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The Provision of Diabetes-Monitoring Exams to Older Latinos

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Abstract

Objectives—To explore factors associated with the provision of diabetes-monitoring practices among older Latinos with type 2 diabetes.

Method—Data from 547 Latinos (≥55 years) were analyzed from the 2007 California Health Interview Survey. Multivariate logistic regression modeled the relationship between health status and sociodemographic factors and the receipt of semiannual HbA1c tests, annual foot exams, and annual retinal exams.

Results—The majority of older Latino diabetics received foot exams (87%) and retinal exams (77%), but the provision of semiannual HbA1c tests (30%) was low. Higher English-language proficiency and health insurance coverage were associated with the provision of HbA1c tests and foot exams, but not retinal exams. Insulin therapy was positively associated with semiannual HbA1c testing, but negatively associated with foot exams.

Discussion—There are considerable missed opportunities in the provision of diabetes monitoring for older Latinos, particularly those with limited English proficiency, less comprehensive insurance, and noninsulin therapy.

Keywords

type 2 diabetes; health services; Mexican American

Introduction

Diabetes care for older adults poses complex challenges resulting from co-occurring chronic conditions and age-related disorders, which include cognitive impairment, depression, and polypharmacy (California Healthcare Foundation [CHF]/American Geriatrics Society [AGS], 2003). Studying the processes of diabetes care among the growing number of older

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Latinos (age ≥ 60 years) is critical, in light of their disproportionate rates of type 2 diabetes, chronic illness, uncontrolled diabetes, and diabetes-related conditions compared to non-Latino Whites (Beard, Al Ghatrif, Samper-Ternent, Gerst, & Markides, 2009; Black, Ray, & Markides, 1999; Cowie et al., 2006; Harris, Klein, Cowie, Rowland, & Byrd-Holt, 1998).

In addition to at-home self-care practices (e.g., diet regimen, physical activity, glucose monitoring), the American Diabetes Association (ADA) recommends that persons with type 2 diabetes receive a semiannual hemoglobin A1c (HbA1c) tests, regular foot examinations, and annual dilated eye exams to be an essential component of overall diabetes management (ADA, 2010). Members of the ADA's Professional Practice Committee provide expert consensus, following a review of the evidence, and revise recommendation annually, which are then published in their "Standards of medical care in diabetes." Recommendations are qualified on a grading system—"A," "B," "C," and "E"—to codify the strength of the evidence for each recommendation. However, these do not preclude clinical judgment and patients' individual medical histories. Monitoring practices, such as HbA1c test, foot and retinal exams are thus crucial to informing decisions to initiate or modify a patient's treatment regimen in response to the progression of the disease. In fact, the National Committee for Quality Assurance uses Health Plan Employer Data and Information Set (HEDIS) requires providers to report on the provision of annual HbA1c and retinal exams to assess diabetes processes of care and outcome measures to quantify the quality of comprehensive care for diabetes patients (HEDIS, 2010).

Unfortunately, older Mexican Americans often have poor adherence to diabetes treatment regimens, which increases their risk for kidney disease and all-cause mortality (Heisler et al., 2007; Kuo et al., 2003). Research has shown that adult Latinos with diabetes are less likely than non-Latino Whites to receive ongoing screening for HbA1c (Nwasuruba, Osuagwu, Bae, Singh, & Egede, 2009; Vargas Bustamante, Chen, Rodriguez, Rizzo, & Ortega, 2010). This inconsistent provision of diabetes-related exams may be attributable to numerous causes, including a host of sociodemographic and acculturation factors that hamper Latinos' efforts to manage their diabetes and navigate health care services (Agency for Healthcare Research and Quality (AHRQ), 2008; Wallace, Gutierrez, & Castaneda, 2008). Prior studies evaluating diabetes processes of care have mostly focused on middle-age adults (Nwasuruba et al., 2009; Vargas-Bustamante et al., 2010) or have examined predictors of self-care activities, such as at-home glucose monitoring, physical activity, medication adherence, and/or dietary changes in adults or middle-age Latinos (Morrow, Haidet, Skinner, & Naik, 2008; Silliman, Bhatti, Khan, Dukes, & Sullivan, 1996). Correlates of diabetes processes of care, however, may be different for older Latinos because of their complex health profiles, lower rates of insurance coverage, and other cultural and linguistic factors that are less prevalent among younger Latinos.

Conceptual Framework

The purpose of this study was to identify the extent to which ADA recommendations for three core exams administered by health care providers (semiannual HbA1c tests, annual foot exam, and annual dilated retinal exam) are consistently provided to older Latinos with type 2 diabetes. Second, we investigate the individual and relative contributions of functional impairment, psychological distress, treatment regimen, sociodemographic factors, and acculturation on older Latinos' receipt of the three ADA recommended diabetes-related screenings.

To accomplish these objectives, we adapted Andersen's model of health service use as a conceptual framework (Aday & Andersen, 1974). Frequently used in studies of older adults, Andersen's framework identifies three primary types of factors influencing the activity of

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seeking to use health care services. *Need factors* (e.g., functional impairment, psychological distress, treatment regimen) are those that may require immediate service use and monitoring; *enabling factors* (e.g., health insurance, acculturation factors) are resources and human capital that facilitate the use of the desired or necessary health services; and *predisposing characteristics* (e.g., education, age) are those that predate the illness for which health care services are needed (Aday & Andersen, 1974; see Figure 1). Within this broad range of factors, three specific issues are likely to be especially relevant to the consistent provision of diabetes-monitoring practices in older Latinos: (a) health correlates (functional impairment, psychological distress, and treatment regimen), (b) health insurance coverage, and (c) acculturation factors (English-language proficiency and U.S. nativity).

Health correlates: Psychological distress, functional impairment, and treatment regimen

The monitoring and treatment of co-occurring conditions may be as critical to older adults' diabetes care as treating the diabetes. For example, comorbid depression, which affects one third of Latinos with type 2 diabetes (Anderson, Freedland, Clouse, & Lustman, 2001; Black, 1999), increases the risk of mortality and diabetes-related complications (de Groot, Anderson, Freedland, Clouse, & Lustman, 2001; Katon et al., 2004; Ludman et al., 2004) by disrupting medication adherence and reducing access to preventive health services (Fitten et al., 2008; Morrow et al., 2008; Morrow, Haidet, Skinner, & Naik, 2008; Pagoto et al., 2009; Silliman et al., 1996). In addition, other conditions such as hypertension may be present and require monitoring and controlling to reduce cardiovascular complications (ADA, 2009).

