

UC Irvine

UC Irvine Previously Published Works

Title

Do Recommendations by Healthcare Providers, Family-members, Friends, and Individual Self-Efficacy Increase Uptake of Hepatitis B Screening? Results of a Population-Based Study of Asian Americans

Permalink

<https://escholarship.org/uc/item/37v6v0q5>

Journal

International Journal of Maternal and Child Health and AIDS (IJMA), 6(1)

ISSN

2161-8674

Authors

Lu, Xiaoxiao

Juon, Hee-Soon

Lee, Sunmin

Publication Date

2017

DOI

10.21106/ijma.176

Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial-ShareAlike License, available at

<https://creativecommons.org/licenses/by-nc-sa/4.0/>

Peer reviewed



Available online at www.mchandaids.org

INTERNATIONAL JOURNAL
of MCH and AIDS
ISSN 2161-864X (Online)
ISSN 2161-8674 (Print)
DOI: 10.21106/ijma.176

ORIGINAL ARTICLE

Do Recommendations by Healthcare Providers, Family-members, Friends, and Individual Self-Efficacy Increase Uptake of Hepatitis B Screening? Results of a Population-Based Study of Asian Americans

Xiaoxiao Lu, MD, MPH;¹ Hee-Soon Juon, PhD;² Sunmin Lee, ScD, MPH¹

¹Department of Epidemiology and Biostatistics, University of Maryland School of Public Health, College Park, Maryland, United States, ²Department of Medicine, Thomas Jefferson University, Philadelphia, PA, United States

✉ Corresponding author email: xxlu@umd.edu

ABSTRACT

Background: Hepatitis B virus (HBV) infection disproportionately affects Asian Americans but HBV screening rates among Asian American are substantially low. This study examines the impact of multiple recommendations and self-efficacy on HBV screening uptake among Asian Americans.

Methods: Data for this study were from 872 Chinese, Korean and Vietnamese recruited for a liver cancer prevention program in the Washington D.C – Baltimore metropolitan area.

Results: 410 (47%) respondents reported previous HBV screening. Only 19.8% recalled a physician recommendation. Higher level of HBV screening was reported among people who had physician recommendation, family member recommendation or friend recommendation. Perceived self-efficacy was also an important predictor to HBV screening. The effect of self-efficacy was significant in subgroup analyses among Chinese and Korean, but not for Vietnamese.

Conclusion and Global Health Implications: The disproportional prevalence of HBV infection among Asian Americans is considered to be one of the most important health disparities for Asian population. Understanding the condition and screening behavior in this population is especially important. Our findings suggest that recommendation from physician and social networks should be encouraged for HBV screening among Asian Americans. Both recommendation and self-efficacy of HBV screening are important psychosocial constructs to be targeted in liver cancer prevention interventions.

Key words: Hepatitis B Virus • Asian Americans • Screening • Recommendation • Self-efficacy

Copyright © 2017 Lu et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

I. Background

Asian Americans are one of the fastest growing racial/ethnic groups in the United States (U.S.).^[1] The U.S. Census Bureau predicts that Asian population will reach 11% of the U.S. population by 2050.^[2] Asian Americans are heterogeneous groups with respect to country of birth, socioeconomic status, time since immigration, language spoken, religion and other characteristics that may affect their health.^[3] Table 1 presents key demographic and socioeconomic characteristics of the 10 largest U.S. Asian groups by origin.^[4]

Asian Americans have a higher prevalence of Hepatitis B virus (HBV) infection compared to other racial/ethnic groups in the U.S.^[5] As the surveillance data collected by the U.S. Centers for Disease Control and Prevention (CDC) report, about one-half of all chronic HBV infections are among persons born in Asia and Asian-Americans who were born to HBV infected mothers in the U.S.^[6] Approximately 10% of Asian Americans are chronically infected with HBV, while only 1% of non-Hispanic whites are infected.^[7] The disproportional prevalence of HBV infection among Asian Americans is considered to be one of the most important health disparities for Asian Americans.^[8,9] HBV infection is etiologically associated with Hepatocellular carcinomas (HCC), which is the fourth most common cause of cancer death among Asian Americans.^[10] Over time, one

in four individuals who acquire HBV as children will develop primary HCC or liver cirrhosis as adults.^[11] Preventive measures including a screening strategy are critical to identify individuals who are infected with HBV because patients with chronic HBV infection are usually asymptomatic until the disease has progressed into a more advanced stage.^[8] Therefore, the CDC recommends routine HBV screening for Americans from all countries in Asia.^[9] However, previous studies show that HBV screening is not widely practiced in the U.S. among Asian Americans.^[12-14]

