

Diabetes Awareness and Knowledge Among Latinos: Does a Usual Source of Healthcare Matter?

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OBJECTIVE: To provide national prevalence estimates of usual source of healthcare (USHC), and examine the relationship between USHC and diabetes awareness and knowledge among Latinos using a modified Andersen model of healthcare access.

PARTICIPANTS: Three thousand eight hundred and ninety-nine Latino (18-years or older) participants of the Pew Hispanic Center/Robert Wood Johnson Foundation Hispanic/Latino Health survey from the 48 contiguous United States.

DESIGN: Cross-sectional, stratified, random sample telephone interviews.

METHODS: Self-reported healthcare service use was examined in regression models that included a past-year USHC as the main predictor of diabetes awareness and knowledge. Anderson model predisposing and enabling factors were included in additional statistical models.

RESULTS: Significant differences in USHC between Latino groups were found with Mexican Americans having the lowest rates (59.7%). USHC was associated with significantly higher diabetes awareness and knowledge (OR=1.24; 95%CI=1.05-1.46) after accounting for important healthcare access factors. Men were significantly (OR=0.64; 95%CI=0.52-0.75) less informed about diabetes than women.

CONCLUSION: We found important and previously unreported differences between Latinos with a current USHC provider, where the predominant group, Mexican Americans, are the least likely to have access to a USHC. USHC was associated with Latinos being better informed about diabetes; however, socioeconomic barriers limit the availability of this potentially valuable tool for reducing the risks and burden of diabetes, which is a major public health problem facing Latinos.

KEY WORDS: Latinos; Hispanics; diabetes; medical care; health literacy.
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INTRODUCTION

Good preventive healthcare requires reliable and trustworthy sources of health information that can guide patients' choices. Most patients turn to their physician for such health information. Reliable health information may be especially important for Latinos who are disproportionately uninsured, economically disadvantaged and among the least able to afford healthcare costs.¹

Among diabetics, a usual source of healthcare (USHC) is associated with higher use of important preventive services (e.g., HgA1c testing) compared to those without usual healthcare.² However, it is not known if a USHC is associated with better awareness and knowledge of specific health information. We selected diabetes since it is an important public health problem, especially among Latinos and other ethnic/racial minorities.³ Additionally, among primary care patients, inadequate health literacy is independently associated with more diabetic complications that contribute to disproportionate disease burden, particularly among disadvantaged populations.⁴

Extant, and commonly cited, national estimates of Latinos with a (USHC) are imprecise and outdated.^{5,6} Furthermore, current estimates conflict despite relying on data from the 1996 National Health Interview Survey. Additionally, extant usual source of healthcare estimates do not provide information on Latinos 65-years and older. Perhaps the greatest problem with most existing USHC estimates is that important and distinct Latino ethnic subgroups are "lumped" rather than disaggregated and may miss important group differences. One purpose of this study was to provide updated estimates of USHC among Latinos in general and among ethnic subgroups. Secondly, we sought to examine the relationship between having USHC and diabetes awareness and knowledge in a nationally representative sample of Latino adults. We predicted that USHC would be associated with higher diabetes awareness and knowledge in the presence of other factors associated with healthcare access. To systematically examine these factors, a modified Andersen model of healthcare access was used. As such, three major healthcare access factors were

examined: predisposing (i.e., characteristics such as ethnicity and sex); enabling resources (e.g., health insurance) and need (i.e., diabetes).⁷

METHODS

Participants. Study participants were part of a stratified, random telephone survey of $N=4,013$ adult Latinos (aged ≥ 18 years) designed to produce a statistically representative sample of Latinos in the contiguous United States. Respondents were eligible if they self-identified as Hispanic or Latino (including Mexican, Puerto Rican, Cuban, Dominican, Central or South American). Recent US Census figures indicate that 4.8% Latinos reported not having household telephones.⁸

