based on 24hr recall data.

Baseline LDBQ factor structure and subscales were examined using exploratory factor analysis (EFA). The EFA utilized oblique rotation, and produced eigenvalues, item factor loadings, and related significance coefficients. An eigenvalue greater than 1.0 indicates a strong factor; a factor loading greater than .32 is acceptable, while .50 or greater indicates a strong loading; a p-value < 0.05 indicates a significant factor loading (30). Guidelines suggest a minimum subject-to-item ratio of between 5:1 and 10:1, and minimum sample sizes of 100 to 200, to produce a stable factor structure (31–33).

LDBQ concurrent validity was evaluated via correlation between (1) baseline LDBQ and 24HR, (2) 12 month LDBQ and 24HR, and (3) baseline LDBQ and proxy “behavioral

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items" (number of servings per food group) based on 24HR mean scores. LDBQ convergent validity was evaluated via correlation with clinical measures (i.e. BMI, blood pressure, HbA1c, LDL, HDL). Concurrent and convergent validity were further examined via change score correlations for LDBQ, 24HR and clinical measures. T-tests of LDBQ change scores for intervention and control groups examined LDBQ responsiveness to change. It was hypothesized that the LDBQ would be able to show significantly greater change in dietary behavior over time in the group that received a diabetes self-management intervention compared to the control group.

Missing values were replaced with the item mean, in cases where 10% or less of LDBQ data were missing (n = 1 item). Analyses were performed using the Statistical Package for the Social Sciences software (version 16.0, 2007, SPSS Inc, Chicago, IL).

Results

Patient characteristics

Of 1034 active patients at the time of screening; 487 were eligible and received physician approval to participate in the study (92% of reviewed patients). Of these, 293 completed the patient screening interview, 276 were eligible, and 252 (91% of eligible paients) were enrolled and randomized. Of these participants, 77% completed the dietary assessments at 12-month follow up.

The sample baseline characteristics are shown in Table 1. The sample was primarily Puerto Rican (94%), female (77%), middle age (mean age = 55 years). Almost three quarters of the sample had less than a high school education and half had an annual household income less than $10,000. The sample was obese (mean BMI = 35) and in poor metabolic control (mean HbA1c = 8.98%).

There were no significant baseline differences between the intervention and control group in demographics, clinical characteristics, and dietary variables, except for diastolic blood pressure (73.37 +/− 8.4 vs. 76.34 +/− 9.9, intervention vs. control respectively; $p < 0.011$).

Gender differences were observed in a subset of demographic and clinical characteristics. Compared to women, men were more likely to be married (60% vs. 32%, male vs. female respectively; $p = .001$) and employed (20% vs. 9%, male vs. female respectively; $p < .001$), and had higher diastolic blood pressure (79.32 +/− 9.7 vs. 73.52 +/− 8.7, male vs. female respectively; $p < 0.001$). Women had higher BMI (35.48 +/− 7.0 vs. 32.43 +/− 6.3, female vs. male respectively; $p = 0.003$), higher LDL (109.32 +/− 34.5 vs. 97.68 +/− 47.4, female vs. male respectively; $p = 0.04$), and higher HDL (45.78 +/− 9.5 vs. 39.47 +/− 6.8, female vs. male respectively; $p = 0.04$).

EFA Analyses: Establishing Construct Validity

EFA analysis identified 3 poorly performing items for elimination. The items loaded weakly on one factor (.45 or below) or cross-loaded (factor loading > .30 on more than one factor), and focused on general eating behaviors (i.e. picking at food between meals; eating while doing something else, and dependence on a community program as source of meals). They did not include behaviors around a specific food (e.g. frequency of drinking 1% or skim milk).

Baseline and 12-month LDBQ factor structure for the remaining 13 items were examined with EFA. The analysis revealed a four factor structure that explained approximately 47% of the variance at each time-point, suggesting similarity in factor structure over time. Based on item content factors were named: (1) Healthy dietary changes; (2) Artificial sweeteners in

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drinks (3) Number of meals per day, and (4) Fat consumption. Of note, only 3 items migrated from their original factor at the second time point. See Table 2 for a summary of EFA data.

