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Correlates of Self-Care in Low-Income African American and Latino Patients with Diabetes

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Abstract

Objective—Examine diabetes self-care (DSC) patterns in low-income African American and Latino patients with type 2 diabetes attending primary care clinics, and identify patient-related, biomedical/disease-related, and psychosocial correlates of DSC.

Methods—Cross-sectional analysis of survey data from African Americans and Latinos aged ≥18 years with type 2 diabetes (*n*=250) participating in a diabetes self-management intervention at four primary care clinics. The Summary of Diabetes Self-Care Activities captured the subcomponents of healthy eating, physical activity, blood sugar testing, foot care and smoking. Correlates included patient-related attributes, biomedical/disease-related factors, and psychosocial constructs, with their multivariable influence assessed with a three-step model building procedure using regression techniques.

Results—Sample baseline characteristics were: Mean age of 53 years (*SD*=12.4); 69% female; 53% African American and 47% Hispanic; 74% with incomes below $20,000; and 60% with less than a high school education. DSC performance levels were highest for foot care (4.5/7 days) and lowest for physical activity (2.5/7 days). Across racial/ethnic subgroups, diabetes-related distress was the strongest correlate for diabetes self-care when measured as a composite score. Psychosocial factors (e.g., diabetes distress) accounted for 14–33% of variance in self-care areas for both racial/ethnic groups. Patient characteristics were more salient correlates in Hispanic/

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Latinos when examining the self-care subscales, particularly those requiring monetary resources (e.g., glucose monitoring).

Conclusions—Important information is provided on specific DSC patterns in a sample of ethnic/racial minorities with type 2 diabetes. Significant correlates found may help with identification and intervention of patients who may benefit from strategies aimed at increasing self-care adherence.

Keywords

diabetes self-care; minorities; biopsychosocial factors; correlates; type 2 diabetes

Diabetes self-care is critical to overall management of diabetes and to optimization of disease-related outcomes (Harris, 1998; Norris, Lau, Smith, Schmid, & Engelgau, 2002). Enhanced patient engagement in self-care activities is associated with significant improvement in metabolic control and reductions in disease-related events, hospitalizations, and mortality (Asche, LaFleur, & Conner, 2011; Schectman, Nadkarni, & Voss, 2002). Despite health benefits associated with greater adherence to the recommended levels of diabetes self-care, patient adherence remains relatively low, with marked disparities among low socioeconomic and ethnic minority populations, who often do not meet the national guidelines as established by the multidisciplinary Professional Practice Committee of the American Diabetes Association (ADA) (Choi, Lee, & Rush, 2011; Levine et al., 2009; Nwasuruba, Khan, & Egede, 2007). Meta-analytic techniques have documented racial disparities in glucose self-monitoring, with minority subgroups consistently displaying lower self-monitoring rates (Kirk, Graves, Bell, Hildebrandt, & Narayan, 2007). When compared to their White peers, there is also evidence of reduced adherence to dietary and physical activity (PA) recommendations among African American and Hispanic/Latino subpopulations. Data from the Behavioral Risk Factor Surveillance Survey (BRFSS) provides additional evidence documenting lower performance levels across multiple diabetes self-care (DSC) behaviors (i.e., diet, PA, and foot care) among ethnic/racial minority groups (Thackeray, Merrill, & Neiger, 2004).

Due to the lower diabetes self-care performance levels among low socioeconomic populations and ethnic/racial minorities, there is urgent need to identify contributing patient-related attributes, biomedical/disease-related, and psychosocial factors. A comprehensive understanding of the mutable and non-mutable factors impacting individual behavior can lead to more targeted and relevant interventions to support diabetes self-care. To our knowledge, there is a paucity of published studies simultaneously exploring patient-related attributes, biomedical/disease-related, and psychosocial factors affecting DSC practices among minority adults with low socioeconomic status residing in the United States (Parada, Horton, Cherrington, Ibarra, & Ayala, 2012). The abovementioned correlates are derived from multiple established theories (e.g., Bandura's Social Cognitive Theory) that have shown predictive ability when examining DSC behavior in racial/ethnic minority groups. Nonetheless, the correlates of DSC in racial/ethnic minority groups have not been thoroughly examined. Informed by the limited evidence available, the aims of the current study are to: (1) examine the DSC patterns among low-income African American and Hispanic/Latino patients with type 2 diabetes attending primary care clinics, and (2) identify

the patient-related attributes, biomedical/disease-related factors, and psychosocial correlates of diabetes self-care within each minority subgroup.

Methods

Participants

This study used a cross-sectional correlational design to examine the association between DSC and measures capturing patient-related attributes, biomedical/disease-related, and psychosocial factors. Data comes from the baseline assessment of a randomized control trial (RCT) with an overall goal to evaluate the effectiveness of a diabetes self-care coaching intervention delivered by certified medical assistants compared with enhanced usual care.