Recommendations from primary care providers and people who belong to one's social networks are critical sources for communication about the importance of HBV screening.^[12] Recommendation by a health care provider (thereafter called Physician) has been described as a major factor which is associated with HBV screening. Results from previous studies show that physician recommendation was independently and positively associated with HBV screening behavior.^[12,15-17] In contrast to physician recommendation, the role of family and friend recommendation has received less attention. A few studies examined the impact of recommendation from family and friends on HBV screening.^[12,18,19] Taylor found that family and friend recommendations were not significantly associated with HBV screening test among Vietnamese

Table 1: Characteristics of the 10 largest U.S. Asian groups by origin (based on self-described race or ethnicity)

	Total	Median age (years)	Foreign born %	U.S. citizen %	Married %	Bachelor's degree or more %	Median household income	Speaks English less than "very well" %
Chinese	4,010,114	43	76	69	59	51	\$65,050	48
Filipino	3,416,840	43	69	77	56	47	\$75,000	22
Indian	3,183,063	37	87	56	71	70	\$88,000	24
Vietnamese	1,737,433	41	84	80	57	26	\$53,400	59
Korean	1,706,822	40	78	67	56	53	\$50,000	46
Japanese	1,304,286	47	32	79	53	46	\$65,390	18
Pakistani	409,163	38	89	63	69	56	\$60,000	33
Cambodian	276,667	37	79	71	48	38	\$47,873	53
Hmong	260,073	29	67	73	51	13	\$42,689	48
Thai	237,583	40	85	59	55	42	\$48,614	46

Source: The Asian Population: 2010, U.S. Census Bureau, March 2012

American women after adjusting for other potential confounders.^[12] However, Coronado et al. found that receiving a recommendation from a family member was strongly associated with HBV screening among Chinese Americans (OR = 2.7, 95% CI: 1.3, 5.4).^[18]

Perceived self-efficacy was also considered as an important factor that related to HBV screening.^[20] Self-efficacy is a central concept within the social cognitive theory (SCT).^[21] Bandura has defined self-efficacy as the conviction that one can successfully execute the behavior required to produce the desired outcome in various situation.^[21] Prior literature has shown that self-efficacy is related to HBV screening.^[20] Ma et al. conducted a cross-sectional study to measure the perceptions of risk, barriers, and self-efficacy of HBV screening in Chinese Americans.^[20] They found that self-efficacy was significantly correlated with screening behavior ($r = 0.14$, $P < 0.05$). In addition to being independently associated with HBV screening, self-efficacy may work in conjunction with perceived social environmental factors when predicting HBV screening behavior.

A growing number of literature have described the importance of recommendation from multiple sources in terms of HBV screening. But very few studies have focused on how different types of recommendation, such as recommendation from physicians, family members and friends, simultaneously impact screening behavior. Moreover, there is limited understanding about the influence of social cognitive factors on HBV screening among Asian Americans. Identification of the effect of recommendation from social networks and self-efficacy may influence future HBV screening interventions developed for Asian Americans. The goals of this paper were to (1) examine variations of the three types of recommendations (physician, family and friend recommendation) across ethnicity groups; (2) simultaneously test the relationship between different types of recommendation and HBV screening behavior; (3) assess the relationship between self-efficacy and HBV screening; and (4) examine how self-efficacy moderates the relationships between recommendation and HBV screening behavior.

2. Methods

The current study used survey data collected by the Maryland Asian American Liver Cancer Education Program. The program was a randomized controlled trial that tested an intervention to increase Hepatitis B screening among Chinese, Korean and Vietnamese in Washington DC Metropolitan area. Participants were recruited through various community-based or faith based organizations, such as churches, language schools, Asian grocery markets and restaurants, nail salons, universities, and individual networks. Detailed eligibility criteria were discussed in other article.^[22] The program received approval for Human Subject Research from the Institutional Review Board of Johns Hopkins Bloomberg School of Public Health.

