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Effect of a Media Intervention on Hepatitis B Screening among Vietnamese Americans

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Abstract

Objective—There is a lack of controlled studies of community-wide interventions to increase screening for hepatitis B (HBV) among Asian Americans, particularly Vietnamese Americans,

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who disproportionately suffer from HBV-related illnesses. The objective of our study was to develop, implement, and evaluate the efficacy of a media campaign to promote HBV screening among Vietnamese Americans.

Design—We designed and implemented a three-year media campaign promoting HBV screening among Vietnamese Americans. Evaluation consisted of cross-sectional pre- and post-intervention population-based telephone surveys of Vietnamese Americans adults age 18–64 who spoke English or Vietnamese and lived in the Northern California (intervention) or Greater Washington, D.C. (comparison) communities in 2007 or 2011. Statistical analysis was completed in 2012. The main outcome was self-report of HBV testing, defined as participants answering “Yes” to the question: “Have you ever had a blood test to check for hepatitis B?”

Results—The sample sizes at pre- and post-intervention were 1,704 and 1,666, respectively. Both communities reported increased exposure to HBV-related booklets, radio and television advertisements, and websites. Only the intervention community reported increased exposure to newspaper elements. HBV screening increased in both communities (intervention: 65.3% to 73.1%, $p < 0.01$, comparison: 57.7% to 66.0%, $p < 0.01$). In multivariable analyses, there was no intervention effect. In both communities, exposure to media elements (Odds Ratio 1.26 [95% Confidence Interval: 1.21, 1.31] for each additional element) was significantly associated with screening.

Conclusions—Among Vietnamese Americans in 2 large communities, HBV screening rates were sub-optimal. Screening increased in both the intensive media intervention and comparison communities, and exposure to HBV-related media messages was associated with increased screening. Efforts to address HBV screening among Vietnamese Americans should include mass media messaging.

Keywords

Vietnamese American; hepatitis B testing; media campaign; prevention; health disparities

Introduction

Approximately 257 million people worldwide, including 2.2 million Americans, are chronically infected with the hepatitis B virus (“Hepatitis B Information | Division of Viral Hepatitis | CDC” 2019). Those infected with HBV have higher risk of liver disease and cancer (“Hepatitis B” n.d.). The incidence of liver cancer has been rising, with an increase in mortality rate higher than any other cancer (Ryerson et al. 2016). The Institute of Medicine (IOM) concluded that HBV is a serious health problem and interventions are needed to reduce the burden of this disease (Institute of Medicine (US) Committee on the Prevention and Control of Viral Hepatitis Infection 2010). One priority area from the IOM report was the need for evidence-based interventions to increase HBV screening among high-risk populations (Institute of Medicine (US) Committee on the Prevention and Control of Viral Hepatitis Infection 2010). Chronic HBV infection is more common among Asian Americans (Institute of Medicine (US) Committee on the Prevention and Control of Viral Hepatitis Infection 2010), with infection rates higher among foreign-born than U.S.-born Asians (Vijayadeva et al. 2014). In this population, infection commonly occurs during birth or

childhood (Hsieh et al. 1992). HBV infection is the leading cause of liver disease and liver cancer among Asians. Vietnamese Americans suffer a disproportionate burden of disease, accounting for 11% of chronic HBV cases in the U.S. (Mitchell et al. 2011); among them, 83% have had been exposed to HBV (Nelson, Bui, and Samet 1997) compared to 3.8% of the general population (Coleman et al. 1998).

HBV screening through blood tests (“Hepatitis B Information | Division of Viral Hepatitis | CDC” 2019) can lead to timely diagnosis and treatment of infected individuals with antiviral medications and to vaccination of the uninfected (“Hepatitis B” n.d.). However, at least one-third of chronically-infected Asian Americans are not aware of being infected (“Asian Americans and Pacific Islanders and Chronic Hepatitis B | Populations and Settings | Division of Viral Hepatitis | CDC” n.d.). Approximately half of Vietnamese Americans have not been screened (Taylor et al. 2005; Grytdal et al. 2009), and many do not consider themselves at high risk for HBV (Ma et al. 2007; T. T. Nguyen et al. 2007). Barriers to screening and vaccination include lack of knowledge about HBV, believing that screening is not necessary if feeling healthy, not knowing where to go for screening and vaccination, linguistic barriers, and fear of a positive result (Ma et al. 2007). Realizing that there was a lack of intervention to promote HBV screening in this high-risk population, we sought to address this health disparity.