Typically, diabetic patients with comorbid conditions are more likely to receive an HbA1c test and eye exam because they require more office-based physician visits and ongoing monitoring (Bae & Rosenthal, 2009). This would lead to the hypothesis that the presence of psychological distress or functional impairment in older Latinos will be associated with increased provision of diabetes-monitoring exams. The Panel on Improving Care for Elders with Diabetes of the American Geriatrics Society (CHF/AGS, 2003) has called attention to the importance of treating geriatric syndromes in older adults with type 2 diabetes because of their pathophysiological association with diabetes, such as depression, pain, polypharmacy, cognitive impairment, injurious falls, and urinary incontinence. This is particularly salient, given the dramatic increase in the prevalence of geriatric syndromes among older (age ≥ 75 years) Mexican Americans between 1994 and 2005, such as pain, arthritis, and limitations in activities of daily living (Beard et al., 2009).

Compared with patients with less complex health problems, the presence of several comorbid conditions requires time and attention away from the provision of diabetes monitoring during an office visit, resulting in missed opportunities for HbA1c testing and foot exams.

Patients' diabetes treatment regimen may also impact the provision of diabetes-monitoring exams. Insulin therapy remains the most aggressive form of diabetes treatment and the best choice if adequate glycemic control is not achieved with oral medication and lifestyle modification (ADA, 2009). It also requires closer monitoring and treatment plans are largely tailored to patients' physical health, changes in disability, and tolerance and response to treatment (ADA, 2009). Thus, insulin therapy, whether alone or in combination with oral medication, may heighten the provision of HbA1c tests, foot and retinal tests.

Health insurance coverage

Aside from the presence of comorbidity, health insurance coverage is also an important predictor of preventive care service use, particularly for Latinos. (Patel, Bae, & Singh, 2010; Vargas-Bustamante et al., 2010). In fact, disparities in the rates of receipt of diabetes

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preventive screening tests between Latino and non-Latino Whites have been attributed to Latinos' underinsurance or complete lack of insurance (Vargas-Bustamante et al., 2010). Health insurance coverage is also a reliable predictor of having a regular source of care (Corbie-Smith, Flagg, Doyle, & O'Brien, 2002), which is associated with adult Latinos having had an HbA1c and retinal test in the previous year (Kurian & Borders, 2006).

Older Mexican Americans tend to accumulate fewer resources in older age and thus rely heavily on public sources of funding, such as Medicaid and Medicare to cover health care and medication expenses (Angel, Angel, & Markides, 2002). This can severely reduce access to timely preventive care. Medicaid, for example, uses capitated managed care plans, which are associated with lower medication adherence (Pawaskar et al., 2010). With multiple comorbidites, patients require many medications that exceed payment limits, forcing low-income patients to be selective in their medication use. Lack of supplemental health insurance is significantly associated with inconsistency of use of medication in older Mexican Americans (Kuo et al., 2003). Underinsurance has also been associated with poorer perceived quality of care among adult Latinos with type 2 diabetes (Rodriguez, Chen, & Rodriguez, 2010). At greatest risk of underinsurance or lack of insurance are recent older Latino immigrants, who are less likely than non-Latino Whites to receive pension benefits and supplemental health insurance (Wallace et al., 2008; Wallace & Villa, 2003). This leads us to hypothesize that levels of health insurance coverage will be associated with decreased incidence of provision of monitoring practices.

Acculturation factors

Compared with young and middle-age Latinos, older Latinos, particularly recent immigrants, have a lower level of education and are less likely to be English-language proficient, which leads to significant language barriers (Wallace et al., 2008; Wallace & Villa, 2003). Limited English proficiency is strongly correlated with patients' poorer perceived quality of care, as it can impair patient-provider communication (Rodriguez, Chen, & Rodriguez, 2010), which is essential to promoting adherence to treatment regimens and the provision of monitoring practices (Stewart et al., 2000; Svetky et al., 2009). Additionally, limited English-language proficiency can create barriers to establishing the best treatment regimen and initiation of insulin therapy (Caballero, 2006; Campos, 2007). Thus, compared to U.S.-born Latinos, we expect older foreign-born Latinos with limited English-language proficiency to encounter greater barriers to receiving recommended diabetes care-monitoring tests.

Research Design and Method

Data Source and Procedures

This cross-sectional study employs a purposive sample subset (n = 547) of older Latinos with diabetes (age ≥55) from the 2007 California Health Interview Survey (CHIS), an annual population-based random telephone survey of California's population that contains a representative and diverse sample of adult interviews. To gather credible and comprehensive information about the health of Californians, the CHIS surveys more than 50,000 people about a large range of health topics from asthma and obesity to immigrant health and health insurance (CHIS, 2008).In the multistage sampling design of the CHIS 2007, data were collected using landline and cellular telephone interviews conducted in five languages (˜8% conducted in languages other than English). Interviews averaged 35 minutes to "complete" (>80% questions answered) and a US$2 incentive was provided. The overall CHIS 2007 response rate was 21% and comparable to rates of other scientific telephone surveys in California (CHIS, 2008).

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Before the CHIS 2007 data set was made available to researchers, missing responses were imputed by the CHIS programming team. Where possible, logical imputation was used with a valid value determined based on other variables from the same respondent or others from the same household. Where this was not possible, "hot-deck" imputation was used with the missing value being taken from an unrelated respondent with a similar response profile. Overall, nonresponse rates were low with most variables missing responses for less than 2% of the sample. However, the nonresponse rate was greater than 20% for some variables, including household income. Proxy interviews were used for frail and ill persons above the age of 65 who were unable to complete the extended adult interview. Extensive logic checks and edits were performed following imputation to ensure data consistency between imputed and nonimputed values (CHIS, 2008).

Following imputation, the CHIS staff weighted the data to produce population estimates enabling our study sample to be representative of the sub-population of older Latinos with type 2 diabetes. Participants for this study were selected if they were above 55 years of age, responded affirmatively to being Hispanic/Latino, and reported that they were told by a doctor they had type 2 diabetes (other than during pregnancy). Prior research has demonstrated positive agreement between self-reported diabetes and diabetes confirmed by blood tests (Kaye, Folsom, Sprafka, Prineas, & Wallace, 1991; Midthjell, Holmen, Bjorndal, & Lund-Larsen, 1992). We excluded persons who reported they were "borderline diabetic" or "prediabetic." Our sample of 547 older (aged ≥ 55) Latinos with type 2 diabetes represented 23% of the original CHIS sample population which is only slightly lower than diabetes prevalence estimates for older Latinos in California (25% for ages 55-65; 26% for ages ≥65; Burrows, Valdez, Geiss, & Engelgau, 2004).