A total of 877 participants were recruited during November 2009 to June 2010, consisting of 303 Chinese, 294 Koreans and 280 Vietnamese. The analytic sample for this study excluded participants who had missing information on recommendations and self-efficacy ($n=13$), resulting 864 participants in the final dataset.

2.1. Measures

2.1.1. Dependent variables

Participants were asked if they had ever had hepatitis B screening, which was not the liver function test. The response was either yes or no.

2.1.2. Independent variables

2.1.2.1. Recommendation

The main independent variables of the analysis were the three types of recommendation. The participants were asked if they had received recommendation from physicians, family members or friends to take a hepatitis B testing respectively (0 = no; 1 = yes). A recommendation index was developed to assess the extent of recommendation received from participants. The index was created by summing the three recommendation variables, which yield a score ranging between 0 and 3. The index score was further categorized into three groups: 0 = none of recommendation received, 1 = one type of recommendation received, 2 = two or more types of recommendation received.

2.1.2.2. Self-efficacy

Four items on self-efficacy examined the level of self-confidence to uptake the screening under challenging circumstances ($\alpha = 0.90$; $n = 4$). The questions included “I am confident that I can make an appointment to get tested for HBV and keep that appointment”, “I am confident that, no matter what happens, I can get tested for HBV”, and “I am confident that I can ask my physician to give me a test for HBV.” The 7-point Likert scale was used to assess this SCT construct: from “strongly agree” (7) to “strongly disagree” (1). The items were used to create a composite index score by calculating a summative mean so that the higher the score, the greater the self-efficacy. We used the median split to make two categories of the self-efficacy variable: low self-efficacy (=1) and high self-efficacy (=2).

2.1.2.3. Covariates

Age was not linearly related to the outcome based on the LOWESS analysis,^[23,24] so age was categorized into two groups (0 = 18 – 40 years; 1 = above 40 years). Other covariates include gender (0 = female; 1 = male), ethnicity (1 = Korean; 2 = Chinese; 3 = Vietnamese), education (1 = less than high school; 2 = high school graduate; 3 = college or higher), health insurance (0 = no; 1 = yes), and having a regular physician (0 = no; 1 = yes).

2.1.3. Analysis

Descriptive analysis was conducted to assess the distribution of participants’ baseline sociodemographic characteristics. Prevalence of HBV screening and recommendations were compared by each ethnic group. Bivariate logistic regression and multiple logistic regressions were performed to assess the unadjusted and multivariate adjusted association between each type of recommendation, self-efficacy and Hepatitis B screening status respectively. Multicollinearity tests were performed by using a variance inflation factor (VIF) and all values were accepted. Potential moderation by self-efficacy was examined for each of recommendation measures by including the corresponding interaction term. The stratified analysis was conducted if interaction term was significant.

3. Results

Table 2 shows the characteristics of the study participants. In our sample, 59% of participants were female, and the average age was about 45 years. Each ethnicity group accounted for approximately one-third of the sample. About 66% of the participants were college graduates or had more than college education. But education level significantly varied across the ethnicity groups. There were more Chinese participants with college education or above (84%) compared to Vietnamese (51%). About 67% of the sample had health insurance coverage and 59% had a regular physician. Overall, only a small percentage of participants received recommendation from their social network. About 20% of the participants reported that they received recommendation from physicians, 22% received recommendation from family members, and 13% received recommendation from friends. Approximately 70% of our sample reported not having received any type of recommendation, 14% had one type, and 17% experienced two or more than two types of recommendation.

Out of the 864 participants, 47% reported that they had received HBV screening. The HBV screening behavior differed significantly by gender, ethnicity, education, health insurance, regular physician, all the measures of recommendation, and self-efficacy. Those received HBV screening tended to be male, more Chinese than Korean or Vietnamese, more educated, insured, having a regular physician, receiving recommendation from physician, family and friends, and high self-efficacy.