Eligible participants were recruited from primary care clinics of four federally qualified health centers in Chicago. Inclusion criteria for participants were:

- Latino or African American;
- Age ≥ 18 years;
- Fluent in English or Spanish;
- Most recent glycated hemoglobin (A1C) value ≥ 6.5%;
- Ability to provide informed consent;
- Diagnosis of type 2 diabetes (fasting plasma glucose ≥ than 126 mg/dl, oral glucose tolerance test 2 hour post-load glucose ≥ 200 mg/dl, or diabetes symptoms and random plasma glucose ≥ 200 mg/dl) for at least six months as determined through patient medical records; and
- Use of hypoglycemic medication (insulin, oral agents, or both).

Exclusion criteria included:

- Pregnant, or planning a pregnancy during the study period;
- As determined by a health center physician, comorbid medical or mental health conditions or serious complications of diabetes that might impact participation; and
- Non-availability by phone.

Approval for the study was obtained through the Institutional Review Board (IRB) at the University of Illinois at Chicago.

Measures

Self-report survey data (patient-related attributes, biomedical/disease-related factors, psychosocial constructs) was collected using an interactive touchscreen tablet computer, with available assistance from trained bilingual staff. Glycemic control (i.e., A1C) was determined via medical chart abstraction or by fingerstick (Bayer DCA 2000). Measurement instruments previously published in the Spanish language appropriate for Hispanic/Latinos of Mexican and Central American origin, which demonstrated acceptable reliability and validity, were used in their published forms. Instruments for which there was not a

previously-tested published Spanish-version were front and back translated by a certified translator.

Outcome Variable of Self-Care

The Summary of Diabetes Self-Care Activities Measure (SDSCA) was used to assess DSC (Toobert, Hampson, & Glasgow, 2000). The instrument captures the self-care subcomponents of healthy eating, PA, blood sugar testing, medication use, foot care, and smoking. The SDSCA was found to have adequate internal reliability within the identified subscales, moderate test-retest reliability, and adequate construct validation when correlated to multiple scales measuring both diet and exercise; less robust results were obtained when capturing use of hypoglycemic medication. The Spanish-version SDSCA was found to have language equivalency with the English-version, with correlation values ranging from 0.78 to 1.00 across subscales (Vincent, McEwen, & Pasvogel, 2008). Test-retest reliability for the Spanish-version ranged from 0.51 to 1.00, with a Cronbach's alpha of 0.68. With the exception of smoking status (i.e., current vs. not current smoker), items for each of the self-care behaviors captured frequency of adherence from 0 to 7 days. As reported by the original authors (Toobert et al., 2000), and confirmed by the distribution of observed values in the current dataset, the SDSCA items capturing medication use displayed a ceiling effect with most survey participants reporting optimal levels of medication use. For this reason, medication adherence was excluded as a self-care outcome in the current study. Reliability for the current study was adequate across most self-care subscales: $\alpha = 0.58$ (composite score), $\alpha = 0.85$ (general diet), $\alpha = 0.27$ (specific diet), $\alpha = 0.71$ (PA), $\alpha = 0.88$ (blood glucose self-testing), and $\alpha = 0.66$ (foot care).

Independent Predictor Variables

Independent variables were categorized as: patient-related attributes, biomedical/disease-related factors, and psychosocial constructs.

Patient-related Attributes—Patient-related attributes included age, gender, income, education and insurance status (insured vs. not-insured).

Biomedical/Disease-related Factors—Body mass index (BMI) was calculated using self-reported values of height and weight. Three items captured diabetes-related disease factors. The first item inquired about current use of prescription insulin with a dichotomous response option (i.e., yes or no). Second, long-term glycemic control was measured using values of A1C. When available, laboratory values for A1C were recorded from the health system computerized medical records; laboratory values were measured using the Bio-Rad Variant II A1C assay. A1C levels not obtained or recorded by attending clinicians were instead obtained by research staff using the DCA 2000+ Analyzer from Bayer (Mishawaka, IN). The DCA 2000+ Analyzer has been found to provide a reliable measure of A1C values in point-of-care testing (St John, Davis, Goodall, Townsend, & Price, 2006). Both the DCA 2000+ and the Bio-Rad Variant II A1C assays are certified by the National Glycohemoglobin Standardization Program (NGSP) laboratory standards and are consistent with the Diabetes Control and Complications Trial (DCCT) A1C methodology (NGSP, 2013). When participants had both DCA 2000+ and laboratory A1C values recorded, only

the laboratory values were entered into the database for analysis. Finally, participants identified the number of people with diabetes currently living within their household, with categorical response options of “none,” “one,” or “more than one.”

Psychosocial Factors—The Diabetes Distress Scale (DDS) was used to assess diabetes-related emotional distress among patients with diabetes (Polonsky et al., 2005). Participants were asked to rate a statement (e.g., not feeling confident in my day-to-day ability to manage diabetes) on a six-point Likert Scale ranging from *not a problem* to *a very serious problem*. The 8-item Diabetes Empowerment Scale-Short Form (DES-SF), created by Anderson et al. (2003) was used to capture psychosocial self-efficacy of individuals with diabetes.