LDBQ Scores: Sensitivity to Change over Time

Table 2 summarizes baseline and 12-month follow-up LDBQ total and factor scores. And table 3 summarizes baseline and 12-month absolute 24HR mean scores, and recommended nutrient guidelines (34). As hypothesized, the LDBQ showed significantly greater change in dietary behavior over time in the intervention group *(M* Δ = 7.10; SD = 5.53; N = 67) compared to the control group *(M* Δ = 3.36; SD = 5.12; N = 75), $t(135) = -4.17$, $p < .01$). Among LDBQ factors, significantly greater dietary change occurred in the intervention group compared to control group for factors 1 [$t(148) = -4.69$, $p < .01$] and 2 [$t(213) = -2.00$, $p < .05$] (data available from the authors).

LDBQ Internal Consistency

Cronbach's alpha coefficients for LDBQ total score ranged from .47 to .48 across the two time points, suggesting that the LDBQ measures multiple dimensions of eating behavior. The 5-item factor 1 ("healthy dietary changes") had the strongest baseline and 12-month follow-up internal consistency coefficients (.60 and .58, respectively). Internal consistency coefficients at these time-points were small for factors two (.29 and .27, respectively), three (.41 and .47, respectively), and four (.32 and .27, respectively), likely because these factors consisted of only 2–3 items each, and Cronbach's alpha values are often small when there are only a few items in a subscale.

LDBQ Concurrent Validity

LDBQ and 24HR mean score correlation data are summarized in Table 4. A pattern of significant correlations were hypothesized for LDBQ factor and total scores and 24HR nutrient mean scores. For example, a significant positive relationship was anticipated for factor 3 (number of meals per day) and dietary fiber. As the number of meals increases per day, then this nutrient would increase as well. Similarly, significant negative relationships were hypothesized between the other factors and specific 24HR variables. For example, as factor 1 scores (healthy dietary changes) increase, there would be a decrease in calories or sodium. As expected, correlations between LDBQ total and factor scores at baseline were significantly related to calories (energy), total dietary fiber, sodium, percent calories from total fat and its subtypes, and percent calories from protein.

Factor 1, which included behavioral items related to dietary choices and limiting portions, was significantly related to lower intake of calories (−.39), sodium (−.30), all *p*'s < .01, percent calories from total fat (−.16), saturated fat (− .16), and an increase in calories from protein (.17), all *p*'s < .05, indicating a pattern of healthy dietary behaviors associated with healthier micronutrients and lower calories. Factor 2 (artificial sweeteners in drinks) was associated with calorie intake (−.29) and sodium intake (−.24), all *p*'s < .01. Factor 3 (number of meals per day) was associated with dietary fiber (.19, $p < .01$) and likely to the number of complete meals (not just snacks) consumed per day (35). Factor 4 (fat consumption) was associated with trans fat (.15, $p < .05$) intake (i.e. those found in processed foods). This pattern of results was repeated, with stronger correlations (i.e. size and significance), in 12-month data (See Table 4).

LDBQ factor and total scores were correlated with "behavioral proxy" items (number of servings per food group) based on 24HR mean scores. LDBQ total score was significantly related to servings of whole grains (.22), refined grains (−.38), full-fat meats (−24), full fat dairy (−.23), reduced fat dairy (.16), artificially sweetened low-fat flavored milks and yogurt

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(.20), and sweets (−.24), all *p*'s < .05. A similar pattern was found for factors 1–4 and the 24HR fruits, vegetables, grains, meats, dairy, fats, sweets, and beverages serving variables (data available from the authors).