Telephone interviews were conducted as part of the Pew Hispanic Center/Robert Wood Johnson Foundation Hispanic/Latino Health survey in summer 2007 and had a response rate of 39.5%.⁹ This response rate is comparable to other important telephone surveys including: the Centers for Disease Control and Prevention's, Behavioral Risk Factor Surveillance System (BRFSS), which had a 41.2% response rate in 2004; and the California Health Interview Survey (38.5% in 2004). In accordance with American Association for Public Opinion Research standards, post-survey probability weights were used to adjust for disproportionalities, including non-response bias.¹⁰

The final sample for analysis consisted of $N=3,899$ persons, after excluding 114 participants who refused to give their age or other key demographic variables and who had, in general, more refusals during the interview than other participants. Post-stratification adjustment consisted of a minor rescaling of sampling weights to match the distribution of Latinos in the March 2007 supplement of the Current Population Survey by sex, age, nativity, and education.¹¹

Sampling Frame. Telephone area codes and exchanges in the contiguous US were divided into four Latino household incidence strata (very high, high, medium, and low) based on estimates of the proportion of Latino households in each exchange as provided by the GENESYS Sampling System (Marketing System Group; m-s-g.com). Using telephone number listings from InfoUSA and other sources, numbers associated with persons with Latino surnames out of these strata and placed into a fifth stratum: the surname strata. The remaining numbers in the four initial strata subsequently became residual strata containing no telephone numbers associated with a known Latino surname. Separate random samples of telephone numbers were drawn from each of these five strata. Sampling rates in each stratum were designed to minimize the estimated design effect given budget constraints.

Main Outcome. All survey respondents were administered a series of eight questions about diabetes awareness and knowledge: 1) symptoms (thirst, urinary and visual problems, and fatigue); 2) risk (family history); 3) prevention (weight control); and 4) treatments (availability of effective treatment and possibility of permanent cure). Factor analysis of the eight items showed a good fit (RMSEA=0.029) for a two factor

solution: 1) diabetic symptoms (four items) and 2) risk, prevention and treatments (four items). Reliability for the four diabetic symptoms was higher (0.80) than the four risk, prevention and treatments items (0.39). All items were dichotomized with correct responses assigned a value 1 and all other responses (i.e., incorrect and "don't know") a value 0. An additive score of all correct answers was subsequently created. The distribution of the total score (range 0-8) was skewed, and therefore the scores were converted to three categorical diabetes knowledge groups (high [7-8 correct], medium [4-6 correct] and low [≤ 3 correct]). Scores for the low diabetes knowledge group were below the 20th percentile of the total sample.

Primary Predictor. Self-reported healthcare services utilization was the outcome of interest. We defined having a USHC as meeting the following three criteria: 1) "a place you usually go to when you are sick or need advice about your health"; 2) care was delivered at a doctor's office (i.e., hospital outpatient clinic, health center, HMO or health community clinic) and not emergency care services; and 3) care was received within the previous 12-months. The 12-month criterion was imposed to capture practice general guidelines for respondents at-risk for or with chronic disorders (e.g., diabetes) and other groups (e.g., older adults). In addition, use of a 12-month criterion reduces recall bias of healthcare visits more than one-year old. This more conservative USHC specification had small effects on the number of respondents meeting three *versus* the less conservative and more conventional two criteria listed above.¹²

Healthcare access factors. Modified Andersen model factors associated with healthcare access were included in our statistical analyses. Predisposing factors included ethnicity, nativity (US- or foreign-born), age (continuous measure) and sex. Five Latino ethnic sub groups (Mexicans, Puerto Ricans, Cuban Americans, Central and South Americans, and other Latinos) were also included. Health need was a self-reported diagnosis of diabetes. It is arguable that Latinos, particularly Mexicans and Puerto Ricans, are at higher risk for diabetes than non-Latino Whites and other ethnic/racial groups and therefore have a *need* for diabetes education because they are an at-risk group.³ Enabling factors included education, household income, marital status and insurance coverage. Education was divided into five categories based on years of schooling completed (8 or less; 9-11; high school or equivalent; some college or vocational training; and a college degree or higher). Annual household income was broken into five groups (\$14,999 or less; \$15,000-24,999; \$25,000-34,999; \$35,000-59,999; and \$60,000 or more). We placed participants in one of three marital status groups (married; divorced, separated or widowed; and never married) and, the presence or absence of health insurance coverage (i.e., employee-based, private or government program) was a dichotomous measure.