Statistical Analyses

Data analysis was performed using SAS statistical software (SAS 9.1 for Windows; SAS, Inc., Cary, NC). While 266 patients enrolled in the RCT, our sample included 250 patients with complete self-report data. Stratified by race/ethnicity, descriptive statistics summarize baseline characteristics of patient sample across the independent variables (patient-related attributes, biomedical/disease-related factors, psychosocial constructs) and the self-care outcomes of interest. Inferential statistics were separately conducted for each of the self-care subcomponents, along with examination of a derived composite self-care score (Trief et al., 2013) through aggregation of the components of diet, PA, blood glucose testing, and foot care. Given the non-normal distribution of the dependent variable(s), Poisson regressions were used for the non-binary behavioral subcomponents of the SDSCA, and logistic regression was used for the binary self-care behavior of smoking.

To identify the multivariable influence of the patient-related attributes, biomedical/disease-related factors, and psychosocial constructs, regression techniques were used for model building using a three-step modeling procedure. Modeling procedures were stratified by race/ethnicity (African American vs. Hispanic/Latino). Only patient-related attributes were included in the first model; this was followed by the addition of biomedical/disease-related factors and addition of psychosocial constructs in the third and final model (Model 1—Patient-related attributes; Model 2—Patient-related attributes + Biomedical/disease-related factors; and Model 3—Patient-related attributes + Biomedical/disease-related factors + Psychosocial constructs). Likelihood ratio tests were performed to determine goodness-of-fit across the modeling procedures. Imputation was used, given that reductions in sample size were evident, given missing data across the selected correlates. With correlates individually missing ≤ 10 observations, mean value substitution was used for continuous variables, while missing categorical values were replaced with the mode (Little & Rubin, 1987). Only income was excluded in the model building procedure, as it was considerably underreported, but correlational analyses with available information on income revealed a significant association with education status. We also examined a subset of differential correlates between psychosocial factors (i.e., diabetes distress and psychosocial self-efficacy) and self-care as a function of ethnicity, while controlling for other demographic variables. This was accomplished by adding interaction terms involving ethnicity (e.g., ethnicity * diabetes distress) into the regression model. Finally, sensitivity analyses were conducted to examine

the effects of imputation on the model building procedures across self-care outcomes, and the variance inflation factor was used to identify and address issues of multicollinearity.

Results

Baseline Characteristics of the Study Sample

The study included 250 participants. Table 1 presents the baseline characteristics for the total sample, along with stratification by race/ethnicity. The sample was primarily composed of females (68.8%) and ranged in age from 25 to 86 years (M = 53.1, SD = 12.4). Fifty-three point two percent (53.2 %) self-reported African American descent and 46.8% self-identified as Latinos. This subpopulation was predominantly of low socio-economic status. Overall, 60.4% had less than a high school education, and 73.6% had an income below $20,000. For the total sample, the mean BMI score was 33.2 ± 7.1; the average A1C value was 8.6 ± 2.4; and over one-third of participants reported insulin use. Eighty-two point four percent (82.4%) reported having at least one family member with diabetes within the household. In unadjusted analyses, compared to the Hispanic/Latino subgroup, African Americans evidenced greater education levels ($p < 0.01$), higher prevalence of health insurance coverage ($p = 0.02$), poorer glycemic control ($p < 0.01$), and more frequent prescribed insulin use ($p < 0.01$).

Table 1 also presents descriptive statistics for the psychosocial and DSC measures. For instance, the total mean score for the diabetes distress scale was slightly below the established cutoff, indicating the need for clinical referral (i.e., DDS ≥ 3). Racial/ethnic differences were observed for diabetes-related psychosocial self-efficacy, with higher mean values for Hispanic/Latinos than African Americans (3.9 vs. 3.6 respectively, $p < 0.01$). Overall, self-reported DSC performance levels were highest for foot care (i.e., 4.5/7 days) and lowest for PA (2.5/7 days). Twenty-two percent (22%) of the adults with type 2 diabetes identified themselves as current smokers. Racial/ethnic differences were observed across self-care behaviors. African Americans had higher engagement levels of blood glucose self-testing and greater prevalence of smoking behavior, but were less likely to perform healthy dietary behaviors associated with consumption of fruit/vegetables and high fat foods (i.e., specific diet). For blood glucose self-testing and smoking, racial/ethnic differences remained significant after adjustment for patient-related attributes, biomedical/disease-related factors, and psychosocial constructs (not shown).

Correlates of Diabetes Self-Care by Race/Ethnicity

Stratified by race/ethnicity, correlates of diabetes self-care are presented for the total self-care score and associated subscales (i.e., diet, PA, blood glucose self-testing, foot care, and smoking). Given the observed consistency in correlates across the model building procedures, descriptions are provided only for the fully adjusted models. The presence of differential correlates of diabetes distress on glucose self-testing was evidenced by significant diabetes distress×ethnicity interaction effects in the model, after adjustment for patient-related factors (i.e., age, education status). A significant interaction was seen between race/ethnicity and distress ($\beta = -0.158$, $p = 0.007$), such that distress was more

strongly associated with glucose testing in the African American cohort. Note that these effects are not presented in the table.

African Americans

Total Self-Care Score—Only psychosocial factors were associated with engagement in self-care activities when using the total score. Statistical significance was evident only for diabetes-related distress in the African American population (β = −0.146, $p = 0.001$), with an associated increase of 12% in variance explained.