The proportions of HBV screening varied across the three ethnic groups. Chinese participants reported the highest proportion of HBV screening (55%) compared to Korean (46%) and Vietnamese (40%). For recommendation, higher percentages of Vietnamese respondents than other subgroups reported having received physician recommendation, family recommendation and friend recommendation ($p < 0.001$). In addition, receiving physician recommendation was more common among those who had a regular physician or who had health insurance. Regarding self-efficacy, Vietnamese

Table 2: Characteristics of study participants and bivariate analysis for HBV screening status by sample characteristics (N=864)

	N (%)			p value
	Total	Screened	Not screened	
N	864	407 (47.1)	457 (52.9)	
Age				
18-40 years	351 (40.6)	164 (40.3)	187 (40.9)	0.852
Above 40 years	513 (59.4)	243 (59.7)	270 (59.1)	
Gender				
Female	506 (58.6)	224 (55.0)	282 (61.7)	0.047
Male	358 (41.4)	183 (45.0)	175 (38.3)	
Ethnicity				
Chinese	298 (34.5)	164 (40.3)	134 (29.3)	0.001
Korean	293 (33.9)	134 (32.9)	159 (34.8)	
Vietnamese	273 (31.6)	109 (26.8)	164 (35.9)	
Education				
Less than high school	113 (13.1)	32 (7.9)	81 (17.7)	<0.001
High school graduate	177 (20.5)	68 (16.7)	109 (23.9)	
College or higher	574 (66.4)	307 (75.4)	267 (58.4)	
Health insurance				
No	287 (33.2)	116 (28.5)	171 (37.4)	0.005
Yes	577 (66.8)	291 (71.5)	286 (62.6)	
Regular physician				
No	353 (40.9)	114 (35.4)	209 (45.7)	0.002
Yes	511 (59.1)	263 (64.6)	248 (54.3)	
Physician recommendation				
No	693 (80.2)	268 (65.8)	425 (93.0)	<0.001
Yes	171 (19.8)	139 (34.2)	32 (7.0)	
Family recommendation				
No	677 (78.4)	264 (64.9)	413 (90.4)	<0.001
Yes	187 (21.6)	143 (35.1)	44 (9.6)	
Friend recommendation				
No	752 (87.0)	325 (79.9)	427 (93.4)	<0.001
Yes	112 (13.0)	82 (20.1)	30 (6.6)	
Recommendation index				
None	602 (69.7)	209 (51.3)	393 (86.0)	<0.001
One type	117 (13.5)	81 (19.9)	36 (7.9)	
Two or more types	145 (16.8)	117 (28.8)	28 (6.1)	
Self-efficacy				
Low	456 (52.8)	187 (45.9)	269 (58.9)	<0.001
High	408 (47.2)	220 (54.1)	188 (41.1)	

participants showed the highest proportion of high self-efficacy (64%) compared to Chinese (39%) and Korean (41%) (data not shown).

Both unadjusted and multivariate adjusted analyses show that there were significant effects of recommendation and self-efficacy on HBV screening

in the total sample (Table 3). The three types of recommendations were strong predictors of HBV screening behavior. After adjusting for other factors, participants reported a physician recommendation was more than 7 times as likely to have a HBV screening (OR = 7.49, 95% CI: 4.79, 11.71), followed by family recommendation (OR = 5.46, 95% CI: 3.66, 8.15) and friend recommendation (OR = 3.75, 95% CI: 2.35, 5.98). Compared to those reported not having received any type of recommendation, respondents who received one type of recommendation were almost 5 times as likely to have HBV screening

(OR = 4.87, 95% CI: 3.08, 7.70). Having two or more than two types of recommendations were even 9 times associated with HBV screening behavior (OR = 9.28, 95% CI: 5.69, 15.13). In addition, those who had high self-efficacy were more likely to have HBV screening than those with low self-efficacy (OR = 1.51, 95% CI: 1.10, 2.07). Interactions between recommendation variables and self-efficacy were not statistically significant.

