Effect of Language on Heart Attack and Stroke Awareness Among U.S. Hispanics

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Background: Hispanics with acute heart attack or stroke have longer delay times to hospital arrival, and are thus less likely to benefit from time-dependent reperfusion therapies. Delay time is influenced largely by recognition of warning symptoms and activation of the 911 system. Previous studies suggest poor symptom recognition among racial/ethnic minorities, but very little is known about heart attack and stroke knowledge among Hispanics, or the influence of English language proficiency on cardiovascular emergency awareness.

Methods: Cross-sectional analysis (conducted in 2005) of data from the 2003 Behavioral Risk Factor Surveillance System population survey was limited to states with Spanish-language interviews. Principal study outcomes were the correct identification of five heart attack and five stroke warning symptoms, and intention to call 911 for a suspected event. Subjects included 698 English-speaking Hispanics, 527 Spanish-speaking Hispanics, and 24,201 non-Hispanics.

Results: Spanish-speaking Hispanics are far less likely to know all heart attack symptoms (7%) than English-speaking Hispanics (23%), non-Hispanic blacks (28%), and non-Hispanic whites (39%) ($p < 0.001$); and far less likely to know all stroke symptoms (18%) than English-speaking Hispanics (31%), non-Hispanic blacks (41%), and non-Hispanic whites (50%) ($p < 0.001$). Intention to call 911 did not differ significantly among groups. Spanish-speaking Hispanics remain significantly less likely than all other groups to correctly identify symptoms after adjustment for sociodemographic characteristics, healthcare access, and cardiovascular risk factors ($p < 0.05$).

Conclusions: Lack of English proficiency is strongly associated with lack of heart attack and stroke knowledge among Hispanics. This highlights the need for educational intervention about cardiovascular emergencies targeted to Spanish-speaking communities.

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Introduction

Racial and ethnic disparities in cardiovascular health have been widely recognized in recent years, and addressing such disparities is now a national priority.[1–5] Several studies have demonstrated longer delay times to treatment for heart attack or stroke for Hispanics compared to non-Hispanic whites, which decreases the likelihood of benefit from time-dependent reperfusion therapies for these conditions.[6–11] Prehospital delay, or the time between onset of symptoms and arrival at a hospital, is the largest component of the delay time to definitive therapy. In the general population, delay times for heart attack and stroke patients are influenced largely by symptom recognition and activation of the emergency medical system.[11–19] Subgroup differences in prehospital delay correspond to subgroup differences in symptom knowledge, in that older patients, nonwhites, and those with lower socioeconomic status have longer delay times and are less knowledgeable about symptoms than middle-aged patients, whites, and those of higher socioeconomic status.[20] Relatively little is known, however, about factors influencing delay time among Hispanics.

Delayed presentation for emergency care is potentially related to a lack of knowledge about stroke and heart attack among Hispanics. Mexican Americans in Texas were less likely than non-Hispanic whites to know that acute stroke therapy existed, to acknowledge a time window for treatment, to say they would call 911 for stroke symptoms, and to recall stroke symptoms.[21] A recent national survey of women also found Hispanics to be significantly less likely to correctly identify stroke symptoms than non-Hispanic whites,[22] although this study was limited to the English-speaking population.

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Over 39 million Hispanics live in the United States, and Hispanics are expected to represent 24% of the population by 2050.[23] Forty-seven percent of Hispanics speak Spanish primarily,[24] and there is a growing body of evidence to suggest that those with low English proficiency experience a greater prevalence of cardiovascular risk factors, greater barriers to care, worse quality of care, and worse health outcomes than English-speaking Hispanics.[25–32] Spanish-speaking patients have been shown to have less ability to read and understand healthcare information than English-speaking patients in a hospital setting.[33] The relationship between low English language proficiency and health-related knowledge in the general population, and its potential impact on clinical outcomes, warrants further consideration.

The aim of this study was to assess knowledge of heart attack and stroke warning symptoms and the importance of calling 911 among Spanish-speaking Hispanics compared to English-speaking Hispanics, non-Hispanic blacks, and non-Hispanic whites; and to test whether language independently affects heart attack and stroke awareness when adjusted for other sociodemographic and clinical factors that may influence health knowledge.