LDBQ Convergent Validity

Baseline LDBQ total and factor scores were significantly related to a subset of baseline clinical measures. Baseline LDBQ total correlated significantly with HDL (.17), HbA1c (−.16), and diastolic blood pressure (−.24), all *p*'s < .05. Factor 1 (healthy dietary changes) was significantly related to HDL (.16) and diastolic blood pressure (−.15), all *p*'s < .05. Factor 2 (artificial sweeteners in drinks) was significantly related to clinic HbA1c (−.20) and systolic blood pressure (.14), all *p*'s < .05. Factor 3 (number of meals per day) was significantly related to HDL (.13) and BMI (−.14), all *p*'s < .05. Factor 4 (fat consumption) was significantly related to diastolic blood pressure (− .20), $p < .05$. No other correlations were significant. Data are summarized in Table 5.

LDBQ total change score was significantly related to change in calories (− .28), sodium (−.20), percent calories from protein (.25), all *p*'s < .05. Change in factor 1 (healthy dietary changes) was significantly related to change in calories (−.28), sodium (−.23), percent calories from total fat (−.22), saturated fat (−.18), and monounsaturated fat (−.23), and percent calories from protein (.27), all *p*'s < .05. LDBQ change scores were not related to change scores in clinical measures other than correlation between LDBQ factor 4 and HDL ($r = −.19$), $p < .05$. No other relationships were significant (data available from the authors).

Conclusions

The Latino Dietary Behaviors Questionnaire (LDBQ) is a 13-item self-report measure that assesses four areas of eating behavior: healthy dietary changes; artificial sweeteners in drinks; number of meals per day; and fat consumption. The LDBQ factor structure is relatively stable over time, and the measure correlates significantly and in the expected directions with: 24-HR dietary recall mean scores; clinical variables (i.e. HDL, systolic blood pressure, BMI, HbA1c); and behavioral "food group servings" measure based on 24HR data. The LDBQ is sensitive to dietary change over time, detected greater change in behavior for intervention versus control group, and LDBQ change scores were significantly related to 24HR nutrient change scores. With the exception of HDL, the LDBQ did not predict change over time in biological outcomes, perhaps due to lack of specificity in dietary behavior items that are primary determinants of such change. When attempting to detect change over time in such outcomes, the LDBQ is most appropriately used as an adjunct measure.

The dietary changes summarized here were the outcome of the Latinos en Control intervention, and these significant dietary changes were in turn associated with HbA1c change at 12 months(36) Taken together, the summarized results provide initial validity of LDBQ in a sample of low-income, Spanish-speaking Latinos with type 2 diabetes.

The LDBQ has multiple strengths. It is a brief measure that allows for quick administration in both research and clinical settings, and provides a valid alternative when longer measures (5–8) are not feasible. It focuses on multiple areas of *dietary behaviors*, providing a general index of healthy eating, in contrast to measures of *food frequency* (9–13) and those that focus on a single area of behavior (5, 10, 11). Finally, it was validated in a relatively large, ethnically diverse, low-income, low-literate, Spanish-speaking sample of 252 participants, and has potential for enhancing generalizability of dietary behavior research when implemented in understudied samples such as low income Latinos. Previously validated

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measures have utilized small samples (8, 12, 13), or samples having only one of the demographic characteristics (6, 8, 12) of the LDBQ sample.

Dietary behavior measures that have used methods similar to the LDBQ for establishing psychometric properties (5–8) include the Dietary Risk Assessment (DRA, 49 items); the Food Habits Questionnaire (5) (FHQ; 21 items); the Sister Talk Food Habits Questionnaire (6) (ST-FHQ; 94 items); the Fat and Fiber Behavior Questionnaire (7) (FFBQ; 33 items). Like the LDBQ, the DRA correlated significantly and in the expected direction with the "gold standard" in nutritional assessment: multiple 24-hour dietary recall assessments. More specifically, the DRA was negatively associated with dietary fiber (r = -.57, p < .001) and percent calories from carbohydrates (r = -.47, p < .01), and positively related to an index of the cholesterol-raising potential of participants diet (Keys score, r = .60, p < .001). The FHQ, ST-FHQ, and the FFBQ also examined and supported concurrent validity through correlations with a second measure of food behavior (a food frequency questionnaire). Similar to the LDBQ, the ST-FHQ was able to detect change over 12-month in eating behaviors, and significantly greater change in an intervention versus control group.

