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Associations of Structural and Functional Social Support with Diabetes Prevalence in U.S. Hispanics/Latinos: Results from the HCHS/SOL Sociocultural Ancillary Study

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Abstract

Background—Little research has examined associations of social support with diabetes (or other physical health outcomes) in Hispanics, who are at elevated risk.

Purpose—We examined associations between social support and diabetes prevalence in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural Ancillary Study.

Methods—Participants were 5181 adults, 18–74 years old, representing diverse Hispanic backgrounds, who underwent baseline exam with fasting blood draw, oral glucose tolerance test, medication review, sociodemographic assessment, and sociocultural exam with functional and structural social support measures.

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Informed Consent Statement: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Results—In adjusted analyses, one standard deviation higher structural and functional social support related to 16% and 15% lower odds, respectively, of having diabetes. Structural and functional support were related to both previously diagnosed diabetes (OR = .84 and .88, respectively) and newly recognized diabetes prevalence (OR = .84 and .83, respectively).

Conclusions—Higher functional and structural social support are associated with lower diabetes prevalence in Hispanics/Latinos.

Keywords

Diabetes; Hispanic; Latino; Prevalence; Risk Factor; Social Support

In the U.S., ethnic minorities including Hispanics[1] are at higher risk for diabetes than non-Hispanic whites. The landmark Hispanic Community Health Study/Study of Hispanics (HCHS/SOL), a prospective, population based cohort study of 16,415 Hispanic adults representing multiple ancestry backgrounds, recruited from four major U.S. metropolitan areas (2008 to 2011) reported an overall diabetes prevalence of 16.9 % (Daviglus et al., 2012; Schneiderman et al., In Press). Prevalence varied among the ancestry groups from 10.2% in South Americans to a high of 18.3% in Mexicans (Schneiderman, et al., In Press). Comparatively, in the 2005–2006 National Health and Nutrition Examination Survey, which, like the HCHS/SOL, included an oral glucose tolerance test (OGTT), prevalence of diabetes was 11.0% among non-Hispanic white participants and 20.1% among Hispanics of Mexican descent (Cowie et al., 2009). Other studies have shown that Hispanics with diabetes have poorer clinical control (Campbell et al., 2012) more complications, and higher mortality rates than their non-Hispanic counterparts (Harris, 2001; Lanting et al., 2005). Additional research is needed to understand the risk and protective factors related to diabetes in Hispanics, given their disproportionate vulnerability and poorer outcomes.

More than three decades of research demonstrates that social ties and support are important to optimal health and longevity (Barth et al., 2010; Fortmann & Gallo, 2013; Pinquart & Duberstein, 2010; Uchino, 2006; Umberson et al., 2010). Social support definitions vary widely, but a central conceptual distinction can be made between structural features of social networks, such as the number and diversity of social roles or frequency of social contact that one experiences (i.e., structural support), and the *function* these networks serve in providing support to an individual (i.e., functional support) (Cohen et al., 1985; Lakey & Cohen, 2000). Functional support is often conceptualized as the perception that support resources, such as material aid, emotional support, companionship or information, would be available from one's social network if needed (i.e., "perceived functional social support") (Lakey & Cohen, 2000). Other studies have examined retrospective self-reports of *received* functional social support (Brissette et al., 2000). However, these support transactions tend to be situational and often arise in the context of stress. Consistently, received support has been less reliably associated with health benefits than has perceived support (Uchino, 2009). Thus, the vast majority of the literature has focused on indicators of structural support and

[1]We use "Hispanic" to encompass the terms Hispanic, Latino, and others that may be favored by certain ethnic or geographic groups, acknowledging that there are differences of opinion regarding the meaning and relevance of these terms.

perceived functional social support in efforts to understand influences on health and well being (Uchino, 2009; Uchino et al., 2012).