General Diet—In the fully adjusted model (Model 3), correlates significantly associated with general diet in the African American population included age, educational status, and diabetes distress. Specifically, greater levels of general diet behaviors were evidenced with increasing age (β = 0.011, $p = 0.009$), greater educational attainment (β = −0.206, $p = 0.02$), and lower levels of diabetes-related distress (β = −0.202, $p < 0.0001$).

Specific Diet—Diabetes-related distress was the only covariate significantly associated with self-reported consumption of fruit/vegetables and high fat foods in the African American population (β = −0.102, $p = 0.02$). Characterized by greater consumption of fruit/vegetables and lower consumption of high-fat foods, those reporting lower levels of distress displayed greater adherence to specific diet behaviors.

Physical Activity—Significantly lower engagement in PA was seen with increasing participant age (β = −0.015, $p = 0.002$), higher BMI scores (β = −0.021, $p = 0.01$), among non-insulin users (β = −0.284, $p = 0.02$), less favorable psychosocial well-being (i.e., higher distress [β = −0.187, $p = 0.0005$]), and lower self-efficacy levels (β = 0.222, p=0.018).

Blood Sugar Testing—Greater testing in the African American group was seen among women (β = 0.225, $p = 0.02$), those with lower levels of education (i.e., > high school vs. college or post graduate education) (β = 0.248, $p = 0.03$), and among patients with lower levels of diabetes-related distress (β = −0.163, $p = 0.0001$). Inclusion of psychosocial factors for the African American group increased the amount of variance explained for the outcome measure of blood glucose testing by 10%.

Foot Care—Engagement in foot care was significantly associated with insulin use, diabetes distress, and psychosocial self-efficacy. Specifically, greater performances of foot care activities were seen for those currently using insulin (β = −0.323, $p = 0.0006$), and those with lower levels of distress (β = −0.104, $p = 0.01$) or higher levels of self-efficacy (β = 0.198, $p = 0.005$). Inclusion of psychosocial variables increased the magnitude of variance explained by 12% ($p < 0.001$).

Smoking—A significant correlate explaining the variance found in smoking behavior was only evidenced for the African American group. Odds of smoking were higher for those with lower BMI values (OR = 0.92, 95% CI—0.86–0.98).

Hispanics/Latinos

Total Self-Care Score—Displaying a trend toward significance (p = 0.07), a negative association was evident between diabetes-related distress and self-care adherence when assessed using the composite score.

General Diet—In the Hispanic/Latino population, only diabetes distress was significantly associated with engagement in general diet behaviors (β = −0.116, *p* = 0.005). The coefficient of determination (r^2) was greatest in magnitude in the fully adjusted model (i.e., 0.13 Model 2 vs. 0.20 Model 3) which additionally considered the psychosocial construct of diabetes-related distress.

Specific Diet—Educational status (β = 0.502, *p* = 0.02) was the only correlate significantly associated with performance of specific dietary behaviors. Compared to those with some college or postgraduate education, higher performance of specific diet behaviors (i.e., healthful consumption of fruit/vegetables and decreased high fat foods) was seen for those with less than a high school education.

Physical Activity—In the Hispanic/Latino group, lower performance of PA was observed in participants with higher BMI scores (β = −0.025, *p* = 0.04) and greater levels of diabetes distress (β = −0.131, *p* = 0.01). Additionally, compared to those with no family member with diabetes residing in the household, lower PA engagement levels were evidenced among those with one household member with previously diagnosed diabetes (β = −0.475, *p* = 0.004).

Blood Sugar Testing—Health insurance status and insulin use were the only significant predictors of blood glucose self-testing in Hispanic/Latino adults, with more frequent testing among those with health insurance (β=−0.468, *p*<0.0001) and prescribed insulin use (β= −0.429, *p*=0.003). Of the two correlates, insurance status explained a greater amount of variance.

Foot Care—Significantly higher levels of foot care were observed among those with lower levels of education (<HS: β = 0.419, *p* = 0.04 and HS/GED: β = 0.529, *p* = 0.04) and those with lower levels of diabetes distress (β = −0.116, *p* = 0.002). Inclusion of psychosocial correlates in the Poisson modeling procedure increased the magnitude of variance explained by 7%.

Discussion

We examined diabetes self-care patterns for African American and Hispanic/Latino patients with type 2 diabetes, along with stratified analyses to identify the associated patient-related, biomedical/disease-related, and psychosocial correlates. This discussion comments on the observed self-care patterns and highlights the most salient correlates evidenced for each racial/ethnic group, (i.e., African Americans vs. Hispanics/Latinos). It also focuses on diabetes-related distress, as this factor spanned both subgroups. Practice-based implications are offered.

