HHS Public Access

Author manuscript

J Community Health. Author manuscript; available in PMC 2022 August 01.

Published in final edited form as:

J Community Health. 2021 August ; 46(4): 767–776. doi:10.1007/s10900-020-00947-0.

Hepatitis B Testing among Vietnamese in Metropolitan Atlanta: The Role of Healthcare-Related and Acculturation-Related Factors

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Abstract

Background: Compared to other racial/ethnic groups, U.S. Vietnamese have higher Hepatitis B infection prevalence, which is a major liver cancer risk factor. Increased testing could reduce this disparity. It is critical to understand subgroups of U.S. Vietnamese least likely to have been tested for Hepatitis B and design appropriate interventions. We examined healthcare- and acculturation-related factors influencing Hepatitis B testing among U.S. Vietnamese.

Methods: Survey data of 100 U.S. Vietnamese attending health fairs/programs hosted by community-based organizations (2017–2018) were analyzed. Healthcare-related predictors included insurance and past 2-year checkup. Acculturation-related predictors included Vancouver Acculturation Index, percentage of lifetime in the U.S., and Vietnamese and English fluency. We conducted a multiple logistic regression controlling for age, sex, education, and household income.

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DATA AVAILABILITY

The datasets generated and analyzed during the current study are not publicly available as they contain confidential and sensitive information of study participants. The data are available from the corresponding author on reasonable request and pending approval from the Institutional Review Board of the corresponding author's university.

DECLARATION OF INTERESTS

The authors declare no conflicts of interest.

Results: The sample was an average 37.5 years old and 61.6% female. Insurance coverage was reported by 83.0%. Average percentage of lifetime in the U.S. was 56.8%. Seventy percent reported having received Hepatitis B testing. Hepatitis B testing was associated with health insurance (aOR=2.61, 95% CI=[1.05–6.47], p=.04) but not any acculturation-related predictors.

Conclusion: Improving insurance coverage and options can be a strategy to increase Hepatitis B testing among U.S. Vietnamese. More education regarding Hepatitis B (e.g., via community-based, culturally-appropriate, lay health worker-led programs) is needed to ensure that individuals are aware of their testing status and pursue appropriate healthcare decisions.

Keywords

Vietnamese; Hepatitis B testing; health insurance; liver cancer

INTRODUCTION

Hepatitis B is a viral infection and leading risk factor for development of hepatocellular carcinoma (i.e., the most common variation of liver cancer) [1]. The risk of hepatocellular carcinoma is estimated to be 100 times higher among those with chronic Hepatitis B infection versus unaffected by Hepatitis B [2,3]. Worldwide, hepatocellular carcinoma is the fourth most common cause of cancer-related deaths [4]. In the United States alone, each year, approximately 33,000 individuals are diagnosed with liver cancer, and nearly 27,000 die due to the disease [5].

Hepatitis B infection can be identified early via blood tests screening for Hepatitis B surface antigen (HBsAg) [6], and chronic Hepatitis B can be identified through screening for both HBsAg and Hepatitis B surface antibody (anti-HBs) [7]. Hepatitis B testing is essential to minimizing impact of the infection, as both treatment and preventative measures can be pursued after testing [8]. Specifically, early diagnosis can potentially lead to screening for hepatocellular carcinoma, which can reduce mortality due to hepatocellular carcinoma by 37% [9].

Vietnamese people living in the U.S. (from here on referred to as U.S. Vietnamese) are at particular risk for Hepatitis B infection. Past community-based studies have estimated prevalence of Hepatitis B infection among U.S. Vietnamese adults of 8.8% to 13.8% [7,10–12]. A study recruiting from both the community and a doctor’s office in the Washington D.C. metropolitan area found that 9.3% of Vietnamese tested positive for HBsAg [13]. In contrast, a study using the 2011–2016 National Health and Nutrition Examination Survey found a HBsAg prevalence of 0.36% among the overall U.S. adult population and 3.37% among non-Hispanic Asian adults [14]. An analysis of 55 community-based screening programs for Hepatitis B in the U.S. found that the mean HBsAg prevalence was 9.7% among Vietnamese (compared to 8.0% among Chinese and 5.7% among Koreans) [15].