Methods

Data Source

Data were used from the 2003 Behavioral Risk Factor Surveillance System (BRFSS), a cross-sectional, population-based, random-digit-dialed telephone survey conducted by the Centers for Disease Control and Prevention (CDC). The BRFSS collects data on health practices and behaviors from a representative sample of non-institutionalized adults. Information is collected in a standardized manner at the state level, using a disproportionate stratified sampling design. Data are weighted to represent population estimates for each state.[34] (Methodologic details are available at www.cdc.gov/brfss.) States may choose whether to conduct the survey in Spanish, using a Spanish version of the questionnaire provided by the CDC.

Study Population

The 2003 BRFSS included an optional Heart Attack and Stroke Module, with questions about recognition and response to warning symptoms. Of the 16 states that included this module, four (FL, NE, NC, and OK) conducted the survey in Spanish and English. Analysis was limited to these four states, with a combined total of 27,105 respondents. Race and ethnicity were self-identified, and language category was defined by the language used for survey response. Initial contact was typically made by an English-speaking interviewer. Spanish-speaking subjects who were unable to communicate with the interviewer in English were called back for a Spanish-language interview. Hispanics who completed the survey in English composed the English-speaking Hispanic (ESH) group, and Hispanics who completed the survey in Spanish composed the Spanish-speaking Hispanic (SSH) group. Comparison groups were English-speaking non-Hispanic whites (NHW) and non-Hispanic blacks (NHB). A total of 1682 respondents who did not identify race or ethnicity, or who did not fall into one of these four categories, were excluded from the analysis.

Table 1. Survey questions

1. Which of the following do you think is a symptom of a heart attack? For each, tell me yes, no, or you're not sure.
   (a) pain or discomfort in the jaw, neck, or back
   (b) feeling weak, lightheaded, or faint
   (c) chest pain or discomfort
   (d) pain or discomfort in the arms or shoulder
   (e) shortness of breath
2. Which of the following do you think is a symptom of a stroke? For each, tell me yes, no, or you're not sure.
   (a) sudden confusion or trouble speaking
   (b) sudden numbness or weakness of face, arm, or leg, especially on one side
   (c) sudden trouble seeing in one or both eyes
   (d) sudden trouble walking, dizziness, or loss of balance
   (e) severe headache with no known cause
3. If you thought someone was having a heart attack or a stroke, what is the first thing you would do?
   (a) Take them to the hospital
   (b) Tell them to call their doctor
   (c) Call 911
   (d) Call their spouse or a family member
   (e) Do something else
   (f) Don't know/not sure

Measures

Respondents were asked to identify heart attack and stroke symptoms from a list of symptoms read by the interviewer, and then were asked, "If you thought someone was having a heart attack or a stroke, what is the first thing you would do?" with a choice of actions provided (Table 1). Principal study outcomes were the correct identification of all five heart attack warning symptoms and the correct identification of all five stroke warning symptoms. These composite outcomes were chosen because of the importance of being aware of all potential warning symptoms, in that any may occur in the absence of the others. The most common (and commonly recognized) symptom in each category was also considered individually. These outcomes were the correct identification of chest pain for heart attack and sudden unilateral numbness or weakness for stroke. A fifth study outcome was intention to call 911 in the event of heart attack or stroke.

Model Covariables

Several variables were considered as potential confounders of the relationship between the four race/ethnicity/language categories and study outcomes. Variables were included if they have been previously found to be associated with symptom knowledge, prehospital delay or other healthcare-seeking behaviors, or if they have been associated with acculturation or language proficiency and could plausibly be related to health knowledge. Sociodemographic measures included age

Table 2. Characteristics of study population by race/ethnicity/language category (weighted percents[a])

	NHW (n=21,354)	NHB (n=2847)	ESH (n=695)	SSH (n=527)	Overall (p value[b])	ESH/SSH (p value[c])
Sociodemographic characteristics						
% income <$20,000	17	35	17	52	**<0.001*****	**<0.001*****
% less than high school education	9	18	14	51	**<0.001*****	**<0.001*****
% unmarried	38	60	43	39	**<0.001*****	0.487
Healthcare access						
% without health insurance	13	20	27	62	**<0.001*****	**<0.001*****
% without personal MD	17	19	34	64	**<0.001*****	**<0.001*****
% foregone care in past year	12	20	19	28	**<0.001*****	**0.049***
Risk factor diagnoses						
% diabetes	9	12	6	7	**0.021***	0.814
% hypertension	31	36	16	15	**<0.001*****	0.660
% high cholesterol	29	22	21	16	**<0.001*****	0.240
% obese (BMI > 30)	21	31	22	27	**0.000*****	0.353
Health behaviors						
% current smokers	25	21	20	21	0.171	0.917
% no leisure-time physical activity	25	30	32	43	**<0.001*****	**0.029***
% <5 daily servings of fruits/vegetables	78	81	75	87	**0.012***	**0.005****