The associations between recommendations and screening behavior varied by three ethnic groups. As shown in Table 4, Vietnamese group had the

Table 3: Unadjusted and adjusted associations between recommendation behavior and HBV screening, all ethnicities (N=864)

	OR (95% CI)				
	Unadjusted model	Adjusted Model 1	Adjusted Model 2	Adjusted Model 3	Adjusted Model 4
Physician recommendation	6.89 (4.56, 10.42)*	7.49 (4.79, 11.71)*			
Family recommendation	5.08 (3.51, 7.37)*		5.46 (3.66, 8.15)*		
Friend recommendation	3.59 (2.31, 5.59)*			3.75 (2.35, 5.98)*	
Recommendation index					
None	Ref				Ref
One type	4.23 (2.76, 6.48)*				4.87 (3.08, 7.70)*
Two or more types	7.86 (5.03, 12.26)*				9.28 (5.69, 15.13)*
Self-efficacy					
Low	Ref	Ref	Ref	Ref	Ref
High	1.68 (1.29, 2.20)*	1.55 (1.13, 2.11)*	1.64 (1.21, 2.23)*	1.79 (1.33, 2.40)*	1.51 (1.10, 2.07)*
Age					
18-40 years	Ref	Ref	Ref	Ref	Ref
Above 40 years	1.03 (0.78, 1.35)	1.05 (0.76, 1.46)	1.09 (0.79, 1.51)	1.04 (0.76, 1.42)	1.02 (0.73, 1.43)
Gender					
Female	Ref	Ref	Ref	Ref	Ref
Male	1.32 (1.00, 1.73)*	1.36 (1.00, 1.85)*	1.30 (0.96, 1.76)	1.31 (0.97, 1.76)	1.30 (0.95, 1.78)
Ethnicity					
Chinese	Ref	Ref	Ref	Ref	Ref
Korean	0.69 (0.50, 0.95)*	0.91 (0.63, 1.31)	0.86 (0.59, 1.23)	0.86 (0.60, 1.24)	0.83 (0.57, 1.20)
Vietnamese	0.54 (0.40, 0.76)*	0.47 (0.31, 0.71)*	0.57 (0.31, 0.70)*	0.53 (0.36, 0.79)*	0.38 (0.25, 0.59)*
Education					
Less than high school	Ref	Ref	Ref	Ref	Ref
High school graduate	1.58 (0.95, 2.63)	1.33 (0.76, 2.33)	1.30 (0.75, 2.26)	1.40 (0.82, 2.38)	1.26 (0.71, 2.21)
College or higher	2.91 (1.87, 4.52)*	2.56 (1.54, 4.25)*	2.44 (1.48, 4.02)*	2.54 (1.56, 4.14)*	2.38 (1.42, 3.98)*
Health insurance	1.50 (1.13, 2.00)*	1.05 (0.72, 1.52)	1.11 (0.77, 1.61)	1.09 (0.76, 1.55)	1.07 (0.73, 1.56)
Regular physician	1.54 (1.17, 2.03)*	1.23 (0.86, 1.75)	1.28 (0.90, 1.81)	1.39 (0.99, 1.96)	1.25 (0.87, 1.79)

*p<0.05

Table 4: Multivariate adjusted associations between recommendation behavior and HBV screening by ethnicities (N=864)

	OR (95% CI)		
	Chinese (n=298)	Korean (n=293)	Vietnamese (n=273)
Physician's recommendation	6.62 (3.00, 14.61)*	7.96 (3.15, 20.09)*	9.18 (4.74, 17.79)*
Family's recommendation	5.51 (2.57, 11.83)*	6.29 (2.85, 13.86)*	6.28 (3.43, 11.49)*
Friend's recommendation	3.54 (1.50, 8.37)*	4.57 (1.74, 11.99)*	3.95 (1.98, 7.89)*
Recommendation index			
None	Ref	Ref	Ref
One type	6.23 (2.18, 17.82)*	6.29 (2.79, 14.18)*	4.44 (2.18, 9.03)*
Two or more types	6.59 (2.84, 15.29)*	9.84 (3.56, 27.20)*	12.43 (6.00, 25.74)*
Self-efficacy			
Low	Ref	Ref	Ref
High	1.66 (1.02, 2.70)*	2.97 (1.77, 4.99)*	1.28 (0.74, 2.21)

*p<0.05 Adjusted for age, gender, education, health regulation and regular physician

strongest associations between physician and family recommendations and HBV screening compared to Chinese and Korean. For those Vietnamese who received two or more than two types of recommendations were 12 fold as likely to have HBV screening compared to participants without any type of recommendation (OR = 12.43, 95% CI: 6.00, 25.74). The strongest association between self-efficacy and HBV screening was shown among Korean Americans. Those with high self-efficacy were about 3 times as likely to have HBV screening compared to those with low self-efficacy among Korean Americans (OR = 2.97, 95% CI: 1.77, 4.99). There was no significant association between self-efficacy and HBV screening among Vietnamese Americans.