Several reviews have concluded that low social support, defined variously, relates to higher risk of premature mortality from all causes (Holt-Lunstad et al., 2010) and of cardiovascular disease (CVD) morbidity and mortality (Barth, et al., 2010; Mookadam & Arthur, 2004). A recent meta-analysis identified a more consistent association of perceived functional social support than of structural social support with CVD incidence and– especially–prognosis (Barth, et al., 2010). In contrast, only limited research has examined associations of social support with diabetes risk. A prospective study identified no relationship of functional or structural support with diabetes incidence over 10.5 years (Kumari et al., 2004). A case-referent study identified an association of low functional support with higher 8-year diabetes incidence in women, but not men, and observed no effect of structural support in either sex group (Norberg et al., 2007). Other studies have examined the association of social support at work with diabetes prevalence or incidence, however, a review and meta-analysis concluded that there is little evidence that low work social support relates to diabetes risk (Cosgrove et al., 2012).

Despite the limited direct evidence, a role of social support in the development of diabetes is biologically plausible through influences on neuroendocrine pathways associated with the development of visceral adiposity and insulin resistance (Buren & Eriksson, 2005; Uchino, 2006). Specifically, psychological stress activates the hypothalamic-pituitary–adrenal axis (HPA) and the sympathetic-adrenal-medullary (SAM) system, triggering increases in circulating glucocorticoids, such as cortisol and corticosterone, and catecholamines, including epinephrine and norepinpherine, respectively (Smith & Vale, 2006). When chronically activated these responses can contribute to metabolic dysregulation, ultimately increasing risks for diabetes and other chronic diseases (McEwen, 2012). Cortisol promotes increased glucose production from liver cells, and inhibits insulin secretion from pancreatic β-cells, thereby encouraging insulin resistance over time (Beaudry & Riddell, 2012). Cortisol also stimulates lipolysis, increasing plasma free fatty acid levels, which in turn inhibits insulin release and further promotes glucose intolerance and insulin resistance (Peckett et al., 2011). There is also evidence of increased cortisol activity in abdominal visceral fat tissue, suggesting a mechanism through which cortisol may contribute to visceral fat accumulation (Kershaw & Flier, 2004). SAM-induced elevations in circulating catecholamines promote the production of inflammatory cytokines and acute phase proteins, such as C-reactive protein, creating an inflammatory state that is closely linked with dyslipidemia and insulin resistance (Black, 2006; Kyrou & Tsigos, 2009). Central obesity further amplifies the release of pro-inflammatory cytokines, and thus, obesity, insulin resistance, and inflammation represent interrelated pathways in the pathophysiology of diabetes (Olefsky & Glass, 2010; Tsatsoulis et al., 2013).

As an important psychosocial resource that can protect against the physiological impact of stress by attenuating perceptions of threat and promoting more adaptive coping (Thoits, 2011), social support could reduce risk for diabetes and other chronic conditions. In addition, provision or perceptions of social support have been shown to have direct effects on SAM and HPA functioning that are in opposition to those potentiated by stress (Uchino, 2006). Higher social support may also protect against the development of diabetes indirectly, through an association with preventive health behaviors such as increased physical activity and healthier dietary patterns (Thoits, 2011; Umberson, et al., 2010). In the context of diabetes specifically, greater support has been associated with improved diabetes self-management behaviors (Gallant, 2003) and, concordantly, better glycemic control (Stopford et al., 2013). In part this mechanism could also involve a multi-step pathway from social support, to physiological alterations, to behavior. For example, high levels of cortisol have been shown to foster resistance to the effects of leptin, increasing appetite and stress-related eating, and thus enhancing risk for obesity and metabolic dysregulation (Adam & Epel, 2007). Emotional pathways have also been suggested as an indirect pathway from social support to physical health (Thoits, 2011; Umberson, et al., 2010), although a recent review found little empirical evidence for the hypothesis (Uchino, et al., 2012).