[a]Percentages and significance tests adjusted for sampling weights.
[b]Overall p value based on chi/square test (df = 3) of association between each characteristic of study population and all four race/ethnicity/language categories.
[c]ESH-SSH p value based on a chi/square test (df = 1) of association between each characteristic of study population and English-speaking versus Spanish- speaking Hispanics.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (all bolded).
BMI, body mass index; NHW, non-Hispanic white; NHB, non-Hispanic black; ESH, English-speaking Hispanic; SSH, Spanish-speaking Hispanic.

(continuous), gender, education (dichotomized at the high school level), and marital status (dichotomized as currently married or unmarried). Annual household income, dichotomized at $20,000, was considered in bivariate analysis but excluded from the model because data were missing for 17% of respondents. Socioeconomic status, then, was represented by education in multivariate analyses.

Access to healthcare measures included health insurance (dichotomized as present or absent), the presence of a personal healthcare provider, and respondent report of having foregone needed healthcare in the past year due to cost. Cardiovascular risk factors included self-report of diabetes, hypertension, or high cholesterol. Obesity was calculated from self-report of height and weight (dichotomized at a body mass index of 30). Health behaviors included current smoking status (any or none), leisure-time physical activity (any or none), and dietary fruit and vegetable intake (dichotomized at five daily servings of fruits and vegetables or not).

Analysis

We conducted bivariate analyses to explore which variables might confound the relationship between race/ethnicity/language category and study outcomes. Chi-square tests were used to determine overall association for dichotomous variables with the four study groups (df=3) and for differences between ESH and SSH (df=1). Bivariate associations between covariables and study outcomes were tested with t-tests for continuous variables and chi-square tests for dichotomous variables.

To determine whether English language proficiency is independently associated with symptom knowledge, we developed multivariable logistic regression models for each of the five study outcomes, with three indicator variables to represent the four-category race/ethnicity/language variable as the main study factor, and all of the abovementioned covariables as potential confounders. Covariables were considered for removal from the model only if they did not change the beta estimates for the relationship between race/ethnicity/language category and outcomes.[35,36] Final reduced models included the following covariables: age, gender, marital status, personal physician, foregone care, diabetes, hypertension, high cholesterol, obesity, tobacco use, physical activity, and diet. Stratifying respondents by state of residence did not significantly alter any of the final results, so data from the four states were pooled for all analyses. Final results are reported as weighted percents, calculated from the beta estimates of the logistic regression equations adjusted for covariates. All analyses were performed in 2005 using Stata software, version 8.0 (Stata Corp, College Station TX, 2003) with adjustments for the complex sampling design.

Results

Subjects included 527 SSH, 695 ESH, 2847 NHB, and 21,354 NHW (Table 2). The Hispanic population was younger, with a mean age of 42 years among SSH and 40 years among ESH, compared to 44 among NHB and 50 among NHW (p <0.001). As a whole, Hispanics were more likely than non-Hispanics to lack health insurance or a personal physician and to have forgone needed care in the past year due to cost. Hispanics were less likely to have known diabetes, hypertension, and high cholesterol; less likely to smoke; and less likely to engage in leisure-time physical activity.

