Disparities in Hypertension Associated with Limited English Proficiency

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BACKGROUND: Limited English proficiency (LEP) is associated with poor health status and worse outcomes.

OBJECTIVE: To examine disparities in hypertension between National Health and Nutrition Examination Survey (NHANES) respondents with LEP versus adequate English proficiency.

DESIGN: Retrospective analysis of multi-year survey data.

PARTICIPANTS: Adults 18 years of age and older who participated in the NHANES survey during the period 2003–2012.

MAIN MEASURES: We defined participants with LEP as anyone who completed the NHANES survey in a language other than English or with the support of an interpreter. Using logistic regression, we estimated the odds ratio for undiagnosed or uncontrolled hypertension (systolic blood pressure (SBP) > 140 mmHg or diastolic blood pressure (DBP) > 90 mmHg) among LEP participants relative to those with adequate English proficiency. We adjusted for sociodemographic, acculturation-related, and hypertension-related variables.

KEY RESULTS: Fourteen percent (*n* = 3,269) of the participants had limited English proficiency: 12.4% (*n* = 2906) used a Spanish questionnaire and 1.6% (*n* = 363) used an interpreter to complete the survey in another language. Those with LEP had higher odds of elevated blood pressure on physical examination (adjusted odds ratio [AOR] = 1.47 [1.07–2.03]). This finding persisted among participants using an interpreter (AOR = 1.88 [1.15–3.06]) but not among those using the Spanish questionnaire (AOR = 1.32 [0.98–1.80]). In a subgroup analysis, we found that the majority of uncontrolled hypertension was concentrated among individuals with a known diagnosis of hypertension (AOR = 1.80 [1.16–2.81]) rather than those with undiagnosed hypertension (AOR = 1.14 [0.74–1.75]). Interpreter use was associated with increased odds of uncontrolled hypertension, especially among patients who were not being medically managed for hypertension (AOR = 6.56 [1.30–33.12]).

CONCLUSIONS: In a nationally representative sample, participants with LEP were more likely to have poorly controlled hypertension than those with adequate English proficiency. LEP is an important driver of disparities in hypertension management and outcomes.

INTRODUCTION

Hypertension affects 30% of adults in the United States.[1] Despite the importance of achieving good blood pressure (BP) control for long-term health, many patients do not have well-controlled BP.[2–5] Poorly controlled hypertension is associated with adverse cardiovascular events, including myocardial infarction and stroke.[6–8] Racial and ethnic disparities exist in the prevalence, awareness, and use of medication for hypertension,[1,9–11] which contributes to disparities in hypertension control and outcomes. These findings persist even after adjusting for sociodemographic and clinical confounders.[12]

Limited English proficiency (LEP) is known to be an important risk factor for reduced access to medical care, poor health status, and adverse outcomes.[13–21] However, most studies examining LEP as a risk factor for poor health outcomes are based on small or convenient samples. As such, evaluations of health risks associated with LEP may not be representative of the overall population, and may not adequately represent important subgroups. As an alternative to in-person evaluation of LEP, national health surveys by the Centers for Disease Control and Prevention (CDC), such as the National Health Interview Survey (NHIS) and National Health and Nutrition Examination Survey (NHANES), have included self-reported information on the language spoken at home. However, a limitation of using this information as an indicator of LEP status is that many participants, despite speaking another language at home, may speak English rather well. Therefore, this definition of LEP would conflate participants who truly have LEP with participants who have adequate English proficiency, diluting any effect from true LEP.

To address this limitation, we examined a potentially more sensitive indicator of LEP, namely, the additional information in the NHANES survey regarding whether the primary survey was administered in English. NHANES respondents have the option of using the Spanish language survey instrument or receiving the assistance of an interpreter. As the choice of a non-English instrument may reflect a respondent's limited proficiency in English, it is likely to be a more accurate indicator than the language spoken at home. Therefore, treating the use of a non-English instrument as a proxy indicator of LEP, we used population models to estimate risk regarding hypertension awareness, treatment, and control among these patients compared to those who used the English version of the survey.