Measures

Primary outcome variables—The three primary outcome variables were diabetes-monitoring practices: (a) HbA1c tests, (b) foot exams, and (c) retinal exams. For HbA1c testing, participants were asked "how many times in the last 12 months has a doctor checked you for hemoglobin 'A one C'?" (scored 0 if *never*/*never heard of it*/*only once in the previous year*, 1 if *two or more times in the previous year*). For foot and retinal exams, participants were asked "how many times in the last 12 months has a doctor checked your feet for any sores or irritations" and "when was the last time you had an eye exam in which the pupils were dilated? This would have made your eyes sensitive to bright light for a short time" (0 if *never*, 1 if *one or more times in the last year*). The ADA treatment guidelines recommend checking HbA1c every 3 to 6 months; however, most insurers including Medicare, only pay for semiannual checks. The ADA recommends that foot exams are performed at every doctor visit and retinal exams performed annually. For the purposes of this study, we defined compliance as being checked at least once per year, on the premise that older adults normally attend at least an annual health check-up.

Need Factors

Functional impairment—Functional impairment was measured using a composite score comprised of four known correlates of frailty and disability among older Latinos, including quality of life, activities of daily living, and cognition (Al Snih et al., 2009; Masel, Graham, Reistetter, Markides, & Ottenbacher, 2009; Ottenbacher, et al., 2009; Raji, Al Snih, Ostir, Markides, & Ottenbacher, 2010). As a population-based study in which elder issues were not explicitly addressed, we conducted a factor analysis to assess the strength and quality of various questions items as individual and aggregate items to describe functional impairment. We found our composite variable to be more reliable than using single items independently. The first component of our composite measure was a one-item question on self-rated health, in which respondents rated their health as "poor," "fair," "good," "very good," or

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"excellent." These categories were then collapsed into a binary variable: 1 if *poor/fair* and 0 if *good/excellent*. The remaining components described participants' level of independence in activities of daily living, and each was coded into a binary variable. Specifically, they were asked if (a) they had a condition that substantially limited one or more basic physical activities, such as walking, climbing stairs, lifting, or carrying things (scored 1 if *yes*, 0 if *no*), (b) had difficulty dressing, bathing, or getting around inside the home (1 if *yes*, 0 if *no*) and/or (c) had difficulty going outside the home alone to shop or visit a doctor's office (1 if *yes*, 0 if *no*). The combined scores ranged from 0 to 7, with 7 indicating the highest level of functional impairment.

To test the strength of this composite variable, we conducted a principal axis factor analysis with oblique rotation to identify the major constructs, given observed intercorrelation between certain items (Jenrich & Sampson, 1966). Using Bartlett's test of Sphericity, $\chi^2(15) = 435.02$, $p = .000$, which meets the criteria for Bartlett's test ($p < .001$). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy produced a score of .74, which is considered "middling" and above mediocre, where typically a KMO = .6 is desired. Reliability testing showed acceptable reliability (Cronbach's $\alpha = .67$).

Psychological distress—The Kessler 6 (K6) Scale (Kessler et al., 2003) was used to measure psychological distress and consists of 6 questions which describe the level of anxiety and depressive symptoms experienced in the preceding 4-week period (i.e., how often the participant felt nervous, hopeless, restless, worthless, or so depressed that nothing cheered them up). The possible responses were: 0 if *none of the time*; 1 if *a little of the time*; 2 if *some of the time*; 3 if *most of the time*; to 4 if *all of the time*. Scores ranged from 0 to 24 and include the following standard 3 categories: 13-24 indicates that a participant is experiencing severe psychological distress, 8-12 moderate distress, and 0-7 no or mild distress (Kessler et al., 2003). Psychological distress is used as a continuous variable in the multivariate models.

Treatment regimen—Diabetes treatment regimen was categorized as 1 if the participant was on no treatment or lifestyle modification alone, 2 if *on insulin therapy only*, 3 if *on oral medication only*, and 4 if *on combined insulin therapy with oral medications*.

Enabling Factors

Factors considered to influence the consistent provision of diabetes preventive screenings, included acculturation factors (English-language proficiency and nativity), health insurance, and income. Although the CHIS did not use a validated acculturation scale, English-language proficiency and nativity were used to represent U.S. cultural orientation. These acculturation variables have been shown to account for high proportions of variation in acculturation measures, indicating they are valid proxy measures (Coronado, Thompson, McLerran, Schwartz, & Koepsell, 2005). Nativity was scored by the participant's place of birth (0 if *foreign born*, 1 if *U.S. born*) and English-language proficiency on a 4-point Likert-type scale (1 if *not at all* to 4 if *very well*). Health insurance was ranked according to levels of preventive screening coverage, with higher numbers indicating more generosity relevant to diabetes care screening and care, with high (1 if the participant *was uninsured*; 2 if they had Medicaid only or other publicly funded insurance besides Medicare; 3 if they had Medicare, Medicare with Medicaid, or Medicare with Supplements/Other; and 4 if they had *employment-based or private insurance*). Income was coded according to the federal poverty level (FPL; 1 if *0%-99% above the FPL*, 2 if *100%-199% above FPL*, 3 if *200%-299% above FPL*, 4 if *300% or more above FPL*).

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Predisposing Factors

Four predisposing variables were included as covariates in this study: age (continuous), sex (scored 1 if *male*, 2 if *female*), marital status (1 if *married*, 2 if *living with partner*, 3 if *widowed/divorced/separated*, 4 if *never married*), and educational attainment (0 if the *participant had no formal education*, 1 if *Grade 1-8*, 2 if *Grade 9-11*, 3 if *Grade12/H.S. Diploma equivalent*, 4 if some college, vocational degree, or associate's degree, 5 if *bachelor's degree or higher*).

Analyses

Descriptive and bivariate statistics were calculated to compare older Latinos by various levels of psychological distress, functional impairment, sociode-mographic characteristics, and acculturation factors (see Table 1). To identify significant differences between categories of variables for preventive screening outcomes, Chi-square tests were performed to compare nominal data, *t*-tests for continuous data.

Ordered logistic regression was used to model the relative odds of health status, medication use, sociodemographic, and cultural factors influencing the receipt of guideline recommended measures of diabetes care among older Latinos with diabetes. Our models were built by sequentially adding risk variables, then adding enabling and predisposing factors with each step. Criterion for entry to the model (and staying in the model) was significance at the $p < .05$ level. Diagnostics for multicollinearity were calculated and examined at each step. Likelihood and Goodness of Fit tests Hosmer-Lemeshow (H-L) was used to assess model fit. All analyses were performed in SPSS version 17.