Prior studies have implemented media campaigns to reduce rates of smoking as well as increase rates of cervical cancer and breast cancer screening among Vietnamese Americans (Lam et al. 2003; C. N. H. Jenkins et al. 1999; C. N. Jenkins et al. 1997). At the time of the report, the only controlled study of an HBV intervention targeting Vietnamese Americans was conducted by members of our team, and it showed that a media campaign and a community mobilization strategy, each directed at parents, were both effective and cost-effective in increasing hepatitis B vaccination among Vietnamese American children (S. J. McPhee et al. 2003; Zhou et al. 2003). Prior studies have used the Health Behavior Framework (HBF) to create theory-driven interventions to promote hepatitis B screening promotions in four Asian American adult populations and evaluated them in controlled studies (A. E. Maxwell et al. 2010; A. Maxwell et al. 2012; A. E. Maxwell et al. 2014; Chen et al. 2013; Bastani et al. 2010; 2015; Taylor et al. 2013). Using this same Framework, we developed a media campaign targeting Vietnamese Americans. We hypothesized that an intensive media campaign focused on providing health education about HBV can lead to increased rates of HBV screening in this high-risk population. The results of the baseline survey have been previously published (T. T. Nguyen et al. 2010) and this article reports the outcomes of the controlled study assessing the subsequent intervention campaign’s effectiveness.

Materials and Methods

Study Design

A three-year multimedia community-wide health education campaign targeting Vietnamese Americans in Northern California was developed and conducted from 2008 to 2011. A quasi-experimental pre-post design with a comparison community in the Greater Washington, D.C. area was utilized to assess its efficacy on HBV screening. Both Northern

California and Greater Washington DC have some of the largest populations of Vietnamese Americans in the U.S. The HBF was used to guide the development of the intervention and the assessment surveys (A. E. Maxwell et al. 2010; 2014; Bastani et al. 2010). The HBF posits that individual health behavior is influenced by individual, health system, and community and societal factors. The pre-intervention and post-intervention surveys assessed some of these factors, including individual factors such as English fluency and level of education; health system factors such as having health insurance or having visited a doctor in the last 12 months; and community factors such as having had talked to family and friends about HBV. In developing the media campaign, we developed messaging with input from community members. We chose various media types based on our experience with prior successful health education interventions in the Vietnamese community (Lam et al. 2003; C. N. Jenkins et al. 1997; C. N. H. Jenkins et al. 1999). The University of California, San Francisco, and San Francisco State University Institutional Review Boards approved this study.

Media Campaign

We produced and distributed 15 television advertisements, 25 radio advertisements, and 12 newspaper advertisements about the health consequences of HBV, its prevalence among Vietnamese Americans, the importance of getting HBV screening tests, and information about modes of HBV transmission and availability of treatments for it. The materials, available in both English and Vietnamese, were developed using data from the pre-intervention survey (T. T. Nguyen et al. 2010) and focus groups, which included people from the community, including patients, family members, and physicians. Media messaging was informed by the HBF and feedback from our community advisory board. For example, to address the individual-level barrier of believing that nothing can be done about hepatitis B, the television and newspaper advertisements featured a community hepatologist talking about how screening can find patients who can then be treated to control the virus. To address the importance of good health to family life, advertisements featured a woman and her parents talking about the importance of getting tested. To address access to care barriers, the campaign promoted a website that had links to free testing sites.

Over the three years, television advertisements were broadcasted 1–2 times weekly on two Vietnamese television programs. Radio advertisements were broadcasted at 1–2 spots weekly on two Vietnamese radio stations. Each newspaper advertisement was posted two times weekly in six ethnic newspapers. We developed a bilingual website which was maintained and updated monthly. A booklet, a pamphlet, info-cards, tote bags, and calendars were distributed at community events such as health fairs and Vietnamese New Year (*Tet*) festivals.