The LDBQ is one of very few Spanish-language dietary measures. Food frequency questionnaires have been translated and used in epidemiological studies (e.g. California Health Interview Survey (37), the National Cancer Institute's fruit and vegetable screener (38), but recently two Spanish-language FFQs have been developed: screeners for fat (16 items) and fruits and vegetables (7 items) (12). In contrast to the LDBQ, no validity data have been provided for the Spanish-language screeners, and the samples for the screener development were Mexican American; smaller (N = 93); and younger (M = 36.5 years; range = range 18–71 years) than the LDBQ development sample. Reliability coefficients of the LDBQ first factor at baseline and 12-months (r = .60 and .56, respectively) were comparable to the 7-item fruits and vegetables screener (r = .64) but lower than the 16-item dietary fat screener (r = .85). Thus, the LDBQ is the first measure of dietary behaviors that can be utilized with Spanish-speaking, Latino adults with chronic illness, who have low income and education levels.

There are a few limitations of the LDBQ. The validation sample was primarily female, Spanish-speaking, low-income, low-education, and included individuals of mostly Puerto Rican and Dominican descent. Therefore, the LDBQ has somewhat limited generalizability for men, English-speaking, higher income, and more educated Latinos, and Latino ethnic subgroups. Further, the response options do not offer a "not applicable" category, and may penalize individuals who do not eat or drink certain foods (e.g. question #7 for individuals who do not drink coffee or tea). Finally, the measure was designed for oral administration to be appropriate for very low literate Latinos, however this may impact its cost in practice. However, despite the limitations of the measure, the LDBQ has a number of strengths. The LDBQ is a promising measure of dietary behaviors both at single time points and change over time, for a group that experiences disparities in chronic illnesses in which dietary behavior change is an essential component of treatment.

The LDBQ may be utilized both in the planning of research interventions and as a screener for clinical care of Latinos with diabetes. A lower score in the tool indicates poorer dietary behaviors. At present, cut-off scores for the measure have not been established, and this is an area for future research. Individual items can assist the clinician in prioritize areas of greater concern that can be targeted through interventions. For example, clinicians may engage in dietary fat and cholesterol health education with patients who respond "2 or more times daily" to LDBQ item 1 (How often do you eat fried foods per week?) Its use in low-income Spanish-speaking populations may enhance our ability to target specific dietary

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behaviors associated with nutrient intake, thus potentially improving health among Latinos with chronic disease.

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Appendix

Latino Dietary Behaviors Questionnaire (LDBQ-Spanish)

Entrevistador: Por favor lea TODAS las opciones de respuesta al participante

1. * Cuántas veces come usted comidas fritas por semana?

5. ❒ nunca

4. ❒ menos de una vez por semana

3. ❒ aproximadamente una vez por semana

2. ❒ 2–5 veces por semana

1. ❒ aproximadamente una vez al día

0. ❒ 2 o más veces al día

2. * Cuántas veces toma usted sodas y jugos que contienen azúcar?

5. ❒ nunca

4. ❒ menos de una vez por semana

3. ❒ aproximadamente una vez por semana

2. ❒ 2–5 veces por semana

1. ❒ aproximadamente una vez al día

0. ❒ 2 o más veces al día

3. * Cuántas veces toma usted sodas y jugos de dieta?