Results

Bivariate analyses and summary statistics are shown in Table 1. The mean age of our study sample was 66.6 years ($SD = 1.58$), with slightly more females (58%). Participants functional impairment score averaged 1.89 ($SD = 1.57$) on a scale of 0 (*no functional impairment*) to 7 (*high functional impairment*). Moderate to severe levels of psychological distress were reported in 20% of the sample. Overall, 87.1% of participants reported receiving a foot exam during the prior 12 months, 76.6% reported a retinal exam during the prior 12 months, and only 30.3% reported more than 1 HbA1c test in the prior 12 months. The majority of our sample were treating their diabetes with oral medications only (62.7%), followed by a combination of insulin and oral medication (15.9%).

As presented in Table 1, bivariate analyses indicate significant differences in average functional impairment scores between those who met ADA guidelines for the biannual HbA1c tests and regular foot exams. Person with higher levels of functional impairment were less likely to have a biannual HbA1c test, $M = 1.98$, $SD = 1.60$ versus $M = 1.71$, $SD = 1.49$; $t(545) = 1.92$, $p < .05$. Similarly, higher functional impairment was associated with a decreased provision of regular foot exams, $M = 2.18$, $SD = 1.56$ versus $M = 1.73$, $SD = 1.60$, $t(72.20) = 2.00$, $p < .05$. Receipt of semiannual HbA1c tests, $\chi^2(3, 547) = 24.76$, $p = .000$, and annual foot exams, $\chi^2(3, 434) = 9.28$, $p = .026$, significantly differed by medication use. As a follow-up analysis, we examined the relationship between medication use and functional impairment, and found insulin therapy or combined insulin with oral medication to be positively correlated with higher functional impairment, lower levels of health insurance coverage, and higher poverty.

Differences in association were observed for several enabling and predisposing variables across the three care process measures. English-language proficiency was higher among those who met requirement for annual foot exams versus those who did not, $\chi^2(3, 434) = 41.55$, $p = .001$. Being U.S.-born was significantly associated with receipt of annual foot

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exams, $\chi^2(1, 434) = 18.53$, $p = .000$, and retinal exams, $\chi^2(1, 547) = 6.39$, $p = .011$, but not HbA1c tests. Health insurance status was associated with greater likelihood of receiving foot exams, $\chi^2(3, 427) = 28.09$, $p = .000$, and retinal exams, $\chi^2(3, 536) = 31.48$, $p = .000$, but not HbA1c tests. In addition, Latinos who met recommendations for retinal exams were significantly older ($M = 67.07$, $SD = 7.97$) compared to those not meeting this recommendation ($M = 65.20$, $SD = 7.76$), $t(545) = -2.38$, $p < .05$. Being married ($p < .05$) and female ($p < .05$) was positively associated with the receipt of HbA1c tests. Education was significantly associated with increased likelihood of having received a foot exam ($p < 0.001$) and retinal test ($p < .05$) in the last 12 months.

Results from the multivariate logistic regression examining the odds of receiving semiannual HbA1c tests are shown in Table 2. As illustrated in this analysis, the model was sequentially improved with the addition of enabling factors, $\chi^2(10, 534) = 34.59$, $p = .000$, and predisposing factors, $\chi^2(14,534) = 40.99$, $p = .000$, indicating that the final full model was able to distinguish between respondents who received a seminannual HbA1c test and those who did not. Older Latinos treating their diabetes with only insulin therapy were almost five times more likely to receive an HbA1a test than those on no therapy (95% CI [2.26, 9.79], $p = .000$). Insulin therapy plus oral medication also significantly increased the odds of receiving semiannual HbA1c tests and remained significant with the addition of enabling and predisposing factors in the full model (OR = 2.01, 95% CI [1.08, 3.72], $p = .027$). Females were less likely to have met the requirements for HbA1c testing when compared to their male counterparts (OR = 0.64, 95% CI [0.43, 0.97], $p = .037$).

Given that 20% of our sample indicated they had never heard of the HbA1c test, we ran a sensitivity analysis to determine if any bias was introduced in our models. In our initial binary measure of semiannual HbA1c tests (received vs. not received), respondents who reported they had never heard of the HbA1c test were treated as “not received.” In the sensitivity analysis, we deemed “never having heard of the HbA1c” as a missing variable. The only major difference was that those with English-language proficiency had higher odds of receiving semiannual HbA1c tests when compared to their counterparts with lower English-language proficiency (OR = 1.65, 95% CI [1.19, 2.28], $p = .003$). Further, no significant relationship was identified for combined therapy (insulin + oral meds) in any of the three models ($p > .05$).

Results from the multivariate logistic regression examining the odds of receiving the recommended annual foot exams are shown in Table 3. As observed in this analysis, the model was sequentially improved with the addition of enabling factors, $\chi^2(10,425) = 61.53$, $p = .000$, and predisposing factors, $\chi^2(14,425) = 64.74$, $p = .000$, indicating that the model was able to distinguish between respondents who had an annual foot exam by a provider and those who did not. In the second and final models, participants with higher English-language proficiency were approximately two times more likely to have received the recommended foot exam when compared to their counterparts with less English-language proficiency (95% CI [1.26, 3.18], $p = .003$). Being on insulin only significantly decreased the odds of receiving annual foot exams by almost one fourth, and persisted with the addition of enabling and predisposing factors (OR = 0.22, 95% CI [0.07, 0.74], $p = .014$). Persons with higher levels of English-language proficiency (OR = 1.99, 95% CI [1.26, 3.18], $p = .003$) and adequate health insurance (OR = 1.62, 95% CI [1.07, 2.45], $p = .023$) were almost twice as likely to have an annual foot exam, respectively.

Results from the multivariate logistic regression examining the odds of receiving the recommended annual retinal exams are shown in Table 4. As seen in this analysis, the model was sequentially improved with the addition of enabling factors, $\chi^2(10,534) = 42.93$, $p = .000$, and predisposing factors, $\chi^2(10,534) = 52.37$, $p = .000$, indicating that the model was

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able to distinguish between respondents who received the ADA required annual retinal exam. In this model, enabling factors contributed most to receiving the recommended foot exams. Higher income (OR = 1.28, 95% CI [1.11, 1.48], $p = .001$) and adequate health insurance coverage (OR = 1.41, 95% CI [1.08, 1.85], $p = .012$) increased the likelihood of having a foot exam with a health care professional in the past year. Older participants were also more likely to have had an annual foot exam when compared to their younger counterparts (OR = 1.04, 95% CI [1.01, 1.07], $p = .014$).