Data Analysis. Procedures designed for the analysis of complex sample survey data in the Stata software package, version 10.1 (College Station, Texas) were used for all analyses. All statistical estimates were weighted to account for unequal probabilities of selection and post-stratification. Design-based variance estimation methods were used to account for the

complex sampling design when computing estimated standard errors.¹³

First, sample estimates describing demographic characteristics were calculated. Next, generalized ordered logit models were run using the `gologit2` command to test the parallel odds constraints and capture any possible differential effects of our predictors on our outcome variable.¹⁴ The generalized ordered logit program relaxes the proportional odds assumptions and fits partial proportional odds models, allowing the effects of our predictor variables to vary for different levels of diabetes awareness and knowledge where parallel lines assumptions are unwarranted. The `gologit2` procedure is equipped to account for the complex sample design. Both variable specific and global Wald tests indicated that there was no evidence of parallel lines assumptions violations. Therefore, ordered logit models using Stata's `ologit` command were deemed acceptable. Ordered logit models are more parsimonious and easier to interpret. We used them to compare diabetes awareness and knowledge between USHC groups while accounting for predisposing factors based on the Andersen model of healthcare access.⁵ Next, health need was included in the model, and then enabling factors were introduced to the ordered logistic regression model.

RESULTS

About one-in-five respondents reported a low level of diabetes awareness, a plurality (44.2%) displayed moderate awareness and the rest (37.6%) were classified as having a high level of diabetes awareness (Table 1). Relative to Puerto Ricans, Mexican and Central/South Americans had significantly lower frequency of health insurance coverage and lower annual household incomes. Other participant characteristics described in Table 1 are consistent with current Census estimates of US Latinos.¹¹

Prevalence of a usual source of healthcare. Over one-third of the sample reported not having a USHC (Table 2). Among non-elderly Latinos, 61.2% reported not having a USHC, which is consistent with a previous national estimate.⁶ Mexicans had significantly lower frequency of USHC relative to Puerto Ricans, but did not differ from other Latino groups. Foreign-born Mexicans had significantly lower odds of USHC relative to Cubans, Puerto Ricans and Central/South Americans. The primary reasons reported for not having a USHC were lack of health insurance coverage (18.3%, SE=0.02) and high costs (10.9%, SE=0.01).

Diabetes awareness and knowledge and USHC. Table 3 shows the ordered logistic regression results with Andersen model predictors. In Model 1, USHC significantly increased the proportional odds of higher diabetes knowledge and awareness levels while controlling for "predisposing factors." Central/South Americans had significantly lower odds of reporting being better informed compared to Puerto Ricans. Older age significantly increased the odds of higher diabetes knowledge and awareness; whereas, men and immigrants had significantly lower odds compared to their study counterparts. The Andersen model "health need" factor, having been diagnosed with diabetes, was included in Model 2. Diabetes

Table 1. Baseline Year (2007) Demographic Characteristics of Pew Hispanic Center/Robert Wood Johnson Foundation Latino Health Survey Participants