Engagement in self-care activities for the total sample, and across racial/ethnic groups, was lowest for PA (2.48 days/week) and highest for foot care (4.53 days/week). This is consistent with findings documenting greatest adherence to diabetes medication and low engagement in PA (Delamater, 2006; Ruggiero et al., 1997). Greater efforts are needed to increase PA, as this may help improve glycemic control (Sigal, Kenny, Wasserman, Castaneda-Sceppa, & White, 2006; Snowling & Hopkins, 2006) and help prevent or delay diabetes-related complications (Boule, Haddad, Kenny, Wells, & Sigal, 2001; Hayes & Kriska, 2008; Sigal et al., 2006). Lynch et al. (2012) recommended that health care practitioners provide detailed instructions on type, intensity, and duration of PA as ethnic/minority groups often express a superficial understanding of their PA needs. Diabetes self-care support programs targeting improvements in PA adherence may benefit from incorporating social support—through inclusion of family and friends—as this is a promising motivational tool for underserved populations (i.e., African Americans and Hispanic/Latino) (Belza et al., 2004; Dunn, 2008; Mier, Medina, & Ory, 2007).

First, we discuss correlates observed in the African American subgroup. Although not explaining a substantial magnitude of variance observed across self-care behaviors, patient attributes and biomedical/disease-related correlates emerged for the African American subgroup. Lower PA levels were evidenced with increasing age (Sallis, 2000). This is consistent with previous findings documenting older adults as the least active age group (Centers for Disease & Prevention, 2005), with only 22% of older adults (65+) self-reporting engagement in leisure-time PA; age-related impairments in mobility and health-related detriments are documented as contributing factors (Federal Interagency Forum on Aging-Related Statistics, July 2010). In contrast, increased age was related to greater scores for dietary behavior in the African American group. This is consistent with literature reporting improvements in dietary quality with age, particularly as evident among the oldest old (75 + years) (Federal Interagency Forum on Aging-Related Statistics, July 2010). Insulin users were more likely to engage in PA and foot care activities. If perceived as a sign for disease progression, insulin users may be more motivated to implement lifestyle modifications. It is also possible that insulin users receive more diabetes self-care education and support from their health care provider.

Distinct correlates emerged for the Hispanic/Latino subgroup. Consistent with our findings on glucose self-monitoring, Hispanics/Latinos often identify lack of health insurance as a barrier to engaging in some self-care activities, particularly those with an associated monetary expense (Huang et al., 2009; Lynch et al., 2012). In one study, 71% of Hispanics/Latinos reported concern regarding the cost of medication and glucose-monitoring equipment, compared with 52% of Whites and 51% of African Americans (Huang et al., 2009). Although only displaying a trend toward significance, we observed a similar pattern for PA in the Hispanic/Latino subgroup, supporting the literature documenting cost as a barrier, particularly as Hispanic/Latinos are more inclined toward use of a workout facility and exercise instructor (Orzech, Vivian, Huebner Torres, Armin, & Shaw, 2013). Residing with a family member with diagnosed diabetes was associated with lower PA. Further research is needed to understand this finding, particularly in light of the potential impact of social support on diabetes self-care in ethnic minorities. Finally, lower levels of education

were at times related to greater self-care activities (e.g., foot care). Further research is needed to elucidate the negative association between education status and self-care.

Psychosocial factors, particularly diabetes-related distress, were common in both ethnic/ groups. Diabetes-related distress was strongly associated with DSC across multiple behavioral subscales. In the African American subgroup, diabetes distress was negatively associated with engagement in dietary behaviors, PA, blood glucose self-testing, and foot care. Similarly, among Hispanics/Latinos, a negative association was evident between diabetes distress and the self-care areas of dietary behavior, PA and foot care. Our finding that psychosocial factors accounted for 14–33% of the variance across self-care metrics is consistent with the literature. For example, Wilson et al. (1986) found that psychosocial factors accounted for ~18–24% of the variance observed in self-care behavior in a community sample composed primarily of non-Hispanic White adults. Finally, although psychosocial self-efficacy was a significant correlate of self-care in the current sample of African American and Hispanic/Latino adults with type 2 diabetes, associations were less robust than that observed for distress. We hypothesize that this could be a consequence of the particular self-efficacy measure used in this study (e.g., heterogeneity of the domains included).

A systematic review found that few diabetes management programs targeting underserved minority groups included an emotional well-being component (Concha et al., 2009). Documentation of the relation between diabetes distress and self-care across different cultural groups in the current study underscores the importance of including emotional well-being components in diabetes self-management programs. Measurement of psychosocial attributes (e.g., negative self-relevant cognitions, distress) may also prove useful when seeking to identify patients at increased risk for nonadherence. This is of particular interest as negative self-relevant cognitions can serve to moderate the effects of a behavior change intervention on program adherence (Jette et al., 1998). For example, one study found that individuals reporting the greatest magnitude of depressed mood were more likely to adhere to a home-based exercise intervention (Jette et al., 1998).

The present study has multiple strengths. It is one of the few studies examining correlates of diabetes self-care in a population composed entirely of underserved U.S. Latino and African American patients with diabetes. An adequately sized sample was available, allowing for simultaneous inclusion of multiple independent variables across race/ethnicity strata. Study limitations should be considered when interpreting the findings. As with all cross-sectional studies, we are unable to make definitive inferences about causality. Self-reported measures are subject to biased responses (e.g., social desirability bias). Information on provider recommendations for self-care activities was not collected thus could not be utilized during the analysis. It is plausible that a health care provider may differently advocate for increases in self-care performance across a range of patient-related attributes.