Discussion

With an adapted version of Andersen's model of health care service use as a guiding framework, we sought to examine the patterns and correlates of diabetes monitoring practices among older Latinos (age ≥ 55 years). Older Latinos in California fell short of national rates of HbA1c testing with an incidence of 30%, compared to 94% for age ≥ 60 (AHRQ, 2008) or 90% for adult/middle-age Mexican Americans (Vargas-Bustamante et al., 2010). However, it is important to note that our results follow the ADA's recommendation that persons with type 2 diabetes receive an HbA1c exam twice per year, whereas AHRQ's compliance rate was determined using less stringent, older ADA standards that recommended HbA1c testing only once per year. Older adults, however, may benefit from more stringent recommendations, such as the semiannual HbA1c testing measured in our study. In contrast, older Latinos in California had higher receipt rates than AHRQ's (2008) national average for foot exams (87% vs. 73%) and retinal exams (77% vs. 61%), a similar result to that observed by Vargas Bustamante et al., (2010). Further, our findings suggest that the *need factor* of treatment/medication, the *enabling factors* of health insurance and English-language proficiency, as well as the *predisposing factor* of age, were more important than a disability-driven need for services.

Based on previous research that indicates a positive relationship between disease complexity and preventive care use (Bae & Rosenthal, 2008), we expected that older Latinos' functional impairment and/or psychological distress would be associated with more consistent provision of HbA1c tests, foot checks, and retinal exams. Instead bivariate analyses showed that older Latinos with higher levels of functional impairment were less likely to receive the ADA required HbA1c tests and foot exams, but that the level of impairment was unrelated to retinal tests. However, these relationships did not persist after adjusting for medication/ treatment type, soicodemographic, and acculturation factors.

We also anticipated that treatment type would be predictive of the provision of different types of screening. Insulin therapy, for example, requires greater glucose monitoring, but also indicates that the person would have previously been deemed to need more aggressive treatment. Although insulin therapy is typically the last choice of treatment, it is the recommended treatment for cases where diet and exercise and/or oral medication have failed to regulate the patients' HbA1c to below 7.0% and diabetes-related complications emerge or worsen. Thus, insulin use, whether alone or combined with oral medication, is a strong indicator of a patients' greater functional disability. Patients have greater difficulty with insulin therapy. It also carries a risk of hypoglycemia, and requires increased monitoring by a physician. This may explain why, in this study, older Latinos on insulin therapy or combined insulin plus oral medication were more likely to have received an HbA1c test according to the ADA's recommended guidelines. In contrast, insulin therapy appeared to have an opposite effect on foot exams compared to HbA1 testing in our study sample. As a follow up analysis, we examined the relationship between treatment type and functional impairment, and found this to be positively correlated with functional impairment, lower levels of health insurance coverage, and greater poverty. Whereas the HbA1c test is performed by a separate health care provider (a partner laboratory, nurse, or phlebotomist)

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and the retinal eye exam requires a dedicated appointment, the foot examination requires more time from the provider during the visit, and may possibly be complicated by the patient's other competing health concerns.

Reliance on self-reported information regarding their receipt of the three screening exams and diagnosis of diabetes may pose a small limitation. However, several studies show a strong concordance between patients' self-reported diabetes diagnosis and provider confirmed diagnosis (Midthjell et al., 1992; Kaye et al., 1991). In our study, 20% of older Latinos surveyed had never heard of the HbA1c test, and thus were unable to provide the estimated number of times they received the exam in the previous 12 months. This is concerning given the relative importance of regular HbA1c testing among those with type 2 diabetes, but also potentially problematic in our interpretation of results. To examine possible biases, we ran a sensitivity analysis to assess the reliability of older Latinos' response to the HbA1c question. We found that older Latinos with low English-language proficiency were most likely to report never having heard of the HbA1c exam. The use of medical jargon by providers and interviewers, though not directly tested here, may further add to miscommunication and the over- or underreporting of actual HbA1c testing. Low health literacy is higher in the elderly, Hispanic or African Americans, impoverished, and less educated (Baker, Gazmararian, Sudano, & Patterson, 2000; Lee, Gazmararian, & Arozullah, 2006). In fact, in a study of English- and Spanish-speaking primary-care patients with type 2 diabetes, Schillinger and colleagues (2002) found low health literacy was independently associated with poor glycemic control and higher rates of retinopathy.

Another potential limitation may lie in the psychometric tool used in this investigation, the Kessler 6 Scale, which captures a broad range of symptoms, including anxiety and depressive symptoms. The somatization of mental health and depressive symptoms, and cultural views and stigma around mental health, as well as their variation by acculturation, are still poorly understood in older adults. Thus, their meaning and interpretation may not be accurately captured in commonly used psychometric instruments (Hays, 1996). Another noteworthy limitation is the exclusion of information on the duration of diabetes, an important determining factor in adherence to medication (Kuo et al., 2003). In addition, although low scores on our functional impairment composite variable may be indicative of low cognition, it does not fully assess cognitive impairment to the same extent that Mini Mental State Examination or similar tests. Cognitive impairment may directly impact patient's ability to follow complex diabetes management regimens or comprehend recommendations.

Enabling factors affecting provision of diabetes monitoring, such as English-language proficiency and adequate health insurance were significantly associated with the receipt of one or more of the three tests. These results support previously reported benefits of English-language proficiency and adequate health insurance in accessing health services (AHRQ, 2008; Mainous, Diaz, Koopman, & Everett, 2007; Patel et al., 2010; Vargas-Bustamante et al., 2010; Wallace et al., 2008).

Although it is possible they had the test and were unaware of it, our results suggest that providers may be failing to test for HbA1c in these uninformed patients. Alternatively, providers may not be furnishing the necessary pre-testing education and/or failing to debrief patients about their test results or implications for their overall diabetes management. This may be an artifact of the patients' low health literacy and poor patient-provider communication, but a symptom of a larger deficiency in cultural competence among health care providers and organizations, and suboptimal quality of care. Fewer doctor visits among Latinos (Mainous et al., 2007) and not having a usual source of care (Devoe, Tillotson, & Wallace, 2009) have been shown to be significantly associated with HbA1c testing among

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persons with type 2 diabetes in the past year. To more effectively identify barriers to compliance with ADA recommendations, diabetes preventive screening practices must be completed within health systems available to older Latinos.

Public Health Implications

Targeting evidence-based programs and education about the relationship between diabetes treatment regimen and disease progression to low-income, limited English-proficient older Latino patients is especially needed to rein-force the importance of timely HbA1c, foot, and retinal exams. Given the role of English-language proficiency in the provision of recommended diabetes monitoring, greater attention is needed toward improving patient-provider communication and overall health systems (Svetky et al., 2009). Several promising models to enhance health system responsiveness to the special needs of older adults do exist, such as Geriatric Resources for Assessment and Care of Elders (GRACE) and Guided Care. GRACE is a care coordination case management model which targets high-risk low-income seniors and addresses medication management, polypharmacy, and common geriatric syndromes (Counsell et al., 2007, Counsell, Callahan, Tu, Stump, & Arling, 2009). Another example is Guided Care, which expands the chronic care model (Bodenheimer, Wagner, & Grumbach, 2002), and seeks to streamline efforts to coordinate chronic disease management among older adults (Boult et al., 2008). Although these programs have found to be cost effective in randomized controlled trials and offer numerous benefits, they have not yet been tested to determine whether they will find similar success with ethnically diverse older adults and those with limited English proficiency.