4. Discussion

Our study identified the importance of recommendation from physicians, family and friends on HBV screening behavior. To our knowledge, this study is one of the first studies to simultaneously address the role of physician, family and friend recommendation to obtain a HBV screening in three ethnic groups. In addition, the study also identifies the effect of self-efficacy on HBV screening behavior. The findings suggest that self-efficacy and recommendations from physician and social networks may impact Hepatitis B screening behavior. We also observed ethnic differences in the relationship between recommendation and screening practice.

The association was strongest among Vietnamese group compared with Chinese and Korean.

Consistent with earlier studies, physician's recommendation is one of the strongest predictors of screening among Asian Americans.^[12,15-18] Surprisingly, only 20% of individuals in our study had ever received a physician's recommendation for HBV screening test. In addition, physicians may be reluctant to recommend HBV screening to patients from Asian countries including China, Korean and Vietnamese because of their own lack of knowledge of screening guidelines for Asian Americans. Therefore, health care providers who usually serve Asian American population should intensify their efforts to encourage patients to prevent HBV infection. Among the three ethnic groups, Korean participants showed the lowest level of physician's recommendation (13%). This may be partially explained by their lack of health insurance. In our sample, Korean had the lowest health insurance coverage among the three ethnic groups (52% vs. 79% for Chinese and 71% for Vietnamese). Other studies also found that Korean Americans were less likely to have health insurance compared with other Asian-American groups.^[25,26] A large number of Korean Americans work in small businesses or are self-employed, so they are less likely to obtain employer-based health insurance.^[27]

Additionally, our study identified the role of family and friend recommendation on hepatitis B screening.

Prior studies have shown the positive relationship between family and friends' recommendation and screening behavior. Coronado et al. found that receiving a suggestion from a family member to obtain HBV testing was strongly correlated with testing behavior among Chinese American (OR = 2.7, 95% CI: 1.3, 5.4).^[18] Another study shows that almost 60% of Vietnamese-American women who received a recommendation from a family member or a friend indicated they had HBV screening compared to 40% of those who did not receive recommendation.^[12] Our results corroborated prior findings. Compared to Vietnamese, Chinese and Korean reported lower level of recommendation from family and friends. One possible explanation for Chinese Americans could be the stigma of chronic Hepatitis B, which is widespread in employment, school, and social discrimination.^[28] In China, it is mandatory for health workers to report a positive test result of HBV screening to the patients' school and employer before 2010.^[28] Only in 2011, the Ministry of Health proposed regulations prohibiting hospitals from carrying out HBV tests for companies as part of pre-employment physical examination.^[15] But these regulations might not have changed misunderstandings and discrimination among Chinese Americans and this trend may continue in near future. Such reporting policies may deter individuals from getting screened and sharing information about HBV prevention.

Our study is consistent with the SCT theory that individual's belief in one's ability to accomplish a task can lead them to take the action.^[21] We found that self-efficacy had a significant impact on HBV screening behavior. Interestingly, Vietnamese Americans showed the highest proportion of high self-efficacy compared to Chinese and Korean Americans, but no significant association between self-efficacy and HBV screening was observed among Vietnamese Americans. One possible explanation could be that the differential socioeconomic profiles exhibited among the three Asian subgroups. Compared to Chinese and Korean in the sample, Vietnamese participants were less educated (51% of Vietnamese had college or higher education compared to 84% Chinese and 63% Korean). The lower educated Vietnamese may experience more

difficulties to receive HBV screening, even though they had a higher level of self-efficacy. Therefore, other than enhancing self-efficacy, comprehensive interventions should focus on raising individual's knowledge and understanding of Hepatitis B and early detection, overcoming the access and cultural barriers, and encouraging proactive behavior.