Given the increased risk of Hepatitis B infection among U.S. Vietnamese, Hepatitis B testing is critical. Existing studies demonstrate varied prevalence of Hepatitis B testing in this population, ranging from 7.5% to 67%. On the low end, a Philadelphia/New Jersey-based survey study of 256 Vietnamese documented that only 7.5% were ever tested for Hepatitis B

[16]. Other studies, most of which were conducted with larger samples of Vietnamese living on the West Coast, found relatively higher prevalence of testing ranging from 61.6% to 67% [17–20]. Other studies have reported testing prevalence between these estimates (e.g., 39.4% in a Baltimore/D.C.-based survey study, n=280 [21], 48.5% in a Philadelphia-based survey study, n=207 [22], 49% in an Atlanta-based survey study, n=316 [23]).

It is critical to understand subgroups of U.S. Vietnamese least likely to have been tested for Hepatitis B and design appropriate interventions. Healthcare-related factors could play a role in testing behaviors in this population, though existing research has yielded inconclusive results. For example, a study with Vietnamese men in Seattle found that those with no insurance or with partially/wholly subsidized public insurance types were less likely than those with private insurance to report past Hepatitis B testing [19]. Another study with Vietnamese in the Philadelphia/New Jersey/New York City area found that current health insurance status was significantly related to testing (i.e., a higher percentage of those without insurance reported never testing compared to those with insurance) [24]. Four other studies with U.S. Vietnamese, however, did not find any association between health insurance and Hepatitis B testing [18,23,25,26]. Moreover, while two studies found that U.S. Vietnamese who had a “regular physician” or “a physician they [saw] regularly” were more likely to have been tested for Hepatitis B [19,26], two other studies found no association [18,25]. These inconsistent findings underscore the need to further examine the role that insurance and healthcare utilization may play in Hepatitis B testing in this population.

Acculturation can also influence Hepatitis B testing among U.S. Vietnamese. Acculturation is a broad and multifaceted construct that refers to processes in which individuals and groups experience changes and adjustments (e.g., in language, cultural practices, and identities) as they interact with new cultures and contexts [27–31]. Existing studies on Hepatitis B testing among U.S. Vietnamese have mostly assessed two measures of acculturation: length of time in the U.S. and language fluency (in Vietnamese or English). Regarding the former, three studies found that Vietnamese living in the U.S. longer were less likely to have ever been tested [18,23,26], while two other studies found no association [20,25]. In terms of language fluency, one study reported that U.S. Vietnamese who spoke English fluently or well were less likely to have been tested than those who spoke English not well or not at all [19]; another documented that those who spoke Vietnamese less than fluently (versus those who spoke Vietnamese fluently) were less likely to have been tested [18]. Meanwhile, two other studies did not find any relationship between English proficiency and Hepatitis B testing among U.S. Vietnamese [20,25].

While the existing literature is useful for considering potential impacts of several healthcare- and acculturation-related factors on Hepatitis B screening among U.S. Vietnamese, limitations exist. First, most studies have used “proxy” measures for acculturation. To our knowledge, no study examining Hepatitis B testing among U.S. Vietnamese has utilized validated measures of participants’ degrees of acculturation to both Vietnamese culture and American culture, undermining our ability to fully understand the complex relationships between acculturation and Hepatitis B testing. Moreover, existing literature has also overwhelmingly focused on Vietnamese living in the Northeast and on the West Coast. While Atlanta, Georgia, is among the top 10 metropolitan areas with the largest populations

of Vietnamese in the U.S. [32], only one 2010 study has examined Hepatitis B testing among Vietnamese living in this region [23].

Given these gaps in the literature, this study assessed the relationships between Hepatitis B testing and different healthcare- and acculturation-related measures among a sample of Vietnamese living in metropolitan Atlanta. We hypothesized that having health insurance and having regular source of healthcare (operationalized as having had a healthcare checkup within the past 2 years) are associated with Hepatitis B testing. Additionally, drawing on past studies on acculturation and health among Asian-Americans, our study uses three different types of acculturation measures, including a validated scale (the Vancouver Index of Acculturation [33]), language fluency in Vietnamese and English, and percentages of lifetime spent in the U.S. to explore the relationship between acculturation and Hepatitis B testing.