Disease-management programs, such as the Diabetes Self-Management Program (DSMP) and Chronic Disease Self-Management Program (CDSMP; Enguidanos, 2006) have been adapted in Spanish, and have been shown to reduce hospitalizations, and improve participant's physical activity, cognitive symptom management, health distress, disability, and communication with physicians (Lorig, Sobel, Ritter, Laurent, & Hobbs, 2001). However, although disease management programs like CDSMP are slated to become increasingly available nationwide through the Patient Protection and Affordable Care Act, additional resources are required to ensure these programs reach the most at-risk older Latinos, are delivered in their primary language, and also link in to aging services (Beattie & Howard, 2010; National Council on Aging, 2005).

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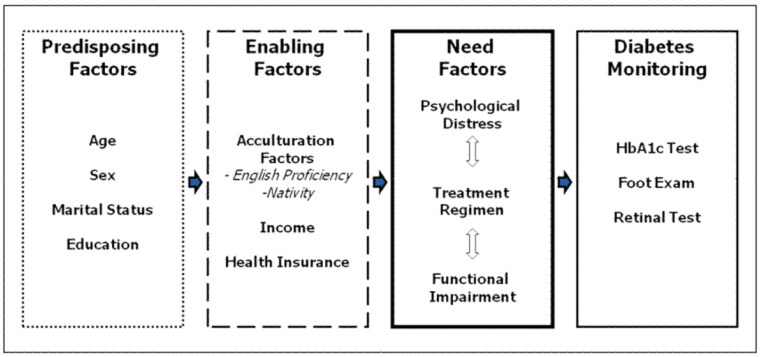

Figure 1.
Factors associated with older Latinos' provision of American Diabetes Association recommended screenings. The solidity of the lines indicates the hypothesized importance of each group of factors. Adapted from Anderson's model of health service utilization (Aday & Andersen, 1974).

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Table 1

Characteristics of Need, Enabling, and Predisposing Factors Associated With Diabetes-Related Monitoring Practices in Older Latinos With Type 2 Diabetes; 2007-08 (n = 547)

	Hemoglobin A1c			Foot exam			Retinal test			Total
	Received n (%)	Not received n (%)		Received n (%)	Not received n (%)		Received n (%)	Not received n (%)		n (%)
NEED FACTORS	166 (30.3%)	381 (69.7%)	χ^2 or t	378 (87.1%)	56 (12.9%)	χ^2 or t	419 (76.6%)	128 (23.4%)	χ^2 or t	547 (100%)
Psychological distress										
None or mild (0-7)	135 (31.0%)	300 (69.0%)	χ^2 = 1-99	310 (88.6%)	40 (1 1.4%)	χ^2 =3.91	328 (75.4%)	107 (24.6%)	χ^2 = 2.07	435 (79.8%)
Moderate (8-12)	20 (31.7%)	43 (68.3%)		39 (81.3%)	9 (18.8%)		52 (82.5%)	1 (17.5%)		63 (1 1.6%)
Severe (13-24)	10 (21.3%)	37 (78.7%)		27 (79.4%)	7 (20.6.%)		38 (80.9%)	9 (19.1%)		47 (8.6%)
Functional impairment,	1.71 (1.49)	1.98 (1.60)	$t(545) = 1.92^{*}$	1.73 (1.60)	2.18 (1.56)	$t(72.20) = 2.00^{*}$	1.92 (1.57)	1.80 (1.56)	$t(2l\ 1.57) = 0.80$	1.89 (1.57)
Mean (SD)										
Treatment regimen										
None	36 (50.7%)	35 (49.3%)	$\chi^2 = 24.76^{***}$	46 (76.7%)	14 (23.3%)	$\chi^2 = 9.28^{*}$	48 (67.6%)	23 (32.4%)	χ^2 =5.31	71 (13%)
Insulin only	B (17.4%)	38 (82.6%)		29 (80.6%)	7 (19.4%)		34 (73.9%)	12 (26.1%)		46 (8.4%)
Oral only	07 (1.2%)	236 (68.8%)		242 (89.3%)	29 (10.7%)		265 (77.3%)	78 (22.7%)		343 (62.7%)
Insulin + Oral	72 (82.8%)	15 (17.2%)		61 (91.0%)	6 (9.0%)		72 (82.8%)	15 (17.2%)		B7 (15.9%)
ENABLING FACTORS										
Acculturation factors										
English-language proficiency										
Very well	73 (28.7%)	81 (71.3%)	χ^2 = 1-12	21 1 (95.9%)	9 (4.1%)	$\chi^2 = 41.55^{***}$	205 (80.7%)	49 (19.3%)	χ^2 = 5.66	254 (46.4%)
Well	36 (29.5%)	B6 (70.5%)		B6 (86.0%)	14 (14.0%)		93 (76.2%)	29 (23.8%)		22 (22.3%)
Not well	30 (32.6%)	62 (67.4%)		42 (70.0%)	18 (30.0%)		65 (70.7%)	27 (29.3%)		92 (16.8%)
Not at all	27 (34.2%)	52 (65.8%)		39 (72.2%)	5 (27.8%)		56 (70.9%)	23 (29.1%)		79 (14.4%)
Nativity										
U.S.-born	90 (54.2%)	236 (61.9%)	χ^2 = 2.87	254 (67.2%)	21 (37.5%)	$\chi^2 = 18.53^{***}$	262 (62.5%)	64 (50.0%)	$\chi^2 = 6\text{-}39^{*}$	326 (59.6%)
Foreign-born	76 (45.8%)	45 (38.1%)		24 (32.8%)	35 (62.5%)		57 (37.5%)	64 (50.0%)		221 (40.4%)
Income										
0-99% FPL	46 (27.7%)	76 (19.9%)	χ^2 = 6.44	66 (17.5%)	19 (33.9%)	$\chi^2 = 23.93^{***}$	B5 (20.3%)	37 (28.9%)	$\chi^2 = 15.85^{**}$	22 (22.3%)
100-199% FPL	43 (25.9%)	35 (35.4%)		1 3 (28.9%)	26 (46.4%)		27 (30.3%)	51 (39.8%)		78 (32.5%)