	N	%	SE
Diabetes awareness and knowledge			
Low	710	18.16	0.78
Moderate	1694	44.24	1.01
High	1495	37.60	0.97
Usual source of healthcare			
No	1395	37.46	0.98
Yes	2497	62.54	0.98
Latino groups			
Mexican	2480	63.73	0.98
Puerto Rican	320	9.42	0.67
Cuban	147	3.26	0.33
Central/South American	777	19.09	0.79
All Other	145	4.49	0.45
Age (years)			
18-29	797	31.37	1.05
30-49	1823	44.47	0.99
50-64	829	15.96	0.63
65 or older	450	8.19	0.46
Sex			
Female	1943	48.35	1.01
Male	1956	51.65	1.01
Nativity			
US-born	978	39.43	1.06
Foreign-born	2921	60.57	1.06
Diabetes			
No	3265	85.72	0.66
Yes	619	14.28	0.66
Education (years)			
0-8	1053	20.51	0.69
9-11	745	18.30	0.78
High school or equivalent	968	29.34	0.94
Some college	595	20.76	0.93
College or more	538	11.09	0.55
Annual household income			
\$0-14,999	1043	24.08	0.81
\$15,000-24,999	894	20.38	0.74
\$25,000-34,999	725	19.61	0.83
\$35,000-59,999	728	21.83	0.89
≥ \$60,000	485	14.10	0.75
Marital status			
Married	2473	61.85	1.00
Divorced/Separated/Widowed	747	17.47	0.76
Never married	644	20.68	0.87
Health insurance coverage			
No	1340	33.87	0.93
Yes	2507	66.13	0.93

was associated with significantly higher odds of high diabetes knowledge and awareness compared to non-diabetics. Enabling factors were introduced in Model 3. Compared to the high school or equivalent group, Latinos in the lowest education group had significantly lower diabetes awareness and knowledge; whereas, those with some college or more scored significantly higher than those with less education. Compared to Latinos with an annual household income of \$35,000-59,000 (median 2007 U.S. household income was \$38,679),⁷ lower income groups had significantly lower odds of diabetes awareness and knowledge, and the highest income group had significantly higher levels. Nativity differences were no longer apparent with the inclusion of enabling factors. Health insurance coverage was not associated with being better informed about diabetes. There was little evidence of effect modification between Model 2 and 3 suggesting USHC was uniquely related to higher diabetes awareness and

Table 2. Usual Source of Healthcare Prevalence Estimates. Results from the Baseline Year (2007) of the Pew Hispanic Center/Robert Wood Johnson Foundation Latino Health Survey

	Usual source of healthcare					
	Overall		Foreign-born		US-born	
	%	SE	%	SE	%	SE
Total	62.5	1.0	59.3	1.1	67.5	1.9
Mexican	59.7	1.2	55.6	1.3	65.6	2.3
Puerto Rican	74.6	3.5	74.7	3.2	74.6	5.6
Cuban	66.2	5.2	72.3	4.6	53.3	12.0
Central/South American	61.9	2.2	61.9	2.2	61.5	7.2
Other Latinos	77.4	4.4	65.0	8.4	82.1	5.0
	<i>P</i> < 0.001		<i>P</i> < 0.001		<i>P</i> = 0.06	

knowledge even after important healthcare access factors were considered.

DISCUSSION

To our knowledge, our national prevalence estimates of usual source of healthcare among Latinos are the most detailed to date. This is the first report to compare Latino ethnicities at the national level and it demonstrates that among Latinos, Mexican Americans reported the lowest rates of USHC. The primary reasons reported for not having USHC was lack of insurance and high costs. Among Latinos, Mexicans had the lowest health insurance coverage rates and lowest annual household incomes. While our estimates are consistent with

Table 3. The Relationship between Current and Usual Source for Healthcare and Diabetes Awareness and Knowledge in a Nationally Representative Sample of Latino Adults. Results from the Baseline Year (2007) of the Pew Hispanic Center/Robert Wood Johnson Foundation Latino Health Survey