Evaluation

The population-based pre-intervention cross-sectional survey was conducted between October 2007 and February 2008 and the post-intervention cross-sectional survey was fielded between February 2011 and June 2011. Using a list of 55 common Vietnamese surnames that account for greater than 95% of the Vietnamese population living in the U.S. (Swallen et al. 1998), a survey sampling company provided a list of all potentially

eligible residential phone numbers in five counties in Northern California and nine counties in the Greater Washington, D.C. area. Participants were eligible if they were age 18 to 64, a resident of either area, spoke Vietnamese or English, and self-identified as Vietnamese, Vietnamese American, or Chinese Vietnamese. Pre-intervention survey participants were not eligible for the post-intervention survey. The computer-assisted telephone interviewing (CATI) survey was available in Vietnamese and English. More detailed information about the survey design and implementation can be found elsewhere (T. T. Nguyen et al. 2010).

To determine eligibility, a minimum of 15 and 12 calls were made in the pre- and post-intervention surveys, respectively. At pre-intervention, out of 10,150 telephone numbers, 30.9% were ineligible, 44.1% eligible, and 9.8% eligible refusals. At post-intervention, out of 12,063 numbers, the corresponding proportions were 31.2%, 19.1%, and 5.3%. There were 1,704 respondents in the pre- and 1,666 in the post-intervention surveys. The overall cooperation rate, calculated as the number of completed interviews (at least 75% of items completed) divided by the number of completed interviews plus refusals was 63.1% (65.5% intervention; 60.7% comparison) at pre-intervention and 72.4% (71.7% intervention; 73.2% comparison) at post-intervention.

Study Variables

The survey included questions about sociodemographics, self-reported health status, family history of HBV, and healthcare access. Participants were asked about whether or not they had heard of HBV, had an HBV blood test, planned to obtain an HBV blood test in the next 6 months, heard of HBV vaccination, or received HBV vaccination. There were eight survey questions regarding knowledge of possible routes of HBV transmission. The transmission knowledge score summed the number of items the participant answered correctly (range 0–8).

There were 10 questions regarding exposure to HBV-related media, including reading a newspaper article, seeing a newspaper advertisement, seeing a pamphlet, seeing a booklet, hearing a radio advertisement, seeing a television advertisement, seeing an advertisement in a non-Vietnamese language (from HBV-related media in other populations), seeing a calendar, visiting a website, and seeing a small card about HBV. The media exposure score summed the number of items to which the participant reported they had been exposed (range 0–10). Questions regarding support and communication with others included whether participants discussed HBV with friends or family, whether their physician recommended HBV testing, whether participants asked for testing, or whether employers asked participants to be tested. The main outcome was self-report of HBV testing, defined as participants answering “Yes” to the question: “Have you ever had a blood test to check for hepatitis B?”

Statistical Analysis

Statistical analysis was completed in 2012. Descriptive statistics for each group and time period were calculated, including means and standard deviations for numeric variables and frequencies and percentages for categorical variables (Tables 1–3). Differences between pre- and post-intervention in sociodemographic characteristics, health and healthcare access variables, (Table 1), hepatitis B-related variables (Table 2), and media exposure variables

(Table 3) were assessed within each group using chi-square tests for categorical variables and t-tests for numeric variables. The groups were compared with respect to pre-post differences in hepatitis B-related variables (Table 2) and media exposure (Table 3) using z-tests for proportions and t-tests for means. Multivariable logistic regression models (Table 4) were used to analyze the impact of the intervention on the receipt of HBV screening, controlling for sociodemographic characteristics and healthcare access (Model 1), as well as the independent effect of media exposure on screening (Model 2). Both models included terms for group (intervention vs. comparison), time (post- vs. pre-intervention), and a group X time interaction as the intervention effect. Statistical significance was assessed at the 0.05 level for all statistical tests. SAS version 9.2 (Base SAS 2008)²⁶ was used to analyze the data.