Our study has several limitations which can be addressed in future studies. First, our recruitment is not based on probability sampling method since our population is a hard-to-reach population. It is possible that self-selected population is more knowledgeable about HBV infection and has a greater motivation to get the screening. However, our sample composition closely follows that of the United States 2010 Census data,^[29] so non-probability sampling may not have a major impact in interpreting study findings. Secondly, the majority of our study population was first generation Asian Americans. Thus, variability for recommendation and self-efficacy might have been smaller than studies that included more US born Asian Americans. This might have reduced our ability to detect potential impact of self-efficacy and recommendation on HBV screening. Thirdly, our outcome data are based on self-reported HBV screening behavior which may be inaccurate due to recall and social desirability biases. Similarly, self-report of recommendation to get screened may be more likely to be recalled by participants who perceived HBV screening as more important.

5. Conclusion and Global Health Implications

Immigrants from Asian countries to the United States have been dramatically increasing. Health disparities, specifically HBV infection, adversely affect Asian populations. This study will advance our understanding of recommendation and self-efficacy among Asian Americans. The findings of our study provide useful insights on how recommendation from physicians and social networks influence on HBV screening behavior among Asian Americans. Future research may address the cultural context of self-efficacy. The study suggests that educational interventions for Asian Americans involving family

and friends and Asian-serving physicians should be effective in increasing the prevalence of HBV screening.

Compliance with Ethical Standards

Conflict of Interest: Authors declare they have no conflicts of interest. **Ethical Approval:** Study was approved by a recognized Institutional Review or Ethics Board. **Informed Consent:** Informed consent was obtained from the study participants.

Acknowledgement: Authors thank all participants of the study. Funding for this study was provided by National Cancer Institute (NCI) Grant R25CA129042. NCI had no further role in study design, data collection, analysis, or interpretation, in the writing of the report, or in the decision to submit the paper for publication.

Key Messages

- Prevalence and factors for HBV screening behaviors differ among each Asian ethnic group.
- Both recommendation and self-efficacy of HBV screening are important psychosocial constructs to be targeted in liver cancer prevention interventions.
- Recommendation from physicians and social networks should be encouraged for HBV screening among Asian Americans.

References

1. U.S. Census Bureau. Asians Fastest-Growing Race or Ethnic Group in 2012, Census Bureau Reports 2012. Available from: <http://www.census.gov/newsroom/press-releases/2013/cb13-112.html>.
2. Colby SL, Ortman JM. Projections of the Size and Composition of the US Population: 2014 to 2060. US Census Bureau, Ed. 2015:25-1143.
3. McGarvey EL, Clavey GJ, Johnson II JB, Butler A, Cook KO, Pennino B. Cancer screening practices and attitudes: comparison of low-income women in three ethnic groups. *Ethnicity and Health*. 2003;8(1):71-82.
4. U.S. Census Bureau. The Asian Population: 2010, U.S. Census Bureau Reports 2012.
5. Ma GX, Lee S, Wang M, Tan Y, Gao W, Ma X, et al. Role of sociocultural factors in hepatitis B screening among Asian Americans. *Southern Medical Journal*. 2011;104(7):466-72.
6. Centers for Disease Control and Prevention. Surveillance for Viral Hepatitis—United States, 2012. 2015.
7. U.S. Department of Health and Human Services. Healthy People 2010: Office of Disease Prevention and Health Promotion, US Department of Health and Human Services; 2000.
8. Lin SY, Chang ET, So SK. Why we should routinely screen Asian American adults for hepatitis B: a cross-sectional study of Asians in California. *Hepatology (Baltimore, Md)*. 2007;46(4):1034-40.
9. Hsu CE, Liu LC, Juon HS, Chiu YW, Bawa J, Tillman U, et al. Reducing liver cancer disparities: a community-based hepatitis-B prevention program for Asian-American communities. *Journal of the National Medical Association*. 2007;99(8):900-7.
10. Miller BA, Chu KC, Hankey BF, Ries LA. Cancer incidence and mortality patterns among specific Asian and Pacific Islander populations in the U.S. *Cancer Causes & Control: CCC*. 2008;19(3):227-56.
11. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *Journal of Viral Hepatitis*. 2004;11(2):97-107.
12. Taylor VM, Choe JH, Yasui Y, Li L, Burke N, Jackson JC. Hepatitis B awareness, testing, and knowledge among Vietnamese American men and women. *Journal of Community Health*. 2005;30(6):477-90.
13. Centers for Disease Control and Prevention. Screening for chronic hepatitis B among Asian/Pacific Islander populations--New York City, 2005. *MMWR Morbidity and Mortality Weekly Report*. 2006;55(18):505-9.
14. Ma GX, Shive SE, Toubbeh JI, Tan Y, Wu D. Knowledge, attitudes, and behaviors of Chinese hepatitis B screening and vaccination. *American Journal of Health Behavior*. 2008;32(2):178-87.
15. Strong C, Lee S, Tanaka M, Juon HS. Ethnic differences in prevalence and barriers of HBV screening and vaccination among Asian Americans. *Journal of Community Health*. 2012;37(5):1071-80.
16. Maxwell AE, Stewart SL, Glenn BA, Wong WK, Yasui Y, Chang LC, et al. Theoretically informed correlates of hepatitis B knowledge among four Asian groups: the