METHODS

Data

We used data from the CDC's NHANES from 2003 to 2012.[22] NHANES is a nationally representative survey that is completed on a biennial cycle and contains self-reported information on sociodemographic background and health status, physical examinations, and laboratory tests. We combined five cycles of NHANES data to ensure adequacy of the sample size for participants with LEP.

Study Population

Our sample included all adults (18 years or older) who responded to survey questionnaires on health status, including hypertension status and antihypertensive medication use, and who had also undergone a physical examination with BP measurement. We excluded participants with invalid/ incomplete responses to the main covariates.

Primary Outcome

Our primary outcome measure was a dichotomous indicator of elevated BP on physical examination. The physical examination data included BP readings; in cases of multiple readings, we used the average of the first three readings to classify elevated BP status (systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg).[3]

Limited English Proficiency

The primary survey instrument was administered in person at the respondent's residence using a computer-assisted personal interviewing system. Respondents were offered the choice of being interviewed in English or Spanish using a questionnaire, or a different language using an interpreter. Our main independent variable was LEP, which was defined as the use of the Spanish questionnaire or an interpreter from NHANES for the survey interview. There were 114 participants who used both a

Spanish questionnaire and an interpreter; for subgroup analyses, they were identified as using an interpreter.

Covariates

Based on previous epidemiologic studies, we identified key demographic, health status, and socioeconomic factors associated with differential risk of undiagnosed or uncontrolled hypertension.[23] There were three main types of variables: sociodemographic, hypertension-related, and acculturation-related variables.

For sociodemographic variables, we included age, gender, race/ethnicity, marital status, low-income status, insurance, and educational level.[24–29] To adjust for differences in BP among different age groups, we categorized age into three groups: 18–39, 40–59, and 60+. We combined race and ethnicity indicators into four groups: Hispanics, non-Hispanic whites, non-Hispanic blacks, and others (Asians and multiracial). We did not identify Asians as a separate group, as they were not identified in the survey prior to 2011. Participants who were not married or not living with a partner were classified as being single. Low-income status was defined as family income less than or equal to 100% of the federal poverty level. Educational achievement was categorized into three groups: no high school diploma, high school diploma or equivalent, and education beyond high school.

We identified medical conditions associated with the main outcome, blood pressure: prior diagnosis of hypertension, obesity, smoking, diabetes, coronary artery disease, chronic kidney disease, and stroke.[30–33] We identified participants with a previous diagnosis of hypertension, diabetes, coronary artery disease, chronic kidney disease, or stroke, and current antihypertensive medication use based on participants' self-reported responses on the survey. Participants who answered "do not know" to questions about having these medical conditions and current antihypertensive medication use were categorized as not having a prior diagnosis of hypertension and not taking antihypertensive medication. Body mass index (BMI) was calculated and categorized into four groups: underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), and obese (≥ 30.0 kg/m^2). Only those who answered "yes" to current smoking were categorized as a smoker. We adjusted for survey cycle due to improvements in the management of hypertension during the study period.[11,34]

We examined variables associated with acculturation, including the language usually spoken at home, US citizenship status, and foreign birth.[35] Self-reported language spoken at home was dichotomized to either English or non-English. If a participant answered "yes" to usually speaking English at home, or answered the question regarding "language(s) usually spoken at home" as "only English," "more English than other language," or "equally between English and other

language," we classified the participants as using English at home.