Results

Table 1 shows the sociodemographic, health, and healthcare characteristics of the 1,704 pre-intervention and 1,666 post-intervention participants by geographic area. Participants were about 45 years old, slightly over half were female, and most were married. A majority of participants were born outside of the U.S. and had lived in the U.S. for longer than 10 years. A majority reported speaking English less than well. Two-thirds of participants had a regular physician and three-fourths had seen a physician in the last 12 months. There was no significant difference in the mean age of the post-intervention participants, birthplace outside the U.S., marital status, or Vietnamese fluency. At post-intervention, intervention respondents were more likely than comparison respondents to be female and speak English less than well, but were less likely to be a college graduate, live in the U.S. for more than 10 years, be employed, or live in a household with more than \$50,000 annual income. Intervention participants were less likely than comparison participants to report excellent/very good health. Other than having a Vietnamese physician, there was no intervention vs. comparison difference in healthcare access variables.

Table 2 shows HBV-related variables by time and arm. Both communities reported significant increases from pre- to post-intervention in having heard of HBV vaccine and having had an HBV vaccine, while only the Northern California (intervention) group reported an increase in having heard of HBV (84.5% to 88.9%, $p=0.01$). There were no significant differences in these changes between the two communities. The mean knowledge score about modes of HBV transmission increased in the intervention (4.8 vs. 5.1, $p<0.01$) but not comparison (4.8 vs. 4.9, $p=0.33$) community, with no significant difference in the change between the two areas (0.3 vs. 0.1, $p=0.09$).

At post-intervention, participants in the intervention area were significantly more likely to have discussed HBV with family and friends, have asked for an HBV test, and have a physician who recommended an HBV test. There was no difference in the pre-post changes between the two communities.

There was an increase in the proportion of respondents that reported having had an HBV blood test in both Northern California (intervention) (65.3% vs. 73.1%, $p<0.01$) and Greater Washington, D.C. (comparison) (57.7% vs. 66.0%, $p<0.01$) areas, with no significant

difference in the increases between the two communities (7.8% vs. 8.3%, $p=0.90$). The proportion of participants who did not get a test but intended to get one increased in the intervention community (26.8% vs. 35.1%, $p=0.05$) but decreased in the comparison community (26.4% vs. 23.6%, $p=0.46$), with a statistically significant difference in the pre- to post-intervention changes (8.3% vs. -2.8%, $p=0.04$).

Exposure to HBV-related media among the respondents is shown in Table 3. From pre- to post-intervention, significantly more participants in the intervention area had seen an HBV newspaper advertisement but not in the comparison area, with the change in the intervention area significantly greater than the change in the comparison area (11.2% vs. 3.0%, $p=0.01$). Both groups reported significant increases in exposure to HBV television advertisements, with the intervention area increase greater than the comparison area increase (22.6% vs. 11.0%, $p=0.05$). Both communities had increases in proportion of participants who had heard a radio advertisement, seen a pamphlet, seen a booklet, and seen a calendar about HBV, with no significant differences in the changes between the two areas. Participants in Northern California were more likely to have read an HBV-related newspaper article and participants in Washington, D.C. were more likely to have visited an HBV-related website, but there were no statistically significant differences in the changes between the two areas. More participants had seen a small card about HBV in Northern California but not in Washington, D.C. (15.8% vs. 2.0%, $p=0.02$). Neither group reported a significant change in having seen a non-Vietnamese language HBV advertisement. Both the intervention and comparison communities reported an increase in the mean media exposure score from 3.7 to 4.8 ($p<0.01$) and 2.8 to 3.3 ($p<0.01$), respectively, with the intervention increase greater than the comparison increase ($p<0.01$).

Table 4 shows the multivariable models for self-report of HBV screening. Model 1 includes sociodemographic, health and healthcare access factors, group (intervention vs. comparison), time (post- vs. pre-intervention), and group X time interaction as the intervention effect. Model 2 adds the media exposure score. In Model 1, sociodemographic factors positively associated with HBV screening included higher levels of education and not speaking Vietnamese fluently (Odds Ratio [OR] 1.56, 95% Confidence Interval [CI] 1.31, 1.87). Participants who have never been married (OR 0.66, CI 0.51, 0.85), who lived in the U.S. more than 10 years (OR 0.78, CI 0.63, 0.96) and who had lower household incomes (<\$50,000) were less likely to report screening. Having health insurance (OR 1.36, CI 1.09, 1.68), a Vietnamese doctor (OR 1.29, CI 1.06, 1.58), and a family history of HBV (OR 2.16, CI 1.72, 2.71) were significantly associated with screening. In Model 2, media exposure was significantly associated with HBV test receipt with an OR of 1.26 (CI 1.21, 1.31) for every 1-point increase in the exposure score, and there were few changes with regard to the effects of other variables in the model.