To date, few studies have examined relationships of social support with diabetes or any other objective health outcome in Hispanics, a diverse, large, and rapidly growing U.S ethnic group (Pew Hispanic Center, 2011). The limited research has generally focused on individuals of Mexican descent and low socioeconomic status (Bell et al., 2010; Fortmann et al., 2011), compromising generalizability to the larger U.S. Hispanic population that represents a range of backgrounds. This scarcity of research is notable, given the salience of social relationships in traditional Hispanic cultural contexts (Caplan, 2007). Hispanics tend to be more collectivistic, family oriented and focused on maintaining smooth and positive social interactions relative to non-Hispanic Whites (Gallo et al., 2009; Perez & Cruess, 2011), although within group variability in experiential and behavioral factors certainly exists (Elder et al., 2009). In fact, researchers have theorized that certain the health advantages experienced by Hispanics relative to non-Hispanic whites may be explained in part by cultural norms that prioritize warm, positive social interactions and strong family support systems (Jasso et al., 2004). Specifically, these protective social processes may represent one factor underlying epidemiological patterns suggesting that despite substantial social disadvantage (low socioeconomic status, poor healthcare access) (Pew Hispanic Center, 2014), and high rates of obesity and type 2 diabetes (Daviglus, et al., 2012; Kurian & Cardarelli, 2007), Hispanics appear to have lower CVD morbidity and mortality (Daviglus, et al., 2012; Go et al., 2013) and increased longevity relative to non-Hispanic whites (Arias, 2010). Often termed the “Hispanic Paradox”, these trends are supported by recent systematic reviews and meta-analyses (Cortes-Bergoderi et al., 2013; Ruiz et al., 2013), though contradictory findings have also been described (Teruya & Bazargan-Hejazi, 2013). In general, Hispanic health advantages are greater in foreign born than in U.S. born Hispanics, and they diminish with increasing time spent in the U.S. (Markides & Eschbach, 2011; Singh et al., 2013). In addition, some researchers have forecasted that health advantages of U.S. Hispanics will lessen in the coming decades as the population ages (Daviglus, et al., 2012) and as the full impact of childhood obesity (and disparities therein) are realized (Buttenheim et al., 2013). The HCHS/SOL (LaVange et al., 2010; Sorlie et al., 2010), and ancillary studies focused on sociocultural factors (Gallo et al., 2014) and health among the children of HCHS/SOL participants (Ayala et al., 2014; Isasi et al., 2014), will provide important insight into these epidemiological patterns and their changes over time in U.S. Hispanics.

Capitalizing on the unique HCHS/SOL cohort, the current study builds upon the limited research concerning the relationship of social support to diabetes and psychosocial correlates of Hispanic health, by examining associations of both functional and structural social support with diabetes prevalence in Hispanic adults of diverse ancestries. We hypothesized that higher levels of both structural and functional support would relate to lower diabetes prevalence. Given the cultural emphasis on maintaining strong positive relationships and social reciprocity in Hispanics, a high level of structural support could conversely impose a psychosocial or tangible burden that partially mitigates salubrious effects. For example, individuals with large networks may have many social responsibilities or obligations that tax their psychosocial resources (Pescosolido & Levy, 2002), or some relationships may be associated with both positive and negative features that on balance create stress (Uchino, 2013). Thus, we hypothesized that functional support would exhibit a stronger relationship with diabetes prevalence than would structural support when both types of support were examined conjointly. To help indirectly shed light on the temporal association between support and diabetes, additional analyses were conducted to separately examine associations of social support with diabetes cases diagnosed prior to the HCHS/SOL baseline exam versus cases that were newly recognized at baseline (i.e., so that participants were not aware of or actively managing their condition).