Statistical Analysis

We used model specifications that incorporated the clustered stratification characteristics and sampling weights. We performed descriptive analyses of all participants, and then subanalyses of participants based on their English proficiency. We calculated chi-square tests for categorical variables and *t* tests for continuous variables. Next, we performed descriptive analyses of participants based on their prior diagnosis of hypertension status. We examined the correlation between self-reported language spoken at home and LEP, defined as the use of a non-English instrument. We performed multiple logistic regression analysis to estimate the relative odds of having elevated BP among LEP participants relative to those with adequate proficiency, adjusting for the sociodemographic, hypertension-related, and acculturation-related variables. Sensitivity analyses were performed to examine whether the results were consistent when the cutoff for elevated BP was lowered to $SBP \geq 130$ and/or $DBP \geq 80$ for patients with diabetes or chronic kidney disease. We also examined the likelihood of having elevated BP using a more conservative definition of LEP to include those who used a language other than English at home and a non-English instrument to complete the survey. Lastly, we used multiple logistic regression to further examine whether LEP increased the likelihood of participants taking antihypertensive medications.

Statistical analyses were conducted using SAS 9.4 software (SAS Institute Inc., Cary, NC. USA). The study was approved by the Boston University institutional review board (IRB).

RESULTS

NHANES 2003–2012 included 29,802 adult participants. We excluded participants without valid BP measurements on physical examination or with invalid information on hypertension status and antihypertensive medication status. We further excluded participants with invalid responses to covariates. After these exclusions, the sample comprised 23,382 participants (weighted sample of 913 million adults; Fig. 1).

Table 1 shows the characteristics of the total sample as well as subgroups of the sample with and without LEP. Fourteen percent ($n = 3269$) of the sample had LEP: 12.4% ($n = 2906$) used the Spanish questionnaire and 1.6% ($n = 363$) used an interpreter for the survey. The majority of the participants who used the Spanish questionnaire were Hispanic. About one-third of the participants using interpreters indicated their race/ethnicity as "other," which included Asians. In addition, 29.7% (weighted %; $n = 7836$) of the study participants had a prior diagnosis of hypertension, and 82.7% of these were taking antihypertensive medication. There was a significant difference in the prevalence of self-reported diagnosis of hypertension between participants with adequate English
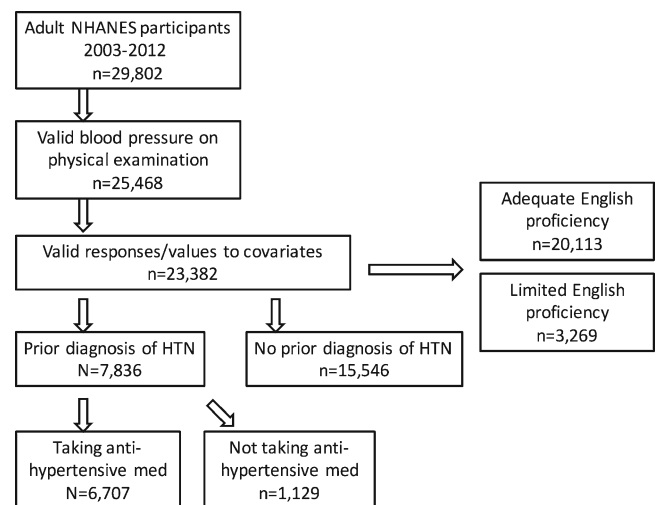

Figure 1 Flowchart of participants.

proficiency and those with LEP (30.4% vs. 20.3%; $p < 0.01$). The prevalence of elevated BP ($SBP \geq 140$ or $DBP \geq 90$) on physical examination was 15.2% for the total sample, and there was a difference in the prevalence of elevated BP between respondents with adequate English proficiency and LEP (15.4% vs. 13.8%; $p < 0.01$).

Patients with a prior diagnosis of hypertension were more likely to be black or other race, older, and married, to have income above the poverty level, to be insured, and to have comorbid conditions compared to those without prior diagnosis of hypertension ($p < 0.01$). A higher percentage of participants without a prior diagnosis of hypertension used a language other than English at home, were non-US citizens, and were born outside the USA ($p < 0.01$).