In both models, there were significant differences in the group term (intervention vs. comparison at pre-intervention) with OR of 1.55 (CI 1.26, 1.92) and 1.28 (CI 1.02, 1.59) for Models 1 and 2, respectively. There were also significant differences in the time term (post- vs. pre-intervention for the comparison group) with OR of 1.47 (CI 1.19, 1.83) in Model 1 and 1.34 (CI 1.07, 1.68) in Model 2. However, the intervention effect, as shown by the group

X time interaction, was not statistically significant with OR of 0.98 (CI 0.72, 1.33) and 0.86 (CI 0.63, 1.18) in Models 1 and 2, respectively.

Discussion

In this controlled study, we found that a multimedia campaign targeting Vietnamese Americans did not increase HBV testing. However, the campaign significantly increased exposure to HBV-related media, and higher media exposure in both the intervention and control community significantly increased HBV screening.

In our study, rates of HBV testing ranged from 65.3% and 57.5% at pre-intervention and 73.1% and 66.0% at post-intervention in Northern California (intervention area) and Washington, D.C. (comparison area) respectively. These rates are similar to a study on Vietnamese Americans (67%) (Taylor et al. 2013). The sub-optimal rates of screening in this high-risk population indicate that interventions are needed to increase HBV screening.

The lack of an intervention effect on HBV screening for our media campaign may be due to a secular trend or due to concurrent media activities in the comparison community. During the study period, the Hepatitis B Initiative of Washington, D.C. conducted a media and community outreach campaign among Asian Americans, including Vietnamese Americans, in that city and the surrounding area. Between 2009–2014, the organization screened over 7,000 at-risk individuals for hepatitis B, provided in-person education to more than 11,000 people, and organized almost 200 hepatitis B education, screening, or vaccination events (“HBI-DC – Hepatitis B Initiative of Washington DC” n.d.). Thus, our study became an evaluation of an intensive media intervention versus a less intensive one that was not under our control. Both communities reported significant increases in the proportion of participants who had seen messages about HBV in Vietnamese language media. Compared to participants from the comparison area, those from the intervention area reported greater increases in exposure to television and newspaper advertisements as well as in the total media exposure score. Nonetheless, the significant association between the media exposure score and HBV screening receipt in both arms of the study indicates that ethnic media are an important tool to reach Vietnamese Americans with information about hepatitis B.

In addition to media exposure, HBF factors associated with HBV screening were being married, shorter length of U.S. residence, higher education and income, having health insurance, and a family history of HBV. It is possible that participants with higher levels of education are more likely to be screened because they are better able to navigate the healthcare system. Prior studies have demonstrated that low levels of health education and low health literacy are associated with lack of access to preventive health care (Berkman et al. 2011) and low rates of hepatitis B screening (Chen et al. 2013), as well as cervical cancer screening rates (Stephen J. McPhee and Nguyen 2000; S. J. McPhee et al. 1997) (McPhee and Nguyen 2000). We found that the difference in screening by educational attainment was large in Model 1 but was much attenuated in Model 2. This indicates that increasing exposure to media materials can reduce the effect of education on screening and that media campaigns can be successful for those who have lower levels of education. Other controlled trials with Vietnamese Americans have shown that culturally targeted media campaigns can

improve rates of cervical cancer screening (C. N. H. Jenkins et al. 1999), colorectal cancer screening (B. H. Nguyen et al. 2010), smoking cessation (C. N. Jenkins et al. 1997), and hepatitis B vaccination (S. J. McPhee et al. 2003).