Although causality cannot be directly inferred since this study is cross-sectional (Hill, 1965), it still has the potential to inform clinical practice. Consideration of patient-related and biomedical/disease-related factors is important when supporting self-care in underserved minority patients with type 2 diabetes. For instance, older African American patients with

elevated levels of distress may benefit from approaches that focus on managing distress when attempting to initiate, increase, or maintain PA. Non-insured Hispanic/Latino patients may benefit from consideration of the cost when recommending and supporting diabetes self-care. The differential association between distress and glucose self-testing across racial/ethnic groups also suggests that diabetes distress may be more robustly associated with self-care practices among African Americans.

In summary, when using the composite diabetes self-care score as the outcome of interest, across racial/ethnic subgroups, only psychosocial factors emerged as significant correlates. In the African American subgroup, across self-care subscales, diabetes-related distress was a consistently significant correlate accounting for considerable proportion of the observed variance. Patient characteristics (e.g., education, health insurance) were more salient correlates in Hispanics/Latinos when examining the self-care subscales, particularly those that may require monetary resources (e.g., glucose monitoring).

Diabetes distress was the correlate that bridged ethnic/racial groups, i.e., African Americans and Hispanic/Latinos. Given the negative association found between distress and engagement in self-care in these groups, healthcare practitioners should regularly assess psychological well-being and support patients in obtaining diabetes self-care support and mental health services as appropriate, with purposeful screening for psychological ill-being (e.g., depression, anxiety) among those not successfully self-managing their illness. Provider counseling to increase diabetes self-care practices may be more effective if targeted toward individual-level characteristics (e.g., age, insurance status, distress levels) and through consideration of within-group differences in race/ethnicity.

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R.H. researched data, wrote, and reviewed/edited the manuscript. L.R. contributed to conceptualization of study, interpretation of data, contributed to discussion, and reviewed/edited the manuscript. B.B.R and Y.C. researched data, contributed to design of analytical methods, and reviewed/edited the manuscript. Y.W. conducted the data analysis and reviewed/edited the manuscript. N.C., L.T.Q., and B.S.G contributed to conceptualization of study, provided recommendations on study methods, and reviewed/edited the manuscript. R.H., L.R., and Y.W. had full access to the data and serve as guarantors, taking responsibility for the integrity of the data and accuracy of data analysis.

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Table 1

Characteristics of the Study Sample by Race/Ethnicity

Variable	Total (*N* = 250)	African American (*n* = 133)	Hispanic/Latino (*n* = 117)	*p*-value
Socio-demographic Characteristics				
Age, *M* (*SD)*	53.1 ± 12.4	51.6 ± 13.0	54.7 ± 11.4	0.05
Female, *n* (%)	172 (68.8)	88 (71.8)	84 (66.2)	0.34
Education, *n* (%)				
< High School	151 (60.4)	52 (39.1)	99 (84.6)	<0.01
High School Graduate	47 (18.8)	39 (29.3)	8 (6.8)	
> High School	52 (20.8)	42 (31.6)	10 (8.6)	
Annual household income, *n* (%)				
Less than $20,000	142 (73.6)	82 (70.7)	60 (77.9)	0.26
More than $20,000	51 (26.4)	34(29.3)	17 (22.1)	
Health Insurance Status, *n* (%)				
Yes	154 (61.6)	91 (68.4)	63 (53.9)	0.02
No	96 (38.4)	42 (31.6)	54 (46.2)	
Biomedical/Disease-related Factors				
Body Mass Index, *M* (*SD*)	33.18 ± 7.0	34.5 ± 7.7	31.7 ± 5.8	0.05
Glycemic Control (A1c), *M* (*SD*)	8.60 ± 2.37	9.0 ± 2.6	8.1 ± 2.1	<0.01
Household members with Diabetes				
None	44 (17.6)	25 (18.8)	19 (16.2)	0.80
One	154 (61.6)	82 (61.7)	72 (61.5)	
More than one	52 (20.8)	26 (19.6)	26 (22.2)	
Insulin Use				
Yes	86 (34.4)	56 (42.1)	30 (25.6)	<0.01
No	164 (65.6)	77 (57.9)	87 (74.4)	
Psychological Factors				
Diabetes Distress, *M* (*SD*) (possible range 1-6)	2.61 ± 1.23	2.7 ± 1.2	2.6 ± 1.3	0.51
Diabetes-related psychosocial self-efficacy, *M* (*SD*) (possible range 1-5)	4.22 ±0.65	3.6 ± 0.8	3.9 ± 0.7	<0.01
Diabetes Self-Care Activities				
Total Score, *M* (*SD*)	3.65 ± 1.37	3.7 ± 1.4	3.6 ± 1.4	0.30
General diet, *M* (*SD*)	3.66 ± 2.31	3.7 ± 2.3	3.7 ± 2.4	0.92
Specific diet, *M* (*SD*)	3.95 ± 1.65	3.7 ± 1.4	4.2 ± 1.8	0.01
Physical activity, *M* (*SD*)	2.48 ± 2.11	2.6 ± 1.9	2.3 ± 2.3	0.27
Blood glucose testing, *M* (*SD*)	3.61 ± 2.68	4.1 ± 2.5	3.0 ± 2.8	<0.01
Foot Care, *M* (*SD*)	4.53 ± 2.47	4.6 ± 2.4	4.5 ± 2.5	0.90
Smoking Status, *n* (%)				
Yes	54 (21.6)	37 (27.8)	17 (14.5)	0.01

Variable	Total (*N* = 250)	African American (*n* = 133)	Hispanic/Latino (*n* = 117)	*p*-value
No	196 (78.4)	96 (72.2)	100 (85.5)	

Note. Data are *n* (%) or mean (±*SD*).