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	Hemoglobin A1c			Foot exam			Retinal test			Total
	Received n (%)	Not received n (%)		Received n (%)	Not received n (%)		Received n (%)	Not received n (%)		n (%)
200-299% FPL	28 (16.9%)	63 (16.5%)		64 (16.9%)	7 (12.5%)		71 (16.9%)	20 (15.6%)		91 (16.6%)
> 300% FPL	49 (29.5%)	07 (28.1%)		35 (35.7%)	4(7.1%)		36 (32.5%)	20(15.6%)		56 (28.5%)
Health insurance										
Uninsured	19 (44.2%)	24 (55.8%)	$\chi^2 = 5.21$	24 (66.7%)	2 (33.3%)	$\chi^2 = 28.09^{***}$	19 (44.2%)	24 (55.8%)	$\chi^2 = 31.48^{***}$	43 (8%)
Medicaid onty or other pubic insurance except Medicare	12 (23.5%)	39 (76.5%)		26 (72.2%)	0 (27.8%)		35 (68.6%)	6 (31.4%)		51 (9.5%)
Medicare, Medicare + Medicaid, or Medicare + Supplement or Choice	95 (29.3%)	229 (70.7%)		226 (88.6%)	29 (1 1.4%)		263 (81.2%)	61 (18.8%)		324 (60.4%)
Private or employment-based	35 (29.7%)	B3 (70.3%)		96 (96.0%)	4 (4.0%)		94 (79.7%)	24 (20.3%)		18 (22%)
PREDISPOSING FACTORS										
Age, mean years (SD)	66.01 (7.57)	66.91 (8.1 1)	$t = 1.24$	66.86 (7.92)	65.93 (8.19)	$t = (-.80)$	67.07 (7.97)	65.20 (7.76)	$t = (-2.38)^{*}$	66.6 (1.58)
Sex										
Female	B3 (50.0%)	234 (61.4%)	$\chi^2 = 6.19^{*}$	219 (57.9%)	31 (55.4%)	$\chi^2 = 0.13$	248 (59.2%)	69 (53.9%)	$\chi^2 = 1\text{-}12$	317 (58.0%)
Male	B3 (50.0%)	47 (38.6%)		59 (42.1%)	25 (44.6%)		71 (40.8%)	59 (46.1%)		230 (42.0%)
Marital status										
Married	B8 (53.0%)	91 (50.1%)	$\chi^2 = 9.03^{*}$	201 (53.2%)	23 (41.1%)	$\chi^2 = 5\text{-}08$	213 (50.8%)	66 (51.6%)	$\chi^2 = 1\text{-}77$	279 (51.0%)
Living w/ partner	B (4.8%)	4 (1.0%)		9 (2.4%)	2 (3.6%)		B (1.9%)	4(3.1%)		2 (2.2%)
Widowed, separated, divorced	63 (38.0%)	63 (42.8%)		50 (39.7%)	24 (44.6%)		77 (42.2%)	49 (38.3%)		226 (41.3%)
Never married	7 (4.2%)	23 (6.0%)		18 (4.8%)	6 (10.7%)		21 (5.0%)	9 (7.0%)		30 (41.3%)
Education										
No formal education	12 (7.2%)	8 (4.7%)	$\chi^2 = 0.64$	10 (2.6%)	1 (19.6%)	$\chi^2 = 18.68^{***}$	16 (3.8%)	4 (10.9%)	$\chi^2 = 5.73^{*}$	30 (5.5%)
Grade 1 to 8	41 (24.7%)	06 (27.8%)		79 (20.9%)	17 (30.4%)		05 (25.1%)	42 (32.8%)		47 (26.9%)
Grade 9 to II	20 (12.0%)	48 (12.6%)		47 (12.4%)	6 (10.7%)		51 (12.2%)	7(13.3%)		68 (12.4%)
Grade 12/H.S. diploma	35 (21.1%)	97 (25.5%)		00 (26.5%)	1 (19.6%)		16 (27.7%)	6 (12.5%)		32 (24.1%)
Some college or vocational training	35 (21.1%)	B2 (21.5%)		98 (25.9%)	6 (10.7%)		94 (22.4%)	23 (18.0%)		17 (21.4%)

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	Hemoglobin A1c		Foot exam		Retinal test		Total
	Received n (%)	Not received n (%)	Received n (%)	Not received n (%)	Received n (%)	Not received n (%)	n (%)
Bachelor's or higher	23 (13.9%)	30 (7.9%)	44 (1 1.6%)	5 (10.2%)	37 (8.8%)	6 (12.5%)	53 (9.7%)

FPL = Federal Poverty Line

Note. Numbers have been rounded.

*** $p < .001$

** $p < .01$

* $p < .05$.

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Table 2

Odds of Receiving Recommended Semiannual Glycosylated Hemoglobin A1c Tests Among Older Latinos With Type 2 Diabetes; 2007-08 (n = 547)

	Hemoglobin A1c											
	Model 1				Model 2				Model 3			
	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ
Constant	−1.00	0.53	3.53	0.06	−0.22	1.01	0.05	0.80	1.16	1.47	0.62	3.18
NEED FACTORS												
Psychological distress	−0.33	0.40	0.68	0.72	−0.49	0.41	1.46	0.61	−0.42	0.41	1.06	0.65
Functional impairment	−0.19	0.16	1.38	0.83	−0.22	0.16	1.85	0.80	−0.17	0.17	1.10	0.84
Functional impairment *	0.09	0.1 1	0.61	1.09	0.12	0.11	1.10	1.13	0.10	0.12	0.69	1.10
Psychological distress												
Treatment regimen												
None (ref)			20.37***				20.88***				21.36***	
Insulin only	1.55	0.37	17.09	4.70***	1.57	0.38	17.26	4.82***	1.59	0.38	17.27	
Oral only	0.10	0.49	0.04	1.10	0.04	0.49	0.01	1.04	−0.02	0.50	0.00	0.98
Insulin + Oral	0.67	0.31	4.70	1.96*	0.69	0.31	4.85	1.99*	0.70	0.31	4.88	2.01*
ENABLING FACTORS												
Acculturation factors												
English–language proficiency					−0.16	0.13	1.48	0.85	−0.23	0.15	2.45	0.79
Nativity (U.S. vs. foreign-born)					0.13	0.27	0.21	1.13	0.04	0.28	0.02	1.04
Higher income					0.07	0.04	4.01	1.07*	0.04	0.04	1.26	1.04
Health insurance generosity					−0.17	0.13	1.76	0.84	−0.16	0.13	1.47	0.85
PREDISPOSING FACTORS												
Older age									−0.01	0.01	0.58	0.99
Female									−0.44	0.21	4.36	0.64*
Marital status (ref: married)									0.01	0.10	0.02	1.01
Higher education									0.09	0.09	0.88	1.09
TEST		χ^2	df	P		χ^2	df	P		χ^2	df	P
Overall model evaluation												