METHODS

Setting, recruitment, and data collection

Our study setting is the Atlanta metropolitan area (Georgia). According to data from the 2015 American Community Survey, the Atlanta-Sandy Springs-Roswell (Georgia) metropolitan area was home to more than 40,000 Vietnamese individuals [34]. We partnered with two Vietnamese community-based organizations in the region to conduct the study. Our community partners reviewed and commented on survey instruments, translated the survey from English to Vietnamese, and assisted with data collection and interpretation. This study was approved by the Emory University Institutional Review Board.

We recruited and administered surveys to 101 self-identifying Vietnamese adults through convenience sampling from September 2017 to April 2018. Within the sample, 97.0% (n=98) of participants were recruited at community health fairs, which were sponsored by one of our partner organizations. The remaining participants (n=3) were clients of the second partner organization. These participants completed the surveys at a convenient time and later returned the completed surveys to our research team. The current analysis excluded one participant due to missing data on the outcome variable, yielding a final sample of 100 individuals.

Participants were given the choice to take the survey (~15–20 minutes long) in English or Vietnamese. Questions focused on substance use (e.g., tobacco and alcohol), vaccinations, preventive care utilization, acculturation, and other sociodemographic information. Study team members fluent in English and/or Vietnamese obtained verbal informed consent prior to survey administration. Each participant recruited from health fairs was entered into a raffle to win two $50 gift cards and one $100 gift card. Each study participant recruited through the second partner organization was given a $5 incentive.

Measures

Hepatitis B testing—Hepatitis B testing was measured by asking participants, “Have you ever been tested or screened for Hepatitis B?” Response options were 1=No, 2=Yes, or 3=I do not know. Based on several previous studies on Hepatitis B testing and vaccination

among U.S. Vietnamese [19,20,25], those who responded “I do not know” were treated as responding “No.” We did not ask participants about the results of testing (e.g., positive or negative results).

Sociodemographic characteristics—Sociodemographic characteristics included age, sex, highest education attained (1=Below a Bachelor’s degree and 2=Bachelor’s degree or above), and annual household income (1=Below $50,000 and 2=$50,000 and above). The choice of these variables was informed by covariates used in previous research on Hepatitis B tested among U.S. Vietnamese and/or Asians [18–21,23,24,26]. The categories for income (<$50,000 vs. ≥$50,000) were chosen because data from the Atlanta Regional Commission show that the median annual household income of Vietnamese in Atlanta was approximately $50,000 [35].

Healthcare-related measures

Health insurance: We asked participants, “Which type of health insurance do you have?” Responses options were 1=I do not have health insurance, 2=Private insurance, 3=Medicaid, 4=Employer-sponsored insurance, and 5=Other. We created a new dichotomized variable (1=No insurance and 2=Have insurance).

Health checkup within the past 2 years: We asked participants whether they participated in a regular check-up or annual exam in the past 2 years. Response options were 1=No, 2=Yes, and 3=I do not know. We combined those who responded “1=No” and “3=I do not know” into one category (“No”).

Acculturation-related measures

Vancouver Index of Acculturation: The Vancouver Index of Acculturation [33] was used to measure degrees of acculturation to American and Vietnamese cultures. The scale has been used in previous research studies with Asian samples that included Vietnamese [36–38]. It consists of 20 items, of which 10 items assess degrees of identification with and acquisition of heritage culture (e.g., Vietnamese) and 10 similar items assess degrees of identification with and acquisition of host culture (e.g., American). Examples of the items in the scale include: “I often participate in my heritage cultural traditions” and “I am comfortable interacting with typical American people.” Response options for each statement ranged from 1=Strongly disagree to 5=Strongly agree. In the sample, the Cronbach’s alpha value for the Vietnamese acculturation subscale was 0.93 and for the American acculturation subscale was 0.86.