Table 3. Bivariate associations between subject characteristics and study outcomes (weighted percents[a])

	% knowing all heart attack symptoms	*p*	% knowing all stroke symptoms	*p*	% intending to call 911	*p*
Gender						
Female	39	**<0.001*****	49	**<0.001*****	86	**0.004****
Male	31		43		84	
Household income (annual)						
≥$20,000	38	**<0.001*****	49	**<0.001*****	86	**0.007****
<$20,000	30		38		83	
Education						
>High school	37	**<0.001*****	49	**<0.001*****	86	**0.003****
<High school	21		28		81	
Married	38		49		85	
Unmarried	31	**<0.001*****	42	**<0.001*****	85	0.895
Insured	38		49		85	
Uninsured	24	**<0.001*****	33	**<0.001*****	84	0.496
Personal MD	38		49		85	
No personal MD	25	**<0.001*****	37	**<0.001*****	85	0.896
No foregone care	36		46		85	
Foregone care due to cost	31	**0.003****	44	0.205	85	0.692
Diabetes						
No	35	**0.042***	46	0.474	85	0.490
Yes	39		47		84	
Hypertension						
No	34	**0.022***	45	**0.002****	85	0.528
Yes	37		49		85	
High cholesterol						
No	33	**<0.001*****	44	**<0.001*****	85	0.178
Yes	40		52		84	
Obese						
No	34	**0.005****	46	**0.028***	85	0.668
Yes	39		49		86	
Smoker						
No	36	**0.015***	47	**0.032*****	85	0.115
Yes	32		43		86	
Any leisure time physical activity	38		49		85	
No leisure time physical activity	28	**<0.001*****	38	**<0.001*****	84	0.188
≥5 daily fruits/vegetables	40		53		84	
<5 daily fruits/vegetables	34	**<0.001*****	44	**<0.001*****	85	0.295

[a]Percentages adjusted for sampling weights.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (all bolded).

Spanish-speaking Hispanics differed significantly from ESH in being much more likely to have a household income <$20,000 (52% vs 17%), and to have completed less than a high school education (51% vs 14%). SSH were far more likely to lack health insurance (62% vs 27%) and a personal healthcare provider (64% vs 34%), and to have foregone needed health care in the past year due to cost (28% vs 19%). The self-reported prevalence of diabetes, hypertension, high cholesterol, obesity, and smoking did not differ between SSH and ESH. SSH were more likely than ESH to report no leisure-time physical activity (43% vs 32%) and less than five daily servings of fruits and vegetables (87% vs 75%).

Less than half of the total study population recognized all five heart attack warning symptoms (35%) and all five stroke symptoms (46%). The vast majority, however, reported that chest pain or discomfort is a symptom of a heart attack (91%), and that sudden numbness or weakness of face, arm, or leg, especially on one side, is a symptom of a stroke (90%).

Significant bivariate associations were found between heart attack or stroke knowledge and each of the covariables (Table 3). Greater knowledge was associated with female gender, higher income and educational level, being married, and greater access to care (having health insurance, having a personal physician, and not having an unmet care need due to cost). Clinical cardiovascular risk factors (diabetes, hypertension, high cholesterol, and obesity) were associated with greater knowledge, while unhealthy behaviors (smoking, lack of physical activity, and fewer dietary

Table 4. Unadjusted and adjusted[a] percents for knowledge of warning symptoms and intention to call 911

	NHW	NHB	ESH	SSH	Overall *p* value[b]	ESH-SSH *p* value[c]
HEART ATTACK						
% knowing all five symptoms						
Unadjusted	39	28	23	7	**<0.001*****	**<0.001*****
Adjusted	39	29	24	10	**<0.001*****	**0.005****
% knowing chest pain is symptom						
Unadjusted	94	89	83	61	**<0.001*****	**<0.001*****
Adjusted	95	91	85	76	**<0.001*****	0.052
STROKE						
% knowing all five symptoms						
Unadjusted	50	41	31	18	**<0.001*****	**0.004****
Adjusted	50	43	33	27	**<0.001*****	0.285
% knowing sudden unilateral numbness/weakness is symptom						
Unadjusted	93	89	83	58	**<0.001*****	**<0.001*****
Adjusted	93	92	85	75	**<0.001*****	**0.046***
EMERGENCY RESPONSE						
% who would call 911 in event of suspected heart attack or stroke						
Unadjusted	86	85	79	85	0.057	0.172
Adjusted	87	85	79	86	**0.047***	0.170