5. ❒ nunca

4. ❒ menos de una vez por semana

3. ❒ aproximadamente una vez por semana

2. ❒ 2–5 veces por semana

1. ❒ aproximadamente una vez al día

0. ❒ 2 o más veces al día

4. * Cuántas veces come usted arroz blanco regular o pan blanco? (no de grano entero o integral)

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5. ❒ nunca

4. ❒ menos de una vez por semana

3. ❒ aproximadamente una vez por semana

2. ❒ 2–5 veces por semana

1. ❒ aproximadamente una vez al día

0. ❒ 2 o más veces al día

5. Cuántas veces toma usted leche de 1% o leche sin grasa (skim)?

0. ❒ Rara vez o nunca

1. ❒ Algunas veces

2. ❒ Bastantes veces

3. ❒ Todo el tiempo

6. Cuántas veces come usted dulces que tienen azúcar de dieta? (como Splenda, Equal o Sweet& Low) (incluyendo postres, golosinas, caramelos, pasteles y helados)

0. ❒ Rara vez o nunca

1. ❒ Algunas veces

2. ❒ Bastantes veces

3. ❒ Todo el tiempo

7. Cuántas veces toma usted café o té sin azúcar o con azúcar de dieta? (Splenda, Equal, Sweet& Low)

0. ❒ Rara vez o nunca

1. ❒ Algunas veces

2. ❒ Bastantes veces

3. ❒ Todo el tiempo

8. * Cuántas veces come usted pollo con la piel (pellejo)?

3. ❒ Rara vez o nunca

2. ❒ Algunas veces

1. ❒ Bastantes veces

0. ❒ Todo el tiempo

9. Cuántas veces controla usted la cantidad de comida que come? O trata de comer porciones pequeñas?

0. ❒ Rara vez o nunca

1. ❒ Algunas veces

2. ❒ Bastantes veces

3. ❒ Todo el tiempo

10. Cuántas veces cambia o modifica usted sus comidas para hacerlas mas saludables?

0. ❒ Rara vez o nunca

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1. ❒ Algunas veces
2. ❒ Bastantes veces
3. ❒ Todo el tiempo

11. Cuántas veces come usted un desayuno completo, y no solo café y galletas?

0. ❒ Rara vez o nunca
1. ❒ Algunas veces
2. ❒ Bastantes veces
3. ❒ Todo el tiempo

12. Cuántas comidas completas come usted al día casi todos los días? (no incluir meriendas o lo que pica durante el día)

(Interviewer: breakfast ought to include more than just coffee and crackers)

1. ❒ Una sola comida completa (Desayuno completo, o almuerzo, o cena)

2. ❒ Dos comidas completas solamente (Almuerzo/cena, o desayuno/cena, o desayuno/almuerzo)

3. ❒ Tres comidas completas (Desayuno, almuerzo y cena)

13. * Cuántas veces al mes come usted desayuno, almuerzo o cena que han sido preparadas fuera de su casa como en un restaurant o lugar de comida rápida? (como McDonald's, Burger King, Wendy's, Arby's, Pizza Hut or Kentucky Fried Chicken) (NO INCLUIR meals-on-wheels)

0. Mas de tres veces al mes
1. 2–3 veces al mes
2. Una ves al mes
3. Casi nunca o menos de una vez al mes

Note. *Items marked with an asterisk are reverse scored.

Latino Dietary Behaviors Questionnaire (LDBQ-English)

Interviewer: Please read ALL response options to the participant

1. * How often do you eat fried foods per week?

5. ❒ never
4. ❒ less than once a week
3. ❒ about once a week
2. ❒ 2–5 times per week
1. ❒ about once a day
0. ❒ 2 or more times per day

2. * How often do you drink regular soft drinks or soda pop? (includes regular soda and regular juices)

5. ❒ never
4. ❒ less than once a week

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3. ❒ about once a week

2. ❒ 2–5 times per week

1. ❒ about once a day

0. ❒ 2 or more times per day

3. * How often do you drink diet soft drinks or soda pop (including diet soda and juices)

5. ❒ never

4. ❒ less than once a week

3. ❒ about once a week

2. ❒ 2–5 times per week

1. ❒ about once a day

0. ❒ 2 or more times per day

4. * How often do you eat regular white rice or white bread? (not whole grain)