Methods

Participants and Procedures

The HCHS/SOL is a prospective epidemiologic cohort study of chronic disease prevalence, incidence, and risk and protective factors in Hispanic individuals of Mexican, Cuban, Puerto Rican, Dominican, Central and South American, and other Hispanic ancestry, recruited from four field centers (the Bronx, NY, Chicago, IL, Miami, FL, and San Diego, CA). Details concerning the study sample (LaVange, et al., 2010) and approach (Sorlie, et al., 2010) have been reported previously. Participants who self-identified as Hispanic and were 18–74 years old at screening were recruited using a two-stage area household probability sampling approach, with oversampling of the 45–74 year age group. Participants attended a baseline exam with anthropometric assessment, fasting blood draw, 2-hour OGTT, self-report sociodemographic and health assessments, and medication review. The current study used demographic data, body mass index (BMI), and diabetes diagnostic information obtained during the HCHS/SOL baseline exam.

Methods for the Sociocultural Ancillary Study have been presented elsewhere (Gallo, et al., 2014). The study was initiated to more thoroughly examine sociocultural correlates of health among HCHS/SOL participants. All participants who were able and willing to attend a separate visit within 9 months of their HCHS/SOL baseline exam were eligible; of 7,321 individuals whom recruiters attempted to reach, 5,313 (N=72.6%) participated. Sociocultural Ancillary Study participants are largely representative of the HCHS/SOL cohort, with the exception of lower participation among some higher socioeconomic strata (Gallo, et al., 2014). Measures of functional and structural social support were administered in the sociocultural exam. Participants with missing data on social support measures (N=126) or diabetes status (N=6) were excluded from the current study; thus, analyses are based on

N=5,181 men and women. Institutional Review Board approval was obtained from all study sites for all HCHS/SOL and HCHS/SOL Sociocultural Ancillary Study procedures and materials.

Measures

Social Support—The 12-item Interpersonal Support Evaluation List (ISEL-12) (Cohen, et al., 1985) was used to assess functional (i.e., perceived) social support. Scores range from 0 to 36 with higher scores reflecting greater perceived support. Analyses with this measure in the HCHS/SOL sociocultural cohort showed evidence of internal consistency (Cronbach's αs > .80 for both language and all Hispanic background groups), support for the one factor structure, evidence of factorial invariance across language and background groups, and construct validity in the form of theoretically consistent patterns of associations with other constructs (Merz et al., 2014). The Social Network Index (Cohen et al., 1997) was used to assess structural support. This 25-item scale provides a count (range 0–12) of the number of high contact (at least once each two weeks) social roles (e.g., friend, co-worker) the respondent has. Internal consistency and other psychometric data are not reported for this scale given the count format and the fact that it is not intended to capture underlying latent construct(s). However, the range of roles surveyed is generally applicable across population groups.

Diabetes Prevalence—Participants who (*a*) self-reported receiving a diagnosis of diabetes by a doctor, *and/or* (*b*) were taking medication for glucose regulation, *and/or* (*c*) met current criteria for diabetes according to physiological markers (fasting plasma glucose >=126 mg/dL, 2-h plasma glucose >200 mg/dl during OGTT, HbA1c >=6.5%) (American Diabetes Association, 2013a) were coded as having diabetes. For secondary analyses, participants who met criteria (*a*) or (*b*) were categorized as having previously diagnosed diabetes. Those who met criterion (*c*) [but <u>not</u> (*a*) or (*b*)] were classified as having newly recognized diabetes based on physiological data, consistent with current diagnostic criteria (American Diabetes Association, 2013a) and with a prior study in the HCHS/SOL cohort (Schneiderman, et al., In Press). Participants who were missing medication, physiological, or diabetes self-report data (N=155) were excluded from these analyses.

Covariates—Sociodemographic covariates included age (in years), sex, education [<high school (HS) diploma/general education degree (GED), HS diploma/GED only, > HS diploma/GED], income (10 categories, ranging from < $10,000 to > $100,000), and Hispanic background (Mexican, Cuban, Puerto Rican, Dominican, Central American, South American, other or more than one). Language of interview (Spanish or English) and immigration status (immigrated < 10 years ago, immigrated ≥ 10 years ago, born in US mainland) were used as proxy indicators of acculturation, and health insurance status (any or none) was used to represent healthcare access. Marital status was examined for descriptive purposes but was not used as a covariate since it forms part of the structural support measure. BMI was indicated by weight in kg/height in m^2.