[a]Adjusted percents calculated using the beta estimates from a each logistic regression model, controlling for demographic factors (age, gender, education, marital status), access to care (personal MD, unmet care need due to cost), known risk factors (diabetes, hypertension, cholesterol, obesity), and health behaviors (smoking, physical activity, dietary fruits/vegetables). All estimates corrected for sampling weights.
[b]Overall *p* value based on chi-square test (df = 3) of association between knowledge and all four race/ethnicity/language categories.
[c]ESH-SSH *p* value based on a chi-square test (df = 1) of association between knowledge and English-speaking versus Spanish-speaking Hispanics.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (all bolded).
NHW, non-Hispanic white; NHB, non-Hispanic black; ESH, English-speaking Hispanic; SSH, Spanish-speaking Hispanic.

fruits and vegetables) were associated with less knowledge. Age was not significantly associated with stroke knowledge, but slightly associated with heart attack knowledge (mean age of knowing all symptoms, 49 vs 48 years, $p = 0.02$). Intention to call 911 was significantly associated with female gender, higher income, higher education, and younger age (mean age of those intending to call 911 was 48 vs 50 years, $p < 0.001$).

Table 4 depicts warning symptom knowledge and intention to call 911 by race/ethnicity/language category. Unadjusted percents are reported along with adjusted percents to reflect actual population prevalence. Only 7% of SSH correctly recognized all five heart attack symptoms, compared to 23% of ESH, 28% of NHB, and 39% of NHW. When asked whether chest pain or discomfort is a warning symptom, only 61% of SSH responded correctly, compared to 83% of ESH, 89% of NHB, and 94% of NHW. After controlling for demographic factors, healthcare access, cardiovascular risk factors, and health behaviors, adjusted percents increased for SSH but remained significantly lower than ESH and non-Hispanics.

Results were similar for stroke-related outcomes. Only 18% of SSH correctly recognized all five stroke symptoms, compared to 31% of ESH, 41% of NHB, and 50% of NHW. Differences between SSH and ESH were not statistically significant when adjusted for confounders, but SSH remained significantly less knowledgeable than NHB and NHW (27% vs 43% and 50%, respectively). When asked whether "sudden numbness or weakness of face, arm, or leg, especially on one side" is a stroke symptom, only 58% of SSH responded correctly, compared to 83% of ESH, 89% of NHB, and 92% of NHW. After adjustment for confounding, SSH remained less likely to recognize this symptom (75%) than ESH (85%), NHB (92%), and NHW (94%).

Eighty-five percent of respondents reported that they would call 911 if they thought someone was having a heart attack or stroke. Unadjusted percents ranged from 79% to 86%, with differences across race/ethnicity/language groups approaching statistical significance ($p = 0.057$). After adjusting for confounders, overall differences in intention to call 911 were statistically significant ($p = 0.047$), but SSH and ESH did not differ significantly (86% vs 79%, $p = 0.170$).

Discussion

Consistent with previous studies[20–22,37,38] and recent unpublished data from the National Health Interview Survey,[39] this analysis provides strong evidence that awareness of heart attack and stroke symptoms is poor in the general population, and even worse among minorities. Our novel finding is that low English lan-

guage proficiency identifies a subpopulation of Hispanics with substantially less awareness of symptoms requiring immediate medical attention. Fewer than 10% of Spanish-speaking Hispanics identified all heart attack symptoms, and fewer than 20% identified all stroke symptoms. Even the most commonly recognized warning symptoms were not well known among Spanish-speaking Hispanics: approximately two of five did not know that chest pain or sudden unilateral neurologic symptoms may indicate a major cardiovascular event.

Warning symptom recognition and activation of the emergency medical system (EMS) are major determinants of delay time to treatment,[11–19] and *Healthy People 2010* objectives include increasing public awareness of these symptoms.[4] Time to reperfusion correlates directly with heart attack mortality,[40–42] yet only two thirds of patients present for care within 4 hours.[7] For ischemic stroke patients, thrombolytic therapy within 3 hours of symptom onset decreases risk of permanent disability,[43] but less than 60% arrive within this timeframe.[19,44] Median prehospital delay time for Hispanics has been observed to exceed non-Hispanic whites by a range of 12 minutes to 6 hours for acute heart attack symptoms,[8–11] and by 50 minutes for acute stroke.[6] To the degree that symptom recognition accounts for observed ethnic disparities in prehospital delay, increasing knowledge about cardiovascular emergencies in Hispanic communities will be a critical step in assuring equal access to appropriate medical care for this population.