5. ❒ never

4. ❒ less than once a week

3. ❒ about once a week

2. ❒ 2–5 times per week

1. ❒ about once a day

0. ❒ 2 or more times per day

5. How often do you drink 1% or skim milk?

0. ❒ Rarely or never

1. ❒Sometimes

2. ❒ Many times

3. ❒ All of the time

6. How often do you eat sweets with artificial sweeteners? (like Splenda, Equal, or Sweet& Low) (including desserts, candies, pastry and ice cream)

0. ❒ Rarely or never

1. ❒Sometimes

2. ❒ Many times

3. ❒ All of the time

7. How often do you drink coffee or tea without sugar OR with artificial sweeteners (like Splenda, Equal, or Sweet & Low)?

0. ❒ Rarely or never

1. ❒ Sometimes

2. ❒ Many times

3. ❒ All of the time

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8. * How often do you eat chicken with the skin?

3. ❒ Rarely or never

2. ❒ Sometimes

1. ❒ Many times

0. ❒ All of the time

9. How often do you control the amount of food that you eat? Or try to eat smaller portions?

0. ❒ Rarely or never

1. ❒ Sometimes

2. ❒ Many times

3. ❒ All of the time

10. How often do you change your foods to make them healthier?

0. ❒ Rarely or never

1. ❒ Sometimes

2. ❒ Many times

3. ❒ All of the time

11. How often do you eat a complete breakfast, and not just coffee and crackers?

0. ❒ Rarely or never

1. ❒ Sometimes

2. ❒ Many times

3. ❒ All of the time

12. How many complete meals do you eat during the day almost every day? (do not include snacks or what you pick at during the day? (Interviewer: breakfast ought to include more than just coffee and crackers)

1. ❒ Only one complete meal (Complete breakfast, or lunch, or dinner)

2. ❒ Two complete meals only (Lunch/dinner, or breakfast/dinner, or breakfast/lunch)

3. ❒ Three complete meals (Breakfast, lunch and dinner)

13. * How many times in a week or month do you eat breakfast, lunch or dinner prepared at restaurants or fast food places? (such as McDonald's, Burger King, Wendy's, Arby's, Pizza Hut or Kentucky Fried Chicken; DO NOT include meals-on wheels)

0. 3 or more times per month

1. 2–3 times per month

2. 1 time per month

3. Almost never or less than 1 time per month

Note. *Items marked with an asterisk are reverse scored.

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Table 1

Baseline Demographic and Clinical Characteristics (n = 252)

	Means (SD) or Frequencies (%)
Demographic Characteristics	
Age (SD; Range)	55.2 years (11.2 years; 21–82)
Female, n (%)	193 (76.6%) ^
Ethnicity (Family Origin), n (%)	
Puerto Rico, n (%)	226 (91.5%)
Dominican Republic, n (%)	11 (4.5%)
Other, n (%)	10 (4.1%)
Marital Status	
Married/Living as Married, n (%)	96 (39.0%)
Language	
Spanish-speaking	252 (100.0%)
Able to speak English without an interpreter	(4.1%)
Education Level	
< 4th grade, n (%)	70 (28.0%)
5–8th grade, n (%)	70 (28.0%)
9–12th grade (not HS graduate), n (%)	48 (19.2%)
≥High School Degree, n (%)	62 (24.8%)
Employment Status:	
Employed Full or Part-Time, n (%)	26 (11.3%)
Unemployed/looking for job, n (%)	8 (3.5%)
Retired, n (%)	25 (10.9%)
Disabled, n (%)	142 (61.7%)
Homemaker, n (%)	29 (12.6%)
Insurance Status: Have Insurance	240 (95.3%)
Annual household income:^	
< 10k/year, n (%)	120 (55.3%)
Clinical Characteristics	
HbA1c (SD)	8.98% (1.87%)
Mean BMI (SD)	34.76 (6.95)
Mean Weight (SD)	192.17 lbs (39.95 lbs)
Waist circumference (SD)	111.6 cm (13.94 cm)
Blood pressure	
Systolic (SD)	137.97 mm Hg (16.88 mm Hg)
Diastolic (SD)	74.88 mm Hg (9.28 mm Hg)
Total cholesterol (SD)	181.56 mg/dL (46.36 mg/dL)
Triglycerides (SD)	156.04 mg/dL (110.76 mg/dL)
LDL (SD)	106.65 mg/dL (38.04 mg/dL)
HDL (SD)	44.31 mg/dL (9.34 mg/dL)

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Note.