Employment status category of “other” includes homeworkers, students, and those retired and/or unable to work.

Table 2

Poisson Regression Model Building Assessing Factors Related to the Diabetes Self-Care Activities of Diet and Physical Activity: African Americans

	Total Self-care Score (*n*=133)			General Diet (*n*=133)			Specific Diet (*n*=133)			Physical Activity (*n*=133)		
Variable	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**
Patient-related attributes												
Age	0.004	0.003	−0.001	0.016**	0.016**	0.011*	0.006§	0.005	0.002	−0.006	−0.009§	−0.015*
Gender (Female)	0.081	0.097	0.113	−0.036	−0.013	0.019	0.112	0.116	0.123	−0.007	0.032	0.045
Education[a]												
Less than HS	0.041	−0.017	0.046	−0.218*	−0.274*	−0.206§	−0.063	−0.481	−0.003	0.097	−0.022	0.063
HS Graduate/GED	0.052	−0.011	0.035	−0.272*	−0.332*	−0.292*	0.109	0.118	0.151	0.054	−0.095	−0.021
Health insurance status (No Insurance)	−0.072	−0.086	−0.089	−0.101	−0.103	−0.103	−0.148	−0.145	−0.147	0.021	−0.019	−0.012
Biomedical/Disease-related Factors												
Body mass index		−0.008	−0.008		−0.008	−0.008		−0.003	−0.002		−0.022*	−0.021*
Glycemic control (A1c)		−0.003	−0.002		0.022	0.026		−0.003	−0.002		−0.012	−0.011
Household members with diabetes[b]												
One person		−0.069	−0.066		−0.005	0.016		−0.026	−0.024		−0.236§	−0.237§
More than one person		−0.043	0.015		−0.099	−0.024		−0.011	0.033		−0.129	−0.052
Insulin Use (no insulin use)		−0.127	−0.176§		−0.099	−0.158		0.072	0.037		−0.215§	−0.284*
Psychosocial Constructs												
Diabetes distress			−0.146*			−0.202**			−0.102*			−0.187**
Diabetes-related psychosocial self-efficacy			0.131§			0.115			0.094			0.222*
r^2	0.03	0.04	0.16	0.16	0.19	0.33	0.07	0.08	0.14	0.02	0.10	0.24
Goodness-of-fit test—Chi-Square, *df*		2.66, 4	16.87, 2		4.71, 4	24.67, 2		1.02, 4	8.52, 2		11.56, 4	22.99, 2
P-value		0.62	<0.001		0.32	<0.001		0.91	0.01		0.02	<0.001

Note.

[a]Reference group = some college or post graduate education.

[b]Reference group = no family members with diabetes residing in the household.

§ $P < 0.10$.

* $P < 0.05$.

** $P < 0.001$.

Table 3

Regression Model Building Assessing Factors Related to the Diabetes Self-Care Activities of Blood Glucose Self-testing, Foot Care and Smoking: African Americans

	Blood Glucose Self-Testing (*n*=133)			**Foot Care (*n*=133)**			**Smoking (*n*=133)**		
Variable	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**
Patient-related attributes									
Age	0.002	0.001	−0.004	−0.0002	0.002	−0.004	−0.016	−0.028	−0.028
Gender (Female)	0.184§	0.203*	0.225*	0.110	0.107	0.112	−0.742§	−0.701§	−0.686
Education[a]									
Less than HS	0.234*	0.188§	0.248*	0.133	0.039	0.101	0.289	0.093	0.093
HS Graduate/GED	0.141	0.079	0.095	0.187§	0.110	0.176	0.181	0.021	−0.072
Health insurance status (No Insurance)	−0.095	−0.098	−0.103	−0.011	−0.501	−0.057	−0.048	−0.067	−0.084
Biomedical/Disease-related Factors									
Body mass index		−0.008	−0.009		−0.004	−0.002		−0.081*	−0.087*
Glycemic control (A1c)		−0.002	−0.001		−0.016	−0.161		0.007	0.005
Household members with diabetes[b]									
One person		−0.093	−0.067		−0.028	−0.054		0.473	0.565
More than one person		−0.160	−0.090		0.126	0.154		1.142§	1.195§
Insulin Use (no insulin use)		−0.087	−0.144		−0.285*	−0.323**		0.086	0.098
Psychosocial Constructs									
Diabetes distress			−0.163**			−0.104*			−0.024
Diabetes-related psychosocial self-efficacy			0.050			0.198*			−0.357
r^2	0.09	0.12	0.22	0.04	0.12	0.24	0.03	0.09	0.10
Goodness-of-fit test—Chi-Square, *df*		3.53, 4	17.52, 2		12.30, 4	18.62, 2		8.87, 4	1.18, 2
P-value		0.47	<0.001		0.02	<0.001		0.99	0.55

Note.