Surprisingly, living in the U.S. for more than 10 years was associated with lower likelihood of screening, perhaps explained by the fact that efforts to promote testing have focused more on recent immigrants (Institute of Medicine (US) Committee on the Prevention and Control of Viral Hepatitis Infection 2010). Having health insurance and more access to healthcare was also associated with screening, pointing to the continued need for system changes to address access barriers. Having a Vietnamese doctor was associated with HBV screening although this effect disappeared once media exposure was added into the model. This suggests that patient-physician ethnic concordance is important. Our prior publication assessing factors associated with HBV screening in the baseline surveys found that physician recommendation was a very strong determinant of screening in this population (T. T. Nguyen et al. 2010). Thus, future intervention studies with Vietnamese American should focus on healthcare settings and patient-provider communication. Our findings are consistent with those of other studies that found that lack of access to the health care system is an important barrier to screening (Taylor et al. 2005; S. J. McPhee et al. 2003).

Limitations of this study include self-selection bias and self-report of HBV testing and other responses. However, this would have occurred in both arms of the study. In addition, the study areas and sampled participants may not be representative of all Vietnamese Americans, particularly those living in areas with fewer ethnic media channels. Generalizability is also limited to those who owned and answered a landline telephone. The study design was not randomized but quasi-experimental with one community in each arm, which limits our ability to make causal inferences. However, this is an appropriate study design for a community-wide intervention. Our study has large sample sizes from two major Vietnamese American population centers in the U.S. Thus, results of our study are more generalizable than others focused on a single area.

Recent reports from IOM and CDC have highlighted the burden of HBV-related diseases and emphasized the need for innovative outreach programs to target populations at highest risk for HBV (Ryerson et al. 2016; Institute of Medicine (US) Committee on the Prevention and Control of Viral Hepatitis Infection 2010). Our findings show that traditional media continues to have a wide reach and that exposure to HBV messages in Vietnamese language through media channels is associated with increased HBV screening among Vietnamese Americans. The finding that an intensive long-term media campaign was not superior to grassroots media activities suggests that interventions to promote HBV screening in this population should not only include traditional media to increase knowledge but also target other barriers in the HBF such as healthcare access and patient-provider communication.

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Table 1. Sociodemographic, Health, and Healthcare Characteristics of Vietnamese Participants at Pre- and Post-Intervention by Area, 2007–2011.

Variable	Intervention (Northern California)			Comparison (Greater Washington, D.C.)		
	Pre-Intervention (n = 871)	Post-Intervention (n = 857)	p-value *	Pre-Intervention (n = 833)	Post-Intervention (n = 809)	p-value *
Age, years (Mean ± SD)	45.8 ± 11.0	47.9 ± 11.6	<0.01	46.0 ± 11.4	47.4 ± 11.6	0.01
Female, %	58.7	60.9	0.35	53.2	55.8	0.30
Birthplace outside U.S., %	98.0	97.7	0.62	97.4	97.5	0.88
Lived >10 years in U.S., %	78.7	77.5	0.56	81.5	82.8	0.52
Marital status, %						
Never married	15.5	15.6		14.0	16.9	
Widowed or divorced	7.1	5.6		6.1	5.6	
Married or has partner	77.4	78.8	0.43	79.9	77.5	0.24
Educational Attainment, %						
College graduate or higher	31.0	28.9		36.9	38.5	
Some college	17.0	13.7		15.9	14.2	
High school graduate	27.7	32.2		29.7	27.3	
Less than high school	24.3	25.2	0.09	17.5	20.0	0.37
Employed, %	64.8	54.3	<0.01	81.9	75.6	<0.01
English fluency, %						
Less than well	71.2	74.8		62.4	60.7	
Well	18.6	15.6		23.5	25.2	
Fluently	10.2	9.6	0.20	14.1	14.2	0.72
Vietnamese fluency, %						
Less than well	11.5	9.1		9.4	9.3	
Well	16.9	16.4		18.9	12.9	
Fluently	71.6	74.5		71.7	77.8	<0.01