Language fluency: Language fluency was measured through two items: “I speak the language of my heritage culture fluently” and “I speak English fluently.” Responses (1=Strongly disagree to 5=Strongly agree) were dichotomized based on the distribution of responses, where 1=No (i.e., strongly disagree, disagree, or neutral) and 2=Yes (i.e. agree or strongly agree).

Percentage of lifetime in the U.S.: We asked participants where they were born (in the U.S. vs. in another country). If participants were born in another country, we asked them to

specify year of immigration to the U.S. For those born in another country, the percentage of life in the U.S. was obtained by first subtracting the year when participants emigrated from the year of data collection, then dividing this number by the age of the participant, and finally multiplying the result by 100%. For participants born in the U.S., the percentage of life in the U.S. was set to 100%.

Statistical Analysis

SAS 9.4 was used for data analysis; significant alpha levels were set at 0.05. Descriptive statistics for each variable were summarized for participants with completed cases. Variables were examined for distribution and missing values. We investigated missing patterns in our dataset and found that the missing patterns were arbitrary [39] and that both continuous and categorical predictor variables had missing values (see Table 1 for additional information on missing values for each predictor). For these reasons, fully conditional specification (FCS) method was used for imputation [40]. Twenty imputed datasets were created. Variables that were incorporated in the multiple imputation procedure included all predictors used in the analysis as well as the outcome variable [41]. After imputed datasets were generated, bivariate analyses were conducted using simple logistic regressions to examine the relationships between each predictor and the outcome variable of Hepatitis B testing. Then, we conducted multiple logistic regressions to investigate the associations between predictors and the outcome variable. Bivariate and multivariable models were fit to each dataset, and the final results were created using the average of the pooled results from all datasets [42,43].

We also examined collinearity among predictors using the variance inflation factor (VIF), which measures how much multicollinearity has increased the variance of a slope estimate [44]. We used a cut off of VIF values above 10 [45] to determine the presence of multicollinearity. Additionally, we conducted two sensitivity analyses to see if observed results changed under certain conditions. First, we conducted a complete case analysis when multiple imputation was not used. We also conducted an additional analysis where we excluded those who responded “I do not know” to the outcome of Hepatitis B testing.

RESULTS

Table 1 shows descriptive characteristics of the sample. The mean age was 37.47, 61.6% (n=61) were female, 48.5% (n=48) indicated having ≥ Bachelor’s degree, and 44.3% (n=39) indicated an annual household income ≥ $50,000.

Regarding healthcare-related measures, 83.0% and 81.0% of the sample indicated having insurance and having health checkup within the past 2 years, respectively. Regarding acculturation-related measures, the mean Vietnamese acculturation scores and American acculturation scores were 4.01 (SD=0.68) and 3.87 (SD=0.51), respectively, indicating that the sample had a higher degree of identification with or acquisition of Vietnamese culture compared to American culture. Of the sample, 80.6% and 69.8% reported fluency in Vietnamese and English, respectively. The mean percentage of lifetime in the U.S. was 56.82 among the entire sample (for those born outside of the U.S., the mean percentage of lifetime in the U.S. was 44.23). Of the sample, 70.0% reported having ever tested for

Hepatitis B, 61.0% reported having received at least one Hepatitis B vaccine dose, and 57.0% reported having completed the Hepatitis B vaccination series.

In bivariate analyses, having health insurance was associated with increased likelihood of having ever tested for Hepatitis B (crude odds ratio or cOR = 1.86, 95% confidence interval or CI = [1.07 – 3.22], p = .03) (Table 2). In a multiple logistic regression, having health insurance was associated with increased likelihood of having ever tested for Hepatitis B (adjusted odds ratio or aOR = 2.61, 95% CI = [1.05 – 6.47], p = .04) (Table 2). No association was found between any acculturation measures and having ever tested for Hepatitis B.