Statistical Analyses

All analyses account for design effects and sample weights (LaVange, et al., 2010). Sample weights are adjusted for non-response, calibrated to the 2010 U.S. Census populations (for the target communities) according to age, sex and Hispanic background, and normalized to the HCHS/SOL cohort sample size. Descriptive statistics were calculated in IBM SPSS Statistics 19.0 (IBM, Inc., Armonk, NY) using complex survey procedures. The maximum likelihood robust (MLR) estimation procedure in MPLUS (Muthén & Muthén, 2006) was used to estimate model parameters for all remaining analyses. This procedure adjusts regression parameters and standard errors for missing data. Structural and functional support indicators were first examined as predictors in separate, unadjusted logistic regression models, and then in adjusted models that controlled for sociodemographic covariates including age, sex, immigration, language, insurance, education, income, and Hispanic background.[2] Adjusted models were repeated with structural and functional support indicators entered conjointly to determine their relative effects in relation to diabetes prevalence. Additional analyses, conducted according to the same steps, used multinomial logistic regression to examine associations of social support variables with odds of previously and newly diagnosed diabetes in separate models; no diabetes was used as the referent group in these analyses. Social support predictors were standardized (M = 0, SD = 1) prior to analysis. For ease of interpretation, the inverse of odds ratios < 1.0 are reported below.

Previous research suggests that the effects of low social support may be amplified in older adults (Tomaka et al., 2006), women (Coyne et al., 2001), and immigrants or less acculturated individuals (Viruell-Fuentes & Schulz, 2009). The health protective effects of social support may also be greater among individuals with lower socioeconomic status (Gorman & Sivaganesan, 2007; Schollgen et al., 2011). Thus, sensitivity analyses that included multiplicative interaction terms were conducted to examine the consistency of the adjusted associations between social support and overall diabetes prevalence across age, sex, immigration, language, income, and education groups. An alpha level of .01 was used to reduce type 1 error risk in these analyses.

Results

The association between structural and functional support measures was positive and moderate in magnitude, $r = 0.28$, $p < .001$. As shown in Table 1, 38.12% of the sample was male and 61.09% was aged 45 years or older. Most participants had a household income of < $30,000 (65.84%), immigrated to the U.S. more than 10 years ago (58.91%), and completed their interview in Spanish (80.70%). Diabetes prevalence was 21.35% (95% CI 20.23–22.46) in the sample (weighted prevalence, 16.77%; 95% CI 15.37–18.27). On average, participants reported having 5.59 “high-contact” social roles and had an average ISEL-12 score of 25.85.

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[2]Additional control for BMI did not substantively alter results. In addition, BMI is viewed as a pathway through which support could relate to diabetes, rather than a confounding factor; thus, BMI was excluded from models.

Overall Diabetes Prevalence

Results of analyses testing primary study hypotheses are presented in Table 2. In adjusted models, a one SD higher structural or functional support score was related to 16% (i.e., 1/0.86) and 15% (i.e., 1/0.87) lower odds, respectively, of having diabetes. Tests of interaction effects showed that these associations were consistent across demographic groups (all p-values > .01). When modeled simultaneously, associations of both types of social support with diabetes prevalence remained statistically significant; one SD higher structural or functional support was related to 12% and 11% lower odds, respectively, of having diabetes (p-values < .05), in the adjusted model.

Previously Diagnosed and Newly Diagnosed Diabetes

One SD higher structural or functional support was related to 19% and 14% lower odds, respectively, of having previously diagnosed (versus no) diabetes, and 19% and 20% lower odds, respectively, of having newly diagnosed (versus no) diabetes (all p-values < .05). (See Table 2). When effects of both types of support were conjointly tested in adjusted models, higher structural support was associated with 16% lower odds of previously diagnosed diabetes ($p < .05$), whereas functional support was not significantly related to this outcome. Neither social support variable was found to be associated with odds of having newly diagnosed diabetes in adjusted, conjoint models.