Variable	Intervention (Northern California)			Comparison (Greater Washington, D.C.)		
	Pre-Intervention (n = 871)	Post-Intervention (n = 857)	p-value *	Pre-Intervention (n = 833)	Post-Intervention (n = 809)	p-value *
Annual household income, %						
Less than \$10,000	5.2	7.7		1.7	1.6	
\$10,000–\$30,000	28.2	29.4		13.2	12.7	
\$30,000–\$50,000	13.3	13.1		16.0	14.7	
More than \$50,000	33.2	25.9		46.9	43.6	
Unknown	20.1	23.9	<0.01	22.2	27.3	0.21
Household size (Mean ± SD)	3.7 ± 1.6	3.6 ± 1.6	0.38	3.8 ± 1.9	3.7 ± 1.8	0.11
General health, %						
Excellent/ very good	16.2	12.1		20.3	19.7	
Good	37.9	37.5		38.8	45.1	
Fair/ poor	45.9	50.5	0.03	40.9	35.2	0.02
Has health insurance, %	83.4	81.7	0.37	85.3	80.8	0.02
Has usual place to go when sick, %	76.0	75.2	0.70	72.4	71.3	0.62
Has regular physician, %	68.7	71.2	0.27	73.6	68.6	0.03
Physician is Vietnamese, %	48.1	50.8	0.27	47.7	41.2	0.01
Saw physician in last 12 months, %	72.4	74.9	0.25	70.3	73.5	0.15

* p-value for the comparison between pre-intervention and post-intervention in each site based on chi-square test or t-test

Hepatitis B Related Variables of Vietnamese Participants at Pre- and Post-Intervention by Area, 2007–2011.

Table 2.

Variable	Intervention (Northern California)			Comparison (Greater Washington, D.C.)			Intervention vs. Comparison Pre-Post Difference p-value**
	Pre-Intervention (n = 871)	Post-Intervention (n = 857)	p-value*	Pre-Intervention (n = 833)	Post-Intervention (n = 809)	p-value*	
Family history of hepatitis B, %	20.6	18.5	0.30	14.8	17.1	0.22	0.10
Heard of hepatitis B, %	84.5	88.9	0.01	82.6	83.0	0.84	0.07
Heard of hepatitis B vaccine, %	61.9	71.5	<0.01	56.1	65.2	<0.01	0.72
Knowledge of hepatitis B transmission score (range 0–8) (Mean ± SD)	4.8 ± 1.8	5.1 ± 1.7	<0.01	4.8 ± 1.7	4.9 ± 1.8	0.33	0.09
Discussed hepatitis B with family/friends, %	46.3	50.7	0.07	43.3	41.3	0.42	0.06
MD recommended blood test for hepatitis B, %	44.9	51.6	0.01	35.8	40.1	0.08	0.55
Employer asked to have blood test for hepatitis B, %	6.4	6.7	0.85	6.9	7.1	0.92	0.98
You asked to have blood test for hepatitis B, %	39.4	44.4	0.04	33.0	34.6	0.50	0.35
Had hepatitis B blood test, %	65.3	73.1	<0.01	57.7	66.0	<0.01	0.90
If not tested, plan to get hepatitis B test in next 6 months, %	26.8	35.1	0.05	26.4	23.6	0.46	0.04
Had hepatitis B vaccine, %	27.0	33.3	0.01	26.1	33.0	<0.01	0.80

* p-value for the comparison between pre-intervention and post-intervention in each site based on chi-square test or t-test

** p-value for the comparison between the pre-post differences of the two sites based on z-test or t-test

Table 3. Hepatitis B Media Exposure of Vietnamese Participants at Pre- and Post-Intervention by Area