We conducted two sensitivity analyses (data not shown in tables). First, when a complete case analysis was conducted (n=68) with no imputation, in a multiple logistic regression, the association between health insurance and having ever tested for Hepatitis B was no longer significant (aOR = 3.45, 95% CI = [0.31 – 38.85], p = 0.31). Additionally, we conducted an analysis excluding those who responded “I do not know” (n=14) to the question about Hepatitis B testing. In this analysis (n=86), with multiple imputation, in a multiple logistic regression, the association between health insurance and having ever tested for Hepatitis B remained significant (aOR = 3.33, 95% CI = [1.04 – 10.66], p = .04). In both of these sensitivity analyses, we did not detect any additional significant association between any predictor and the outcome variable.

DISCUSSION

The current study examined Hepatitis B testing among Vietnamese adults living in metropolitan Atlanta, Georgia. Key findings were that, in this sample, the prevalence of testing was 70.0% and that compared to uninsured adults, insured adults were more likely to have ever tested for Hepatitis B. The prevalence of testing found in our study (70.0%) is higher than past studies with U.S. Vietnamese. For example, an earlier survey with 316 Vietnamese in Atlanta in 2010 found that 49% had ever tested [23]. Other studies, most of which were conducted with Vietnamese living on the West Coast, found prevalence of testing ranging from 61.6% to 67% [17–20], which is closer to our estimate. While our study did not recruit from a clinic, it did recruit people participating in health fairs who may have been more health-conscious, leading to the observed high prevalence of testing.

Our research highlights the association between health insurance and having ever tested for Hepatitis B among U.S. Vietnamese. Of existing literature on Hepatitis B testing among Vietnamese, a study found that those with no insurance or with partially/wholly subsidized public insurance types were less likely than those with private insurance to report past Hepatitis B testing [19], while another reported that current health insurance status was significantly related to testing (i.e., a higher percentage of those without insurance reported never testing compared to those with insurance) [24]. Other studies with Chinese-Americans [46] and with Hmong populations in the U.S. [47] also documented the relationship between health insurance and having ever tested for Hepatitis B. The 2009 – 2010 Racial and Ethnic Approaches to Community Health (REACH), which surveyed 53,896 respondents in 28

minority communities across the U.S, also reported that compared to uninsured persons, those having health insurance were more likely to report Hepatitis B testing [48].

An explanation for this relationship is that having insurance may reduce the costs of Hepatitis B testing as well as treatment-related costs for those found to be positive carriers [49], which may encourage people to seek testing. Research also found that insurance coverage is associated with higher utilization of different forms of preventive care [50,51]. Particularly, among Asian-American populations, having insurance is associated with different cancer-preventive practices. For example, insurance coverage was associated with an increased likelihood of ever getting Pap test, timely Pap test, ever getting mammogram, and ever practicing breast self-examination among South Asian women in New York City [52]. Data from the 2001–2009 California Health Interview Survey showed that uninsured South Asian and Chinese women were less likely to report receiving a Pap test in the past 3 years compared with their insured counterparts [53]. Moreover, a study using the Medical Expenditure Panel Survey National Data demonstrated that having health insurance was associated with colorectal screening among Filipinos, Chinese, and Asian Indians [54].

Improving insurance coverage and options can be a strategy to increase Hepatitis B testing among U.S. Vietnamese. Data from the 2018 American Community Survey show that 7.3% of U.S. Vietnamese were uninsured, a prevalence higher than that of other Asian subgroups such as Japanese (4.0%), Asian Indians (4.5%), Filipino (5.5%), and Chinese (6.3%) [55]. Community-based programs and coalitions can identify uninsured individuals and help them navigate paperwork to enroll in health insurance plans as well as facilitating linkage to Hepatitis B testing and care services [56–58]. Improving awareness of health insurance schemes and benefits through mass media can also increase enrollment [59]. Beneficial public health policy can include encouraging states to cover Hepatitis B testing and vaccination for high-risk populations (such as U.S. Vietnamese) under Medicaid and adopting Medicaid expansion.