Discussion

The current study is the first, to our knowledge, to demonstrate that higher social support is related to lower odds of diabetes prevalence among Hispanics of diverse backgrounds, and is among the first to examine the association of social support with diabetes prevalence or incidence in any population. The study also adds to the very limited research that has examined psychosocial factors in relation to objectively assessed physical health outcomes in Hispanics. This is an important research emphasis, given the growth of the Hispanic population. According to the 2010 U.S. Census, Hispanics comprised 16% of the US population and accounted for 56% of the population growth between 2000–2010 (Ennis et al., 2011). In addition, protective social factors associated with the traditional Hispanic culture represent one potential explanation for the so called “Hispanic Paradox”, yet to date, very little is known the psychosocial correlates of health in the diverse U.S. Hispanic population. The HCHS/SOL provides a unique opportunity to examine the psychosocial correlates of health in a cohort that includes representation of several background groups, and a range of socioeconomic and acculturation levels (Gallo, et al., 2014).

The results showed that that higher levels of structural and functional social support were associated with lower odds of diabetes prevalence. Effects were small in magnitude, but were statistically significant after adjusting for a range of sociodemographic covariates, and were consistent across demographic groups defined by age, sex, immigration, language, income, education, and Hispanic ancestry. Although prior research has identified differential health implications of functional versus structural support (Barth, et al., 2010), including a study of social support and diabetes risk (Norberg, et al., 2007), both types of support were independently related to diabetes prevalence in this cohort. Structural social support may be important because it indicates regular social contact and promotes role diversity, thus contributing to a sense of meaning in life that enhances health and well-being, and because it fosters accessible functional support (Uchino, 2004). In turn, functional support provides access to specific resources (or perceptions that they are available if needed), which can attenuate stress appraisals and enhance positive coping with stressors ranging in severity from minor daily hassles to major life events (Uchino, 2004). Ultimately, direct and indirect behavioral and physiological pathways are believed to underlie the associations of functional and structural social with physical health outcomes, as detailed above.

Analyses separately examining associations of functional and structural social support with previously diagnosed and newly recognized diabetes cases provide additional information. Specifically, the associations of structural support with previously diagnosed and newly recognized diabetes (versus no diabetes) were equivalent in strength. Associations of functional support with each outcome were also similar in magnitude, though the association with previously diagnosed diabetes was slightly stronger. In analyses that simultaneously modeled effects of functional and structural support in relation to newly or previously diagnosed versus no diabetes, only the association of structural support with previously diagnosed diabetes remained statistically significant. This may in part reflect the shared influences of these constructs as discussed above, but could also reflect the lower statistical power inherent to these conjoint analyses. Although the cross-sectional design precludes conclusions regarding causality or directionality, the relationship of social support to the prevalence of diabetes that was newly recognized at the baseline exam provides indirect, albeit preliminary evidence for an etiological role of social support in the diabetes pathophysiological process. For example, it is possible that individuals with diabetes may withdraw from certain social roles (e.g., employee, volunteer) due to illness or disability, or, their friends and family may become less willing to provide support and assistance over time, as support sources become taxed or exhausted. Indeed, there is evidence that stressful circumstances, such as those associated with a health crisis, can erode social support (Bolger et al., 1996; Uchino, 2009). It is probable that individuals who were unaware of their diabetes diagnosis prior to the HCHS/SOL baseline exam had less advanced disease, relative to those who had sought care. In addition, individuals who were not aware they had diabetes would be less likely to rely on their support networks for assistance in coping with their health and medical care, at least as related to diabetes specifically. The fact that effects of support emerged in relation to newly recognized diabetes provides the impetus for future research that explores the etiological role of social support in diabetes.