[a]Reference group = some college or post graduate education.

[b]Reference group = no family members with diabetes residing in the household.

§ $P < 0.10$.

* $P < 0.05$.

** $P < 0.001$.

Table 4

Poisson Regression Model Building Assessing Factors Related to the Diabetes Self-Care Activities of Diet and Physical Activity: Hispanic/Latinos

	Total Self-care Score (*n* = 117)			General Diet (*n*=117)			Specific Diet (*n*=117)			Physical Activity (*n*=117)		
Variable	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**
Patient-related attributes												
Age	0.002	0.0004	0.0003	0.001	−0.001	−0.001	0.002	0.001	0.001	0.001	−0.007	−0.007
Gender (Female)	0.032	0.058	0.039	−0.154	−0.112	−0.129	0.020	0.054	0.050	−0.149	−0.034	−0.086
Education[a]												
Less than HS	0.184	0.163	0.130	−0.022	−0.052	−0.113	0.551*	0.502*	0.502*	−0.120	−0.084	−0.153
HS Graduate/GED	0.179	0.173	0.158	−0.424	−0.277	−0.317	0.473§	0.378	0.385	0.034	0.066	0.007
Health insurance status (No Insurance)	−0.050	−0.045	−0.079	−0.015	−0.027	−0.076	0.046	0.053	0.043	−0.136	−0.160	−0.234§
Biomedical/Disease-related Factors												
Body mass index		−0.010	−0.007		−0.023*	−0.019§		−0.008	−0.007		−0.030*	−0.025*
Glycemic control (A1c)		−0.007	−0.001		0.021	0.031		0.011	0.013		−0.087*	−0.081§
Household members with diabetes[b]												
One person		−0.048	−0.053		0.293§	0.275§		−0.205	−0.212§		−0.460*	−0.475*
More than one person		0.071	0.043		0.330§	0.283§		−0.167	−0.181		−0.097	−0.147
Insulin Use (no insulin use)		−0.105	−0.094		0.069	0.077		−0.078	−0.075		−0.204	−0.184
Psychosocial Constructs												
Diabetes distress			−0.075§			−0.116*			−0.015			−0.131*
Diabetes-related psychosocial self-efficacy			0.092			0.114			0.068			0.114
r^2	0.01	0.04	0.08	0.05	0.13	0.20	0.08	0.12	0.13	0.03	0.21	0.26
Goodness-of-fit test—Chi-Square, *df*		1.54, 4	2.41, 2		10.42, 4	10.39, 2		5.16, 2	1.03, 2		24.69, 4	7.71, 2
P-value		0.55	0.09		0.03	0.005		0.27	0.60		<0.001	0.02

Note.

[a]Reference group = some college or post graduate education.

[b]Reference group = no family members with diabetes residing in the household.

§ $P < 0.10$.

* $P < 0.05$.

** $P < 0.001$.

Table 5

Regression Model Building Assessing Factors Related to the Diabetes Self-Care Activities of Blood Glucose Self-testing, Foot Care and Smoking: Hispanic/Latinos

	Blood Glucose Self-Testing (*n*=117)			Foot Care (*n*=117)			Smoking (*n*=117)		
Variable	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**	**M1**	**M2**	**M3**
Patient-related attributes									
Age	0.004	0.004	0.003	0.001	0.001	0.001	0.016	0.022	0.023
Gender (Female)	0.132	0.156	0.150	0.237*	0.204§	0.186§	−0.765	−0.866	−0.873
Education[a]									
Less than HS	−0.015	−0.157	−0.136	0.437*	0.481*	0.419*	0.580	0.429	0.560
HS Graduate/GED	0.148	−0.035	0.001	0.549*	0.573*	0.529*	−23.000	−22.816	−22.609
Health insurance status (No Insurance)	−0.504**	−0.454**	−0.468**	0.159§	0.162§	0.121	0.086	0.084	0.205
Biomedical/Disease-related Factors									
Body mass index		−0.015	−0.014		0.009	0.013		−0.002	−0.009
Glycemic control (A1c)		0.005	0.008		−0.020	−0.012		−0.015	−0.028
Household members with diabetes[b]									
One person		−0.084	−0.098		0.084	0.095		0.781	0.867
More than one person		0.222	0.193		0.088	0.074		−0.109	−1.014
Insulin Use (no insulin use)		−0.447*	−0.429*		−0.005	0.009		0.055	0.035
Psychosocial Constructs									
Diabetes distress			−0.015			−0.116*			0.226
Diabetes-related psychosocial self-efficacy			0.138			0.048			0.024
r^2	0.20	0.35	0.36	0.13	0.16	0.23	0.04	0.08	0.09
Goodness-of-fit test—Chi-Square, *df*		23.61, 4	2.61, 2		2.99, 4	10.69, 2		4.96, 4	1.31, 2
P-value		<0.001	0.27		0.56	0.005		0.29	0.52

Note.

[a]Reference group = some college or post graduate education.

[b] Reference group = no family members with diabetes residing in the household.

§ $P < 0.10$.

* $P < 0.05$.

** $P < 0.001$.