	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Usual source of healthcare						
No	1.00		1.00		1.00	
Yes	1.35*	(1.15-1.58)	1.30*	(1.11-1.53)	1.24*	(1.05-1.46)
Predisposing Factors						
Ethnicity						
Mexican	0.98	(0.75-1.29)	0.99	(0.75-1.30)	1.14	(1.05-1.46)
Puerto Rican	1.00		1.00		1.00	
Cuban	0.90	(0.53-1.52)	0.98	(0.57-1.68)	0.79	(0.46-1.37)
Central/South American	0.69†	(0.51-0.94)	0.71†	(0.52-0.97)	0.70†	(0.51-0.96)
Other Latinos	1.42	(0.91-2.20)	1.45	(0.93-2.26)	1.29	(0.80-2.08)
Age (years)						
18-29	0.55*	(0.46-0.66)	0.56*	(0.47-0.68)	0.64*	(0.52-0.79)
30-49	1.00		1.00		1.00	
50-64	1.11	(0.91-1.35)	1.02	(0.83-1.24)	1.07	(0.87-1.32)
≥65	0.48*	(0.38-0.61)	0.42*	(0.33-0.53)	0.54*	(0.41-0.71)
Sex						
Female	1.00		1.00		1.00	
Male	0.64*	(0.55-0.75)	0.63*	(0.54-0.74)	0.64*	(0.54-0.75)
Nativity						
US-born	1.00		1.00		1.00	
Foreign-born	0.75*	(0.63-0.89)	0.75*	(0.63-0.90)	1.00	(0.83-1.21)
Need Factors						
Diabetes						
No			1.00		1.00	
Yes			1.82*	(1.49-2.24)	1.96*	(1.58-2.42)
Enabling Factors						
Education (years)						
≤8					0.68*	(0.55-0.84)
9-12					0.88	(0.69-1.12)
High school or equivalent					1.00	
Some college					1.29†	(1.01-1.65)
College or more					1.59*	(1.21-2.09)
Annual household income						
≤\$14,999					0.81‡	(0.63-1.03)
\$15,000-24,999					0.81‡	(0.63-1.03)
\$25,000-34,999					0.92	(0.71-1.20)
\$35,000-59,999					1.00	
≥\$60,000					1.57*	(1.14-2.15)
Marital status						
Married					1.00	
Divorced/widowed					1.22‡	(0.99-1.49)
Never married					0.90	(0.72-1.11)
Health insurance coverage						
No					1.00	
Yes					0.95	(0.80-1.13)

* *p* < 0.01; † *p* < 0.05; ‡ *p* < 0.10

previous studies, our up-to-date findings indicate that *no progress* has been made over the past decade in achieving the *Healthy People 2010 objective* of improving the proportion of Latinos with USHC.^{5,6,15} Among Latinos, a USHC was uniquely and similarly associated with higher diabetes awareness and knowledge. Because diabetes is a major public health problem, particularly among Mexicans, our findings indicate that a USHC may be a valuable tool for reducing the risks and burden of this major public health problem.⁴ Although our findings indicate that USHC is associated with higher diabetes awareness and knowledge, key barriers to USHC, such as lack of health insurance and unaffordable costs, restrict its availability.

Lumping Latinos into one group *masks* important socioeconomic differences associated with access to healthcare.¹⁶ By disaggregating Latino ethnicities, we were able to demonstrate that Mexicans, who represent two-thirds of Latinos, are the least likely to report a USHC. Furthermore, our relatively high USHC estimates for Puerto Ricans are comparable to non-Latino Whites rates found in previous studies.^{5,6} Our findings suggest that efforts to improve access to USHC should target Latinos with the greatest need. The practice of *lumping* ethnicities is discouraged by the Institute of Medicine, Agency for Healthcare Research Quality and other major institutions, yet *lumping* is a common practice in research.¹⁷ The goal of reducing disparities in healthcare will remain elusive until those groups Latinos with the greatest need are correctly identified in research.¹⁸

Other findings herein merit further discussion. We report a gender disparity in diabetes awareness and knowledge among Latinos. Latino men demonstrated markedly less understanding of diabetes information compared to women. This information gap was found despite comparable rate of diabetes between the sexes. If this is indeed the case, this disparity poses a double jeopardy for Latino men: they are at-risk for diabetes and may lack knowledge about the risks, symptoms and treatments available for diabetes. Moreover, men are less likely to seek preventive healthcare services from their usual source of care, particularly when medical discrimination is perceived.¹⁹ We found that nativity differences in diabetes health information knowledge were largely explained by economic and structural factors that are known to enable better access to care. This particular finding has noteworthy implications for bi-national discussions regarding regular healthcare provision to people of Mexican and Latin American origins on either side of the US/Mexico border.