In addition to the cross-sectional design, several limitations of the current study should be noted. The social support and diabetes variables were ascertained at different points in time. The Sociocultural Ancillary Study was initiated during the second wave of HCHS/SOL recruitment, and a generous window (9 months) was adopted between the baseline and sociocultural exam to ensure a more inclusive approach. Notably, 88.3% of participants completed the sociocultural assessment within 6 months and 72.6% within 4 months of their baseline exam (Gallo, et al., 2014). The clinical exam with OGTT, HbA1c, and fasting glucose represents a rigorous approach for detecting diabetes in a large cohort study such as the HCHS/SOL. However, a small number of cases were based on self-reported information alone (for prevalence analyses only) and this may have introduced error into the categorization scheme. In addition, we were unable to distinguish between type 1 and type 2 diabetes. However, only 2.6% of participants aged 18–29 in the HCHS/SOL cohort had diabetes (Schneiderman, et al., In Press) and at the population level, 90–95% of diabetes cases are type 2 rather than type 1 (American Diabetes Association, 2013a). Thus it is unlikely that this imprecision significantly affected our results.

Limitations not withstanding, the current findings add to the limited evidence suggesting that social support may relate to the occurrence of diabetes. In addition, they build upon the small body of research suggesting the protective health implications of social support in US Hispanics (Bell, et al., 2010; Fortmann, et al., 2011), in a large cohort representing multiple backgrounds, varied levels of socioeconomic status and acculturation, and several geographic locations with large metropolitan Hispanic populations. Given the marked increases in diabetes rates among Hispanics (Cowie, et al., 2009; Schneiderman et al., 2014), and the tremendous economic burden this condition exacts [e.g., total costs of $245 billion in 2012 (American Diabetes Association, 2013b)], it is important to identify modifiable risk and protective factors to inform prevention efforts in this population. Health promotion or disease management interventions with a social support emphasis have varied widely and many studies of their effectiveness have important methodological limitations, or have produced mixed findings (Hogan et al., 2002). Nonetheless, a systematic review of support interventions tested across emotional and physical health contexts found that 73/92 (83%) randomized controlled trials identified at least some benefits of support promoting interventions (Hogan et al., 2002), suggesting that efforts to modify support may be a useful strategy. In addition, specific social support enhancing intervention approaches (social support groups, group medical visits) appear to be effective in promoting better self-management and clinical outcomes in patients with diabetes (van Dam et al., 2005), and could also be useful in a prevention context. To justify such efforts, further research based on the HCHS/SOL and other cohorts is needed to examine the association of social support with diabetes incidence and to elucidate the specific direct and indirect mechanisms that underlie this association.

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Table 1

Descriptive statistics for sample demographic characteristics, diabetes prevalence, and social support variables: HCHS/SOL Sociocultural Ancillary Study (N=5181)

Characteristic	N	Unweighted Percent (%)	Weighted Percent (%)[a]
Male sex	1975	38.12	45.46
Age group			
18–44	2016	38.91	57.15
45+	3165	61.09	42.85
Hispanic Background			
Central American	538	10.38	7.56
Cuban	741	14.30	19.96
Dominican	525	10.13	11.83
Mexican	2041	39.39	36.83
Puerto Rican	857	16.54	15.63
South American	340	6.56	4.81
More than one/Other	136	2.62	3.37
Household yearly income < $30K	3411	65.84	69.73
Education < HS diploma or GED	1834	35.40	32.40
Immigration Status			
Born in the US Mainland	903	17.43	22.15
Immigrated < 10 years ago	1216	23.47	27.12
Immigrated ≥ 10 years ago	3052	58.91	50.69
Spanish Language Interview	4181	80.70	75.20
Has Health Insurance	2605	50.28	52.20
Diabetes Prevalence	1106	21.35	16.77

Social Support Indicators (Unweighted Data)	M	SD
Structural Support[b]	5.59	1.85
Functional Support[c]	25.85	6.65

[a]Differences in weighted versus unweighted percents are due to targeted sampling scheme

[b]Number of high contact social roles as measured by the Social Network Index (possible range 0–12)

[c]Overall perceived social support as measured by the ISEL-12 (possible range 0–36)