As supplementary analysis, we also examined LEP status for the 4073 participants (17.4% of survey participants; 9.8% of the weighted sample) who reported speaking a language other than English at home. A quarter of these participants used an English instrument and three-quarters used a non-English instrument to complete the survey (not reported).

Table 2 shows the results from a multivariate logistic regression model for estimating the relative odds of having elevated BP among LEP participants, while adjusting for covariates. LEP was associated with an odds ratio of 1.47 (95% confidence interval: [1.07–2.03]) for having elevated BP. In subgroup analysis (Table 3), only the use of an interpreter was associated with higher odds of elevated BP (OR = 1.88 [1.15–3.06]), and not the use of the Spanish questionnaire (OR = 1.32 [0.98–1.80]). Other factors associated with an increased likelihood of having elevated BP included being male, older, non-Hispanic black, single, with lower educational achievement, and a prior diagnosis of hypertension.

The race/ethnicity variable had a significant interaction with the main variable of interest, LEP. Virtually all participants (99.7%) who used the Spanish questionnaire were Hispanic. Also, 42% of the participants who used an interpreter were

Table 1 Study Participant Characteristics by English Proficiency: Prevalence (%)

	Total	Limited English proficiency	Adequate English proficiency	*p* value*
	(*n* = 23,382)	(*n* = 3269)	(*n* = 20,113)	
	(population weighted percentages)			
SBP ≥ 140 or DBP ≥ 90	15.2	13.8	15.4	<0.01
Sociodemographic characteristics				
Male	48.8	52.4	48.5	<0.01
Age groups, years				
18–39	38.2	46.8	37.5	<0.01
40–59	37.0	36.8	37.0	
≥ 60	24.9	16.4	25.5	
Race/ethnicity				
Hispanic	12.8	88.4	7.2	<0.01
White	70.9	4.3	75.9	
Black	11.2	0.8	12.0	
Other	5.0	6.5	4.9	
Single	36.5	28.6	37.1	<0.01
Low income	18.9	48.4	16.7	<0.01
No insurance	19.2	41.8	16.3	<0.01
Education				
Less than high school	18.2	65.2	14.7	<0.01
High school or equivalent	23.9	17.4	24.4	
More than high school	57.9	17.4	60.9	
Hypertension (HTN)-related characteristics				
Study period				
2003–2004	17.7	13.3	18.0	<0.01
2005–2006	19.8	17.8	20.0	
2007–2008	20.8	22.0	20.8	
2009–2010	21.4	25.5	21.1	
2011–2012	20.3	21.4	20.2	
Prior diagnosis of HTN	29.7	20.3	30.4	<0.01
Taking HTN medication[†]	82.7	79.9	82.8	<0.01
BMI				
Underweight	1.8	0.7	1.8	<0.01
Normal	29.6	24.9	29.9	
Overweight	33.9	41.2	33.4	
Obese	34.7	33.2	34.8	
Current smoker	22.4	16.5	22.8	<0.01
Has comorbid condition(s)[‡]	13.1	14.1	13.0	<0.01
Acculturation-related characteristics				
Speaks language other than English at home	9.8	93.9	3.5	<0.01
Not US citizen	8.7	73.8	3.9	<0.01
Foreign birth	15.5	96.2	9.5	<0.01

* The p value compared participants who used an English vs. non-English instrument using a sample weight
[†]Weighted percentages calculated of participants with previous diagnosis of HTN
[‡]Comorbid conditions include coronary artery disease, diabetes, chronic kidney disease, and/or stroke

Hispanic and 32% were "other" race/ethnicity. To examine the interaction between the two variables, we ran multivariate logistic regressions with and the without race/ethnicity variable and LEP (Table 2). The analyses showed that these variables interacted, and affected the significance of LEP on hypertension outcome when the race/ethnicity variable was not included.