Our findings suggest that at least four new research efforts may be needed to understand the gender disparity in diabetes health information. Research should be conducted to determine: 1) whether the disparities identified herein can be replicated and which groups of Latino men are implicated; 2) if gender differences in knowledge are associated with higher diabetes disease burden among men; and 3) if public health efforts such as expanded community screening would be more useful in improving diabetes knowledge and the health of Latinos than simply having a USHC. Because our findings have indicated gender differences in diabetes awareness and information, it is important for healthcare providers to acknowledge the important role that *Latinas* may play as gatekeepers for care and information conduits to Latino families. Interventions in primary care that target *Latina* mothers as a portal to family-based modifications in diet, exercise, and regular healthcare may merit further study. New interventions could improve weight control and the flow of diabetes infor-

mation in family systems to reach males more effectively. Secondly, improved diabetes awareness and knowledge through better access to primary care, especially via provision of a USHC, may afford new public health opportunities for reducing disease burden. Diabetes is a major public health problem that affects many Latinos. USHC as a vehicle for improving diabetes awareness and knowledge among non- or pre-diabetic Latinos has potential for diabetes prevention.

Of the Andersen model factors examined, higher education and income were associated with being better informed about diabetes; however, this must be understood in the context of current US Latino demographics. Latinos are less likely to complete high school and to have health insurance coverage compared to Blacks and non-Latino Whites.¹ Additionally, Latinos, particularly Mexicans, are *the* largest and most economically disadvantaged group in the United States.¹ Yet paradoxically, health insurance coverage was not strongly associated with being better informed about diabetes. This suggests that exclusively relying on insurance to improve access to USHC and better health information may be insufficient without also advancing socioeconomic position.

USHC was more common among older Latinos (65-years and over). Yet, the average age of onset of type-2 diabetes is 45 years.²⁰ If USHC increases knowledge about the risks, symptoms and treatments for diabetes, that information may reduce risks for diabetes and its complications. Reliable knowledge about chronic disorders, like diabetes, is valuable at any age. Increasing access to healthcare for Latinos in younger age groups may be particularly beneficial for stemming early onset of type-2 diabetes, which is increasingly prevalent.²⁰ Our findings suggest that opportunities are being lost for diabetes prevention among younger Latinos who have the highest risk for diabetes, but who also have less access to health information at crucial periods of life for diabetes onset.

Several issues should be considered when interpreting our findings. First, our measure of diabetes awareness and knowledge was limited to a few questions related to diabetes symptoms, risks, and treatments. A more comprehensive diabetes awareness and knowledge assessment was not possible in this national survey. Secondly, our USHC indicator differs from previous reports since we included a past-year time criterion for healthcare receipt. Our motivation for this more stringent USHC definition was guided by limiting respondent recall bias for clinical visits that occurred in the more distant past. While our study results were largely unaffected by our more stringent criteria, readers should note this difference. Thirdly, our results were associational and precisely discerning which factors were truly causal in acquiring higher diabetes health information was not possible. Nevertheless, delineating determinants that facilitate improved health information merits further investigation.

CONCLUSION

For most Americans, including Latinos, one's personal physician is the primary and most trusted source of reliable health information. Yet, many Latinos, particularly Mexican Americans, do not have access to a USHC. Our results support the hypothesis that having a current USHC promotes knowledge about diabetes, which is a major source of morbidity and mortality in this population. Latino group differences in

diabetes awareness and knowledge were largely explained by socioeconomic healthcare access barriers. We found that diabetes awareness and knowledge was lower for men than women. This suggests that women may be instrumental in improving diabetes information within their families and may provide a foundation, together with improved USHC access, for interventions designed for children and adult males. In sum, improved diabetes awareness and knowledge among Latinos could prove valuable in reducing the heavy disease burden associated with diabetes in disadvantaged populations. This supports arguments for healthcare reform directed toward expanding USHC access among low SES Latinos. A fundamental resource in this process is having a usual source of healthcare that will provide high quality information, instruction, and guidance to Latino patients.

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