The Trump administration has issued the “public charge” rule, which negatively weighs the use of public benefits in applications for adjustments of status for several categories of non-U.S. citizens [60]. Many have voiced concerns that the public charge rule will lead to a decrease in Medicaid participation of families with at least one non-citizens as well as a “chilling effect” on individuals not directly affected by the rule [61–63]. A recent report found that 45% of adults in immigrant families reported avoiding Medicaid/Children’s Health Insurance Plan benefits in the past year due to green card concerns [64]. In light of our findings, the public charge rule will likely have negative health effects on Hepatitis B testing among U.S. Vietnamese who are not U.S citizens and seeking adjustments of status [65].

Of the sample, 14.0% reported not knowing their Hepatitis B testing status. The finding regarding the association between health insurance and having ever tested for Hepatitis B did not change when those reporting “I do not know” were excluded from the analysis. More education regarding Hepatitis B is needed to ensure that individuals are aware of their testing status and pursue appropriate healthcare decisions. Community-based, culturally-appropriate, lay health worker-led programs and interventions can be a useful way to

improve Hepatitis B-related knowledge among Asians in general and Vietnamese in particular [66–68].

We did not find any associations between Hepatitis B testing and acculturation-related measures in our sample. Past literature generally indicates that among U.S. Vietnamese, Hepatitis B testing is associated with lower American acculturation (demonstrated through shorter duration of stay in the U.S. and lower English fluency) [18,19,23,26] or higher Vietnamese acculturation (demonstrated through higher Vietnamese fluency) [18]. Future studies can continue to explore these possible relationships.

Strengths and limitations

Strengths of our study include our involvement of community members in the design and execution of the study, which increased the relevance of the survey questions in relation to the target population. Additionally, instead of relying on completed case analysis, multiple imputation was utilized in order to handle missing data. Nevertheless, given the exploratory nature of this study, our sample size is small, and the small sample size may have prevented us from having adequate power to detect associations between variables. In addition, as our sample was also a convenience sample drawn mostly from health fairs, our participants may have been more likely to be seeking health services compared to other Vietnamese Americans. However, despite the limited generalizability of this sample, this sample did represent community members as opposed to those drawn exclusively from a specific program or clinic.

As we did not record information on all of the individuals who were approached to take the survey, we were unable to compare the differences between those who agreed to participate and those who declined to participate. Further, the use of self-reported data for Hepatitis B testing is subjected to recall bias and social desirability bias. Additionally, the survey was limited in scope, and thus we were unable to exhaustively assess all variables associated with Hepatitis B testing, including physician’s recommendation, perceived risks of Hepatitis B infection. and perceived benefits of Hepatitis B testing and vaccination.

Conclusion

U.S. Vietnamese are a high-risk group for Hepatitis B infection. This study examined the associations between Hepatitis B testing and different healthcare-related and acculturation-related measures among a sample of Vietnamese living in metropolitan Atlanta. Health insurance is associated with having ever tested for Hepatitis B; consequently, improving insurance coverage and options can be a strategy to increase Hepatitis B testing among U.S. Vietnamese. More education regarding Hepatitis B (e.g., via community-based, culturally-appropriate, lay health worker-led programs) is needed to ensure that individuals are aware of their testing status and pursue appropriate healthcare decisions.

ACKNOWLEDGMENTS

We are grateful to staff members from the Boat People SOS – Atlanta chapter and the Center for Pan Asian Community Services for their assistance in survey design and translation and data collection. We would also like to thank our research assistants in the Department of Behavioral, Social, and Health Education Sciences at the Rollins School of Public Health, Emory University for their help with data collection and entry.

FUNDING

This research was supported by a Global Health Institute Individual Field Scholar Award from Emory University (PI: Vu). The funder had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication. Ms. Vu is supported by the National Cancer Institute (F31CA243220-01, PI: Vu) and a 2020-2021 PEO Scholar Award. Dr. Berg is supported by the US National Cancer Institute (R01CA215155-01A1, PI: Berg; R01CA179422-01, PI: Berg; R01CA239178-01A1, MPIs: Berg, Levine), the US Fogarty International Center/National Institutes of Health (1R01TW010664-01, MPIs: Berg, Kegler), and the US National Institute on Environmental Health Science/Fogarty International Center (D43ES030927-01, MPIs: Berg, Marsit, Sturua). Ms. Allen is supported by the National Cancer Institute (F99CA253576-01, PI: Allen). Dr. Escoffery is supported by the Centers for Disease Control and Prevention (Cancer Prevention and Control Research Network, U48 DP006377).