We also performed subgroup analyses to examine the association of LEP with BP control between patients with and without a known diagnosis of hypertension and among those on antihypertensive medications (Table 3). Among participants with a prior diagnosis of hypertension, LEP was associated with an increased likelihood of having elevated BP on physical examination (OR = 1.80 [1.16–2.81]). This finding persisted among participants who used the Spanish questionnaire (OR = 1.66 [1.09–2.53]) or an interpreter (OR = 2.16 [1.09–4.30]). Participants with LEP also had an increased likelihood of having elevated BP while being medically managed with antihypertensive medication(s) (OR = 1.69 [1.14–2.50]). Among those not taking antihypertensive medication, only the use of an interpreter was associated with 6.56 [1.30–33.12] times the odds of having elevated BP. There was also no association between LEP (both use of the Spanish questionnaire or an interpreter) and being on antihypertensive medication(s) among people with hypertension (OR = 1.22 [0.71–2.08]). LEP was not associated with elevated BP among participants with no prior diagnosis of hypertension.

Table 2 Predictors of Having Elevated Blood Pressure (SBP ≥ 140 or DBP ≥ 90) on Physical Examination[†]

	Model 1	Model 2	Model 3
	(base model)	(without race/ethnicity)	(without LEP)
Low English proficiency	1.47 [1.07–2.03]*	1.34 [0.99–1.81]	
Sociodemographic characteristics			
Male	1.25 [1.15–1.35]*	1.24 [1.14–1.34]*	1.24 [1.15–1.35]*
Age groups, years			
40–59	3.17 [2.68–3.76]*	3.13 [2.65–3.71]*	3.20 [2.70–3.78]*
≥ 60	7.33 [6.18–8.71]*	6.97 [5.87–8.27]*	7.39 [6.23–8.77]*
Race/ethnicity			
Hispanic	1.00 [0.84–1.20]		1.06 [0.91–1.24]
Black	1.62 [1.45–1.80]*		1.61 [1.44–1.80]*
Other	1.16 [0.91–1.47]		1.14 [0.90–1.44]
Single (%)	1.21 [1.09–1.34]*	1.26 [1.14–1.39]*	1.21 [1.09–1.34]*
Low income	1.00 [0.90–1.11]	1.03 [0.93–1.14]	1.01 [0.91–1.12]
No insurance	1.19 [1.01–1.40]*	1.21 [1.03–1.43]*	1.19 [1.01–1.41]*
Education			
Less than high school	1.28 [1.14–1.43]*	1.32 [1.19–1.48]*	1.30 [1.16–1.45]*
High school or equivalent	1.22 [1.09–1.37]*	1.23 [1.10–1.38]*	1.23 [1.10–1.38]*
Hypertension (HTN)-related characteristics			
Study period			
2005–2006	0.88 [0.72–1.08]	0.88 [0.72–1.09]	0.89 [0.73–1.08]
2007–2008	0.83 [0.69–0.99]*	0.83 [0.68–1.01]	0.83 [0.69–1.00]*
2009–2010	0.69 [0.56–0.84]*	0.69 [0.56–0.85]*	0.69 [0.57–0.84]*
2011–2012	0.72 [0.58–0.90]*	0.73 [0.57–0.92]*	0.72 [0.58–0.91]*
Prior diagnosis of HTN	3.42 [2.81–4.16]*	3.42 [2.81–4.16]*	3.42 [2.81–4.16]*
Taking HTN medication	0.84 [0.67–1.04]	0.86 [0.69–1.06]	0.84 [0.68–1.04]
BMI			
Underweight	1.21 [0.81–1.81]	1.20 [0.81–1.79]	1.21 [0.81–1.81]
Overweight	1.00 [0.86–1.18]	1.00 [0.86–1.18]	1.01 [0.86–1.18]
Obese	1.09 [0.95–1.26]	1.11 [0.96–1.27]	1.09 [0.95–1.26]
Current smoker	0.94 [0.84–1.06]	0.95 [0.84–1.07]	0.94 [0.83–1.06]
Has comorbid conditions[‡]	0.92 [0.82–1.04]	0.93 [0.83–1.05]	0.92 [0.82–1.04]
Acculturation-related characteristics			
Speak non-English language at home	0.87 [0.65–1.16]	0.85 [0.63–1.13]	1.04 [0.82–1.33]
Not US citizen	0.87 [0.68–1.10]	0.85 [0.67–1.08]	0.92 [0.73–1.17]
Foreign birth	0.92 [0.74–1.14]	0.96 [0.77–1.20]	0.93 [0.75–1.16]