Cardiovascular health disparities have been increasingly recognized, but reducing such disparities will require a more refined understanding of contributing factors. This necessitates representative health data for minority populations and analytic strategies that aim to disaggregate these factors.[3] This is especially true for the U.S. Hispanic population, which is remarkably heterogeneous and under-represented in the published literature.[45] With adequate sampling of Spanish-speaking Hispanics, we have identified a particularly vulnerable subpopulation that is much poorer, less educated, and less likely to have access to medical care. Indeed, differences between English-speaking and Spanish-speaking Hispanics are of greater magnitude than differences between English-speaking Hispanics and non-Hispanics in rates of poverty, high school education, health insurance, access to medical care, physical activity, and healthy eating habits. Health research that excludes non-English speakers is unlikely to be accurately representative of the Hispanic population.

The pathway by which language relates to cardiovascular awareness is likely complex. English language proficiency, commonly used as a measure of acculturation, is known to be associated with culturally based health behaviors.[46–49] Low English proficiency is associated with lower rates of preventive services[27,50,51] and delayed use of physician services for needed care.[52–54] English speaking and reading ability is not formally assessed in the BRFSS, and it is possible that our SSH group contained subjects who were proficient in English but chose to respond in Spanish (this classification bias would tend to obscure differences in symptom knowledge between ESH and SSH). While language preference is an imperfect measure of language proficiency, it is likely to reflect the language through which respondents are best able to communicate and receive health information.

Adjusted percentages for symptom knowledge among SSH were considerably higher than unadjusted percentages in our multivariate analysis, which reveals that the relationship between language and knowledge is partially confounded by differences in sociodemographic factors, access to health care, and health behaviors between English-speaking and Spanish-speaking Hispanics. That cardiovascular symptom awareness remains significantly worse among Spanish speakers after controlling for these factors, however, suggests that low English proficiency may be an independent risk factor for poor health knowledge. Spanish speakers may have received their education in another country, with less availability of information about recognition and treatment of emergencies in the U.S. medical system. Within the United States, Spanish speakers may be relatively isolated from usual modes of disseminating health information to the public. The increasingly widespread availability of Spanish-language media may be as yet underutilized in promoting health knowledge.

Several limitations of this analysis should be noted. The categories used are crude representations of diversity, and heterogeneity within these groups could not be fully explored with the available data. The BRFSS does not collect information about country of origin, age at immigration, or generation in the United States, all of which influence acculturation and may be related to health knowledge. Limiting the analysis to the four states that conducted surveys in Spanish and excluding some states with larger or more established Hispanic populations may introduce selection bias. Only adults living in households with land-line telephones were surveyed; thus, the most indigent and migrant Hispanics in the United States are not represented. This selection bias would most likely lead to an underestimation of true differences between English-speaking and Spanish-speaking Hispanics.

A final consideration relates to the relatively new application of telephone-based survey methodology in studying Spanish-speaking Hispanics. Because responses may be influenced by norms of telephone conversation, stranger communications, or self-presentation, cultural differences between study populations may differentially raise the likelihood of measurement

What This Study Adds . . .

Hispanics with acute heart attack or stroke have longer delay times to hospital arrival than non-Hispanics.

Previous studies document low awareness of cardiovascular warning symptoms among racial and ethnic minorities, but cardiovascular emergency awareness in the Spanish-speaking population had not been well described.

Spanish-speaking Hispanics are far less likely to know warning symptoms than English-speaking Hispanics, and the association between language and knowledge persists after controlling for sociodemographic and other factors.

bias and influence results. Since much of population-level health data rely on survey methodology, the acceptability and validity of telephone surveys for Spanish-speaking Hispanics should be investigated more rigorously.

Conclusions

Although more than one of ten U.S. residents ages 5 years and older speak Spanish at home,[55] our health system and public health efforts remain largely oriented toward English speakers. Hispanics carry a large burden of cardiovascular risk factors, which are magnified by difficulties accessing preventive services and chronic disease care. Lack of English proficiency identifies a subpopulation of Hispanics with even greater barriers to care and, as demonstrated in this analysis, markedly lower cardiovascular health knowledge. With the growth and aging of this population, we can expect to see a rise in cardiovascular morbidity and mortality among U.S. Hispanics. Now is the time to develop more effective health education strategies for Spanish-speaking communities.

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