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Table 1 -

Descriptive characteristics of the sample

	Total Sample (n=100)
Characteristics	***Mean (SD) or N (%)***
Age (n=100)	37.47 (17.11)
Sex (n=99)	
Male	38 (38.4%)
Female	61 (61.6%)
Highest education (n=99)	
Below a bachelor's degree	51 (51.5%)
Bachelor's degree or above	48 (48.5%)
Annual household income (n=88)	
Below $50,000	49 (55.7%)
$50,000 and above	39 (44.3%)
Health insurance (n=94)	
No insurance	16 (17.0%)
Have insurance	78 (83.0%)
Heath checkup within the past 2 years (n=100)	
No	19 (19.0%)
Yes	81 (81.0%)
Vietnamese culture acculturation scores (n=90) (range 1–5)	4.01 (0.68)
American culture acculturation scores (n=92) (range 1–5)	3.87 (0.51)
Fluency in Vietnamese (n=98)	
No	19 (19.4%)
Yes	79 (80.6%)
Fluency in English (n=96)	
No	29 (30.2%)
Yes	67 (69.8%)
Percentage of lifetime in the U.S. (n=93)	56.82 (33.68)
Ever screened for HBV (n=100)	
No	16 (16.0%)
Yes	70 (70.0%)
I do not know	14 (14.0%)
Ever vaccinated for HBV (n=100)	
No	24 (24.0%)
Yes	61 (61.0%)
I do not know	15 (15.0%)
Completed vaccination for HBV (n=100)	
No	25 (25.0%)
Yes	57 (57.0%)
I do not know	18 (18.0%)

Table 2 -

Predictors of Hepatitis B screening (pooled results from multiple imputation)

	Hepatitis B screening							
	Crude Odds Ratio (cOR)				Adjusted Odds Ratio (aOR)			
Variables	**cOR**	**cOR LL**	**cOR UL**	**p**	**aOR**	**aOR LL**	**aOR UL**	**p**
Sociodemographic characteristics								
Age	1.01	0.98	1.04	.35	1.01	0.97	1.05	.67
Sex								
Male	Reference				Reference			
Female	1.40	0.91	2.17	.13	1.29	0.75	2.21	.36
Highest education								
A high school's degree or below	Reference				Reference			
Bachelor's degree or above	1.51	0.97	2.37	.07	1.30	0.72	2.34	.38
Annual household income								
Below $50,000	Reference				Reference			
$50,000 and above	1.45	0.90	2.33	.13	1.08	0.58	2.00	.82
Healthcare access								
Health insurance								
No insurance	Reference				Reference			
Have insurance	1.86	1.07	3.22	.03	2.61	1.05	6.47	.04
Heath checkup within the past 2 years								
No	Reference				Reference			
Yes	2.57	0.92	7.19	.07	1.49	0.70	3.16	.30
Acculturation								
Vietnamese culture acculturation scores	0.80	0.39	1.61	.53	1.60	0.34	7.58	.55
American culture acculturation scores	0.38	0.14	1.06	.07	0.14	0.02	1.00	.05
Fluency in Vietnamese								
No	Reference				Reference			
Yes	1.39	0.83	2.33	.21	1.54	0.72	3.28	.26
Fluency in English								

J Community Health. Author manuscript; available in PMC 2022 August 01.

	Hepatitis B screening								
	Crude Odds Ratio (cOR)				Adjusted Odds Ratio (aOR)				
Variables	**cOR**	**cOR LL**	**cOR UL**	**p**	**aOR**	**aOR LL**	**aOR UL**	**p**	
No	Reference				Reference				
Yes	0.93	0.58	1.50	.77	1.32	0.55	3.17	.53	
Percentage of lifetime in the U.S.	0.99	0.98	1.00	.14	0.98	0.96	1.01	.23	