*p < 0.05

[†]Reference groups: age group = 18–39; race/ethnicity = non-Hispanic white; education = more than high school; study period = 2003–2004; BMI = normal BMI

[‡]Comorbid conditions include coronary artery disease, diabetes, chronic kidney disease, and stroke

LEP remained a significant predictor of elevated BP on physical examination in sensitivity analysis testing. We found that with a lower BP goal (SBP ≥ 130 or DBP ≥ 80) among participants with diabetes or chronic kidney disease, the use of an interpreter was now significantly associated with an increased likelihood of having uncontrolled hypertension, despite taking antihypertensive medication(s) (Online Appendix A). Also, the results were consistent (OR = 1.48 [1.03–2.13]) when LEP was defined more conservatively as the use of a non-English instrument to complete the survey and non-English as a primary language at home (Online Appendix B).

DISCUSSION

We examined data from a nationally representative cohort, in which 14% of US adults were identified as having LEP. LEP was associated with an increased likelihood of having elevated BP on physical examination, after adjusting for socioeconomic, acculturation, and hypertension-related characteristics. Further analyses demonstrated that this finding was driven primarily by patients with a known diagnosis of hypertension. The association

between LEP and uncontrolled BP persisted despite participants being medically treated for the hypertension. These results imply that LEP may have a mediating effect on the management of hypertension and BP outcomes.

In this study, LEP was defined as using a non-English instrument to complete the survey. The finding that non-English instrument use is associated with poorly controlled disease is consistent with previous studies showing that limited language proficiency was associated with poor health outcomes.[36–38] When a provider and a patient speak different languages and an interpreter is not used, patients may not understand the significance of their diseases, the importance of medication adherence, and prognosis. Accordingly, LEP is a marker for communication barriers. Another factor that could contribute to the findings is that people with LEP were more likely to be socioeconomically disadvantaged; they were more likely to have low income, no insurance coverage, and low educational level compared to people with adequate English proficiency. These characteristics are associated with reduced access to medical care, decreased patient navigation, and poor medication compliance.[13] In addition, providers may perceive LEP patients differently and assume that these

Table 3 Odds Ratios [95% CI] of Having Elevated Blood Pressure (SBP ≥ 140 or DBP ≥ 90) on Physical Examination: Subgroup Analysis[†]

	All	Subgroups based on prior diagnosis of hypertension (HTN)			Subgroup with no prior diagnosis of HTN
		All with prior diagnosis of HTN	Taking anti-HTN medication(s)	Not taking anti-HTN medication	
	(*n* = 23,382)	(*n* = 7836)	(*n* = 6707)	(*n* = 1129)	(*n* = 15,546)
Limited English proficiency (LEP)	1.47 [1.07–2.03]*	1.80 [1.16–2.81]*	1.69 [1.14–2.50]*	2.59 [0.66–10.21]	1.14 [0.74–1.75]
LEP subgroup: Spanish questionnaire	1.32 [0.98–1.80]	1.66 [1.09–2.53]*	1.65 [1.10–2.46]*	1.69 [0.47–5.99]	1.01 [0.67–1.53]
LEP subgroup: interpreter	1.88 [1.15–3.06]*	2.16 [1.09–4.30]*	1.78 [0.95–3.34]	6.56 [1.30–33.12]*	1.50 [0.81–2.78]