HS = High School; GED = General Education Development Test

Table 2

Results of logistic and multinomial regression analyses examining associations between structural and functional social support and diabetes prevalence: HCHS/SOL Sociocultural Ancillary Study

	Logistic Regression Analyses (N = 5181)	Multinomial Regression Analyses (N = 5026)	
	Any diabetes vs. No diabetes OR [95% CI]	**Previously diagnosed vs. No diabetes, OR [95% CI]**	**Newly diagnosed vs. No diabetes, OR [95% CI]**
Demographic covariates (coefficients are from model excluding support variables)			
Age[a]	1.07 [1.06, 1.08]	1.08 [1.06, 1.09]	1.06 [1.05, 1.07]
Gender[b]	0.97 [0.79, 1.20]	1.02 [0.79, 1.31]	0.88 [0.66, 1.17]
Immigrated 10+ years ago[b]	0.80 [0.56, 1.16]	0.78 [0.50, 1.22]	0.84 [0.51, 1.37]
Immigrated <10 years ago[b]	0.54 [0.33, 0.87]	0.43 [0.25, 0.73]	0.71 [0.38, 1.34]
Interview Language[b]	0.90 [0.60, 1.34]	0.87 [0.55, 1.37]	0.73 [0.44, 1.21]
Income[a]	0.90 [0.86, 0.95]	0.88 [0.83, 0.93]	0.93 [0.86, 1.01]
Education[a]	0.90 [0.79, 1.02]	0.88 [0.76, 1.03]	0.91 [0.75, 1.09]
Health Insurance[b]	1.29 [1.03, 1.61]	1.67 [1.26, 2.21]	0.81 [0.58, 1.13]
Hispanic Background[b]			
Central American	0.89 [0.62, 1.28]	1.07 [0.68, 1.67]	0.69 [0.42, 1.15]
Cuban	0.74 [0.53, 1.01]	0.83 [0.56, 1.23]	0.60 [0.38, 0.97]
Dominican	0.75 [0.53, 1.06]	0.76 [0.49, 1.16]	0.75 [0.44, 1.27]
Puerto Rican	0.95 [0.68, 1.32]	1.09 [0.75, 1.57]	0.77 [0.45, 1.31]
South American	0.65 [0.42, 1.00]	0.65 [0.38, 1.10]	0.73 [0.40, 1.33]
More than one/Other	0.45 [0.23, 0.90]	0.51 [0.23, 1.15]	0.33 [0.12, 0.87]
Structural Support			
Unadjusted Model	0.72 [0.65, 0.80]	0.68 [0.61, 0.76]	0.78 [0.68, 0.89]
Adjusted Model	0.86 [0.77, 0.96]	0.84 [0.73, 0.96]	0.84 [0.72, 0.98]
Functional Support			
Unadjusted Model	0.78 [0.71, 0.86]	0.78 [0.70, 0.87]	0.78 [0.66, 0.91]
Adjusted Model	0.87 [0.78, 0.96]	0.88 [0.79, 0.98]	0.83 [0.71, 0.99]
Conjoint Models (Adjusted Models Only)			
Structural Support[c]	0.89 [0.79, 0.99]	0.86 [0.75, 0.99]	0.88 [0.75, 1.03]
Functional Support[d]	0.90 [0.81, 0.99]	0.92 [0.82, 1.03]	0.87 [0.72, 1.03]

[a] Continuous (Age) or ordinal (Education, 3 categories, <HS diploma/GED, HS diploma/GED only, >HS diploma/GED; Income, 10 categories, < $10,000 to > $100,000) effects tested.

[b] Categorical effects tested [Gender, Male = 0; Immigration, Born in US Mainland = 0 (referent group); Interview Language, Spanish =0; Insurance, No Insurance = 0; Ethnic Background, Mexican = 0 (referent group)].

[c] Number of high contact social roles as measured by the Social Network Index (possible range 0–12)

[d] Overall perceived social support as measured by the ISEL-12 (possible range 0–36)