- health behavior framework. *Asian Pacific Journal of Cancer Prevention: APJCP*. 2012;13(4):1687-92.
17. Chen MS, Jr., Fang DM, Stewart SL, Ly MY, Lee S, Dang JH, et al. Increasing hepatitis B screening for hmong adults: results from a randomized controlled community-based study. *Cancer Epidemiology, Biomarkers & Prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*. 2013;22(5):782-91.
 18. Coronado GD, Taylor VM, Tu S-P, Yasui Y, Acorda E, Woodall E, et al. Correlates of Hepatitis B Testing Among Chinese Americans. *Journal of Community Health*. 2007;32(6):379-90.
 19. Hu K-Q, Pan CQ, Goodwin D. Barriers to screening for hepatitis B virus infection in Asian Americans. *Digestive Diseases and Sciences*. 2011;56(11):3163-71.
 20. Ma GX, Shive SS, Toubbeh J, Wu D, Wang P. Risk Perceptions, Barriers, and Self-Efficacy of Hepatitis B Screening and Vaccination among Chinese Immigrants. *International Electronic Journal of Health Education*. 2006;9:141-53.
 21. Bandura A. *Self-efficacy*: Wiley Online Library; 1994.
 22. Juon H-S, Lee S, Strong C, Rimal R, Kirk GD, Bowie J. Peer Reviewed: Effect of a Liver Cancer Education Program on Hepatitis B Screening Among Asian Americans in the Baltimore–Washington Metropolitan Area, 2009–2010. *Preventing Chronic Disease*. 2014;11.
 23. Cleveland WS, Devlin SJ. Locally weighted regression: an approach to regression analysis by local fitting. *Journal of the American Statistical Association*. 1988;83(403):596-610.
 24. Cleveland WS. Robust locally weighted regression and smoothing scatterplots. *Journal of the American Statistical Association*. 1979;74(368):829-36.
 25. Ryu H, Young WB, Park C. Korean American health insurance and health services utilization. *Research in Nursing & Health*. 2001;24(6):494-505.
 26. Jo AM, Maxwell AE, Rick AJ, Cha J, Bastani R. Why are Korean American physicians reluctant to recommend colorectal cancer screening to Korean American patients? Exploratory interview findings. *Journal of Immigrant and Minority Health/Center for Minority Public Health*. 2009;11(4):302-9.
 27. Kim YO. Access to hepatitis B vaccination among Korean American children in immigrant families. *Journal of Health Care for the Poor and Underserved*. 2004;15(2):170-82.
 28. Chao J, Chang E, So S. Hepatitis B and liver cancer knowledge and practices among healthcare and public health professionals in China: a cross-sectional study. *BMC Public Health*. 2010;10(1):98.
 29. U.S. Census Bureau. 2010 American Community Survey: Maryland 2010 [cited 2015 May 1]. Available from: <https://www.census.gov/quickfacts/table/PST045215/00>.