^35 participants did not provide household income data

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Table 2

Latino Dietary Behavior Questionnaire (LDBQ): Summary of Exploratory Factor Analysis Results, Means, and Standard Deviations

	Factor Analysis Summary: Baseline (12 Months)[#]				
	Factor I: Healthy Dietary Changes	Factor II: Artificial Sweeteners in Drinks	Factor III: Number of Meals per Day	Factor IV: Fat consumption	
Eigenvalue	2.45 (2.33)	1.38 (1.42)	1.21 (1.32)	1.06 (1.10)	
Percent Variance Explained	18.87 (17.93)	10.63 (10.94)	9.27 (10.17)	8.13 (8.43)	
	Factor Loadings Summary: Baseline (12 Months)[#]				
	Factor I: Healthy Dietary Changes	Factor II: Artificial Sweeteners in Drinks	Factor III: Number of Meals per Day	Factor IV: Fat consumption	
1. Eat fried foods	.67 (.72)				
4. Eat white rice or bread	.40 (.56)				
9. Control amount of food eaten, smaller portions	−.66 (−.62)				
10. Change foods to make healthier	−.66 (−.52)				
13. Times eat out per month	.54			(.72)	
2. Drink regular soda	(.56)	−.44			
3. Drink diet soda		.66	(.77)		
7. Drink coffee/tea w/o sugar or w/artificial sweetener		.72			
11. Eat complete breakfast		(.73)	.70		
12. Number complete meals		(.75)	.75		
5. Drink 1% or skim milk		(.39)		.65	
6. Eat sweets with artificial sweetener			(.65)	.70	
8. Eat chicken with skin			(−.29)	−.44	
	Score Summary[^]				
	Factor I: Healthy Dietary Changes	Factor II: Artificial Sweeteners in Drinks	Factor III: Number of Meals per Day	Factor IV: Fat consumption	Total LDBQ
Possible	0.00 – 19.00	0.00 – 13.00	0.00 – 6.00	0.00 – 9.00	0.00 – 47.00

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Baseline (SD)	9.06 (3.49)	7.45 (2.78)	2.85 (1.45)	3.65 (1.87)	22.94 (5.93)
12 Month (SD)	11.64 (3.40)	8.42 (2.65)	3.38 (1.56)	4.40 (1.71)	27.66 (5.83)
p	<.01**	<.01**	<.01**	<.01**	<.01**

Notes.

#For factor analyses and factor loadings summaries, data in parentheses are values at 12-month time point.

*$p < 0.05$ level;

**$p < 0.01$.

^See text for detailed scoring directions.

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Table 3

24 Hour Recall Nutrient Scores

	Nutrient Guidelines[#]	24 Hour Recall Nutrient Score		*p*
		BL (SD)	12 MO (SD)	
Energy (Kcal)	[^]see note	1700.72 (568.26)	1632.11 (503.34)	.19
Total Dietary Fiber (g/Kcal)	14/1000	15.06 (6.24)	16.22 (6.54)	.06
Sodium (mg)	<2300	3373.95 (1350.45)	3320.35 (1192.75)	.67
% Calories from Fat	25–35%	30.13 (5.97)	28.15 (5.12)	<.01**
% Calories from Carbohydrate	45–65%	52.88 (7.11)	53.75 (6.84)	.21
% Calories from Protein	10–30%	17.43 (3.55)	18.57 (4.16)	<.01**
% Calories from SFA	<7%	9.62 (2.49)	8.79 (2.36)	<.01**
% Calories from MUFA	10–20%	11.25 (2.66)	10.55 (2.75)	<.01**
% Calories from PUFA	5–10%	6.62 (2.24)	6.35 (2.08)	.19
% Calories from TSFA	<1%	1.52 (.86)	1.29 (.77)	<.01**

Notes.