Variable	Intervention (Northern California)			Comparison (Greater Washington, D.C.)			Intervention vs. Comparison Pre-Post Difference <i>p-value</i> ***
	Pre-Intervention (n = 871)	Post-Intervention (n = 857)	<i>p-value</i> *	Pre-Intervention (n = 833)	Post-Intervention (n = 809)	<i>p-value</i> *	
Saw Hep B newspaper ad, %	54.3	65.5	<0.01	49.6	52.6	0.24	0.01
Saw TV ad about Hep B, %	26.8	49.4	<0.01	15.9	26.9	<0.01	0.05
Heard radio ad about Hep B, %	50.9	64.3	<0.01	21.6	27.8	<0.01	0.15
Saw Hep B pamphlet, %	55.0	66.8	<0.01	50.2	56.9	0.01	0.10
Saw booklet about Hep B, %	35.0	48.4	<0.01	20.7	31.7	<0.01	0.88
Saw calendar about Hep B, %	22.8	33.3	<0.01	3.8	7.9	<0.01	0.30
Read Hep B news article, %	60.0	64.9	0.04	58.0	58.0	1.00	0.14
Visited Website about Hep B, %	17.8	21.4	0.06	17.3	23.6	<0.01	0.36
Saw small card about Hep B, %	12.2	28.0	<0.01	4.0	6.0	0.07	0.02
Saw ad about Hep B in another language (not Vietnamese), %	36.9	36.0	0.73	37.6	35.4	0.38	0.70
Mean media exposure score (Standard Deviation)	3.7 (2.4)	4.8 (2.6)	<0.01	2.8 (2.1)	3.3 (2.3)	<0.01	<0.01

* *p-value* for the comparison between pre-intervention and post-intervention in each site based on chi-square test or t-test

*** *p-value* for the comparison between the pre-post differences of the two sites based on z-test or t-test

Table 4.

Multivariable Logistic Regression Models of Hepatitis B Screening among Vietnamese Americans in Northern California (Intervention) and Greater Washington, D.C. (Comparison) Areas, 2007–11.

	Model 1	Model 2
	Adjusted Odds Ratio (95% Confidence Interval)	
Intervention vs. Comparison Site (at Pre-Intervention)	1.55 (1.26, 1.92)	1.28 (1.02, 1.59)
Post- vs. Pre-Intervention (at Comparison Community)	1.47 (1.19, 1.83)	1.34 (1.07, 1.68)
Post- vs. Pre-Intervention at Intervention Community vs. Post- vs. Pre-Intervention at Comparison Community	0.98 (0.72, 1.33)	0.86 (0.63, 1.18)
Age (ref. 50–64 years)		
18–29 years	0.78 (0.55, 1.10)	0.93 (0.65, 1.34)
30–49 years	0.80 (0.68, 0.94)	0.87 (0.74, 1.04)
Male (ref. female)	1.00 (0.85, 1.17)	0.98 (0.83, 1.16)
Marital status (ref. Married or has partner)		
Never married	0.66 (0.51, 0.85)	0.67 (0.52, 0.87)
Widowed or divorced	0.77 (0.56, 1.08)	0.79 (0.56, 1.10)
Education (ref. Did not graduate high school)		
College graduate or higher	1.88 (1.48, 2.37)	1.52 (1.19, 1.94)
Some college	1.44 (1.10, 1.88)	1.22 (0.93, 1.61)
High school graduate	1.33 (1.07, 1.65)	1.14 (0.91, 1.42)
Lived in the U.S. > 10 years (ref. 10 years)	0.78 (0.63, 0.96)	0.79 (0.63, 0.97)
Spoke Vietnamese less than fluently (ref. fluently)	1.56 (1.31, 1.87)	1.36 (1.14, 1.64)
Annual household income (ref. \$50,000 or more)		
< \$10,000	0.59 (0.38, 0.91)	0.59 (0.37, 0.92)
\$10,000– \$30,000	0.72 (0.56, 0.91)	0.74 (0.58, 0.94)
\$30,000– \$50,000	0.66 (0.51, 0.84)	0.65 (0.50, 0.83)
Missing	0.75 (0.59, 0.94)	0.86 (0.68, 1.09)
Has health insurance (ref. No)	1.36 (1.09, 1.68)	1.37 (1.10, 1.71)
Has regular doctor (ref. No)	1.15 (0.92, 1.44)	1.14 (0.91, 1.43)
Has Vietnamese doctor (ref. Other ethnicity)	1.29 (1.06, 1.58)	1.19 (0.97, 1.47)
Has family history of hepatitis B (ref. No)	2.16 (1.72, 2.71)	1.85 (1.46, 2.33)
Media exposure (per media source)		1.26 (1.21, 1.31)
Max-rescaled R-square	0.12	0.18
Hosmer-Lemeshow P-value	0.25	0.31