* *p < 0.05*
[†]*Adjusting for gender, age group, race/ethnicity, marital status, low income, lack of insurance, educational level, study period, BMI group, current smoking status, comorbidities, not speaking English at home, no US citizenship, and birth outside the USA*

patients will not understand their medical diagnosis or will not follow up on management. This is reflected in the feeling among LEP patients that the language barrier has resulted in poor quality of medical care.[39–41]

Utilization of a non-English instrument was used as a marker for identifying participants' primary language for these analyses. This study showed that self-reported language use at home, a commonly used marker for English proficiency, does not correlate well with the language used to complete a survey, as a quarter of the participants who spoke a non-English language at home completed the survey in English. This discrepancy may arise because individuals over- or underestimate their ability to communicate in English. A previous study found that an individual's preferred language for healthcare, in addition to self-reported English proficiency, was strongly associated with LEP.[42] In addition, it is possible that some may have completed the survey in English but did not understand parts of the survey. In our study, self-reported language spoken at home was not associated with elevated BP on physical examination. This underscores the value of using the survey instrument language to identify respondents with LEP, as opposed to relying on a question about language spoken at home; if we had relied on the language spoken at home, we would not have been able to show an effect. Furthermore, utilizing language-concordant patient informational materials as well as language-concordant providers or interpreters could reduce disparities in health outcomes among people with LEP. Studies have found that the use of an interpreter during a medical visit resulted in more guideline-concordant health utilization, improved health outcomes, and better patient safety.[14,43–47] In addition, contrary to common belief, interpreter use does not necessarily result in prolonged encounters or higher medical costs.[48,49]

There are several limitations to this study. Because this is a retrospective cross-sectional study, a causal relationship cannot be established between LEP and elevated BP on physical examination. Due to the nature of the secondary data, not all variables of interest were available for analysis. For example, we could not differentiate whether participants were not taking antihypertensive medication

because they were not prescribed any, or because they chose not to take the medication that had been prescribed. Another limitation is the absence of data on health literacy and the potential confounding resulting from its exclusion. There is considerable evidence that low health literacy increases the risk of poor health status, including hypertension.[50–52] In addition, while health literacy is likely correlated with our model covariates, including educational achievement, age, sex, race/ethnicity, and poverty, it represents a different construct.[53–55] Consequently, it is difficult to predict how inclusion of health literacy would affect the association between our LEP measure and the risk of elevated blood pressure. The interaction between health literacy and language proficiency is an excellent target for future research. In addition, variables used in this study to represent acculturation (home language, US citizenship, and foreign birth) do not represent the broader concept of acculturation. In addition, the survey data contains self-reported information, and this may result in the underreporting of a prior diagnosis of hypertension or medication use for some participants. However, previous studies suggest that individuals who are diagnosed with hypertension are fairly accurate in reporting the diagnosis.[56–59] Lastly, subgroup analysis involving Asians could not be performed because the study sample included only a small number of Asians who used an interpreter.

One limitation of the study is that because of the survey-based method used to identify LEP patients, the findings may not be generalizable to healthcare settings. However, patients with LEP may still be identified based on questionnaires and consent forms that patients must complete during the initial doctor's visit. Our measure of LEP is not a validated measure, but our study suggests the need for a validation study, given the potential relevance of this information. With regard to improving hypertension management among individuals with LEP, the findings may be relevant only in settings where language-concordant instruments, providers, or interpreters are available, as required by federal regulations.[60] Interpreters remain underutilized within healthcare settings, although there have been efforts to improve interpreter use

based on studies that have shown the importance of reducing patient–provider language barriers.[61–64]

In summary, we found that non-English instrument use was associated with uncontrolled hypertension. Reducing language barriers by providing language-concordant care and improving interpreter services should be examined as a means to improve hypertension outcomes among those with LEP. Our study also demonstrates the greater accuracy in the use of a non-English survey instrument for capturing true LEP than in using a direct question about the language spoken at home.

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