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	Hemoglobin A1c											
	Model 1				Model 2				Model 3			
	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ
Likelihood ratio test	625.62	26A4	6.00	0.00	617.47	34.59	10.00	0.00	611.08	40.99	14.00	0.00
Cox & Snell R^2	0.05				0.06				0.07			
Nagelkerke R^2	0.07				0.09				0.1 1			
Goodness–of–fit test	72.00				70.80				70.60			
Hosmer & Lemeshow		2.28	7.00	0.94		9.27	8.00	0.32		11.05	8.00	0.20

* $p < .05$

** $p < .01$

*** $p < .001$.

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Table 3

Odds of Receiving Recommended Annual Foot Exams Among Older Latinos With Type 2 Diabetes; 2007-08 (n=547)

	Foot Exam											
	Model 1				Model 2				Model 3			
	B	*SE* B	Wald's χ^2	eβ	B	*SE* B	Wald's χ^2	eβ	B	*SE* B	Wald's χ^2	eβ
Constant	3.18	0.79	16.17	24.05	−1.89	1.53	1.53	0.15	−2.25	2.40	0.88	0.10
NEED FACTORS												
Psychological distress	−0.29	0.54	0.29	0.75	0.36	0.57	0.39	1.43	0.33	0.59	0.32	1.39
Functional impairment	−0.08	0.22	0.13	0.92	0.26	0.24	1.17	1.30	0.26	0.25	1.10	1.30
Functional impairment *	−0.03	0.14	0.03	0.97	−0.17	0.15	1.27	0.84	−0.16	0.16	1.00	0.86
Psychological distress												
Treatment regimen												
None (ref)			10.64*				7.01				6.95	
Insulin only	−1.52	0.57	7.09	0.22**	−1.49	0.61	5.94	0.23**	−1.51	0.62	6.00	0.22*
Oral only	−0.98	0.64	2.31	0.38	−0.78	0.68	1.32	0.46	−0.82	0.68	1.44	0.44
Insulin + Oral	−0.48	0.51	0.89	0.62	−0.61	0.53	1.28	0.55	−0.64	0.54	1.41	0.53
ENABLING FACTORS												
Acculturation factors												
English–language proficiency					0.65	0.21	9.77	1.91**	0.69	0.24	8.55	2.00**
Nativity (U.S. vs. foreign–born)					0.22	0.45	0.24	1.24	0.24	0.48	0.25	1.27
Higher income					0.24	0.13	3.40	1.27	0.22	0.13	2.99	1.25
Health insurance generosity					0.51	0.20	6.83	1.67**	0.48	0.21	5.20	1.62*
PREDISPOSING FACTORS												
Older age									0.01	0.02	0.12	1.01
Female									0.25	0.35	0.53	1.29
Marital status (ref: married)									−0.28	0.16	3.00	0.76
Higher education									0.00	0.14	0.00	1.00
TEST		χ^2	df	p		χ^2	df	p		χ^2	df	p
Overall model evaluation												

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	Foot Exam											
	Model 1				Model 2				Model 3			
	B	*SE* B	Wald's χ^2	eβ	B	*SE* B	Wald's χ^2	eβ	B	*SE* B	Wald's χ^2	eβ
Likelihood ratio test	312.30	15.18	6.00	0.02	265.95	61.53	10.00	0.00	262.73	64.74	14.00	0.00
Cox & Snell R^2	0.04				0.14				0.14			
Nagelkerke R^2	0.07				0.25				0.26			
	87.10				87.50				87.30			
Goodness–of–fit test												
Hosmer & Lemeshow		8.73	6.00	0.19		10.33	8.00	0.24		12.30	8.00	0.14

* $p<.05$

** $p<.01$

*** $p<.001$.

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Table 4

Odds of Receiving Recommended Annual Retinal Tests Among Older Latinos With Type 2 Diabetes; 2007-08 (n = 547)

	Retinal Test											
	Model 1				Model 2				Model 3			
	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ
Constant	1.29	0.58	5.00	3.62	−0.60	1.09	0.30	0.55	−4.14	1.67	6.17	0.02
NEED FACTORS												
Psychological distress	0.11	0.44	0.07	1.12	0.43	0.45	0.88	1.53	0.53	0.46	1.30	1.69
Functional impairment	−0.01	0.17	0.01	0.99	0.19	0.18	1.08	1.21	0.17	0.18	0.88	1.19
Functional impairment *	0.04	0.13	0.12	1.04	−0.03	0.13	0.07	0.97	−0.03	0.13	0.06	0.97
Psychological distress												
Treatment regimen												
None (ref)			4.42				3.05				3.48	
Insulin only	−0.69	0.39	3.23	0.50	−0.63	0.40	2.49	0.53	−0.72	0.41	3.12	0.49
Oral only	−0.65	0.45	2.08	0.52	−0.63	0.46	1.84	0.53	−0.61	0.47	1.72	0.54
Insulin + Oral	−0.27	0.32	0.71	0.77	−0.37	0.32	1.31	0.69	−0.42	0.33	1.61	0.66
ENABLING FACTORS												
Acculturation factors												
English–language proficiency					−0.02	0.14	0.01	0.98	−0.01	0.16	0.00	0.99
Nativity (U.S. vs. foreign–born)					−0.19	0.30	0.42	0.82	0.06	0.32	0.04	1.06
Higher income					0.20	0.07	9.11	1.22 **	0.25	0.07	10.91	1.28 **
Health insurance generosity					0.43	0.14	9.71	1.53 **	0.35	0.14	6.35	1.41 **
PREDISPOSING FACTORS												
Older age									0.04	0.02	6.04	1.04 **
Female									0.38	0.23	2.58	1.46
Marital status (ref: married)									−0.01	0.11	0.00	0.99
Higher education									0.05	0.10	0.26	1.05
TEST		χ^2	df	p		χ^2	df	p		χ^2	df	p
Overall model evaluation												
Likelihood ratio test	571.34	7.44	6.00	0.28	535.85	42.931	10	0	526.42	52.37	14.00	0.00
Cox & Snell R^2	0.01				0.08				0.09			

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	Retinal Test											
	Model 1				Model 2				Model 3			
	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ	B	SE B	Wald's χ^2	eβ
Nagelkerke R^2	0.02				0.12				0.14			
	76.80				77.70				77.30			
Goodness–of–fit test												
Hosmer & Lemeshow		3.50	7.00	0.84		12.78	8.00	0.12		4.76	8.00	0.78

* $p < .05$

** $p < .01$

*** $p < .001$.