[#]Source of nutrient guidelines: Dietary Guidelines for Americans, 2005 [29].

[^]nutrient guidelines for energy = consume kcal appropriate to height, weight, and energy expenditure [29]. % = percent; SFA = Saturated Fat; MUFA = Mono unsaturated fat; PUFA = Poly unsaturated fat; TSFA = Transaturated Fat.

*$p < 0.05$ level;

**$p < 0.01$.

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Table 4

Correlations between Latino Dietary Behavior Questionnaire Total and Factor Scores and 24-Hour Recall Data

	Correlation Summary: Baseline (12 Month)[#]				
	Factor I: Healthy Dietary Changes	**Factor II: Artificial Sweeteners in Drinks**	**Factor III: Number of Meals per Day**	**Factor IV: Fat consumption**	**Total LDBQ**
Energy (Kcal)	−.39** (−.42**)	−.29** (−.11)	.11 (.03)	−.11 (−.14)	−.34** (−.29**)
Total Dietary Fiber (g/Kcal)	−.08 (.03)	−.004 (.03)	.19** (.14)	−.02 (.04)	−.02 (.08)
Sodium (mg)	−.30** (−.41**)	−.24** (−.09)	.11 (−.04)	−.08 (−.14)	−.25** (−.30**)
% Calories from Fat	−.16* (−.43**)	−.09 (−.09)	−.12 (−.13)	−.02 (−.15*)	−.10 (−.31**)
% Calories from Carbohydrate	.07 (.22**)	.07 (.00)	.05 (.02)	.03 (.04)	.06 (.10)
% Calories from Protein	.17* (.34**)	.03 (.19**)	.09 (.16*)	.05 (.19**)	.12 (.37**)
% Calories from SFA	−.16* (−.39**)	−.10 (−.15**)	−.12 (−.16*)	−.05 (−.13)	−.14 (−.32**)
% Calories from MUFA	−.06 (−.30**)	−.02 (−.07)	−.09 (−.13)	.04 (−.10)	.006 (−.22**)
% Calories from PUFA	−.14 (−.31**)	−.05 (.06)	−.07 (−.01)	−.04 (−.12)	−.11 (−.18*)
% Calories from TSFA	−.06 (−.21**)	.03 (−.06)	−.02 (−.05)	.15* (−.006)	.06 (−.16*)

Note.

[#]Data in parentheses are correlations at 12-month time point. % = percent; SFA = Saturated Fat; MUFA = Mono unsaturated fat; PUFA = Poly unsaturated fat; TSFA = Transaturated Fat.

*$p < 0.05$ level;

**$p < 0.01$. When interpreting correlation size and direction (alone or in contrast to other correlations in the table), please note that it is advisable to interpret only the significant correlations.

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Table 5

Baseline Correlations between Latino Dietary Behavior Questionnaire Total and Clinical Data

	Factor I: Healthy Dietary Changes	Factor II: Artificial Sweeteners in Drinks	Factor III: Number of Meals per Day	Factor IV: Fat consumption	Total LDBQ
HbA1c	−.11	−.20**	−.03	−.04	−.16*
SBP	.02	.14*	.05	−.10	.02
DBP	−.15*	−.10	−.01	−.20**	−.24**
HDL	.16*	.10	.13*	−.05	.17*
LDL	−.02	−.02	−.07	−.003	−.09
BMI	−.03	−.06	−.14*	−.009	−.03

Note. HbA1c = hemoglobin A1c; SBP = systolic blood pressure; DBP = diastolic blood pressure; HDL = high-density lipoprotein; LDL = low-density lipoprotein; BMI = body mass index.

* $p < 0.05$ level;

** $p < 0.01$.

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