

# HEPATITIS B TESTING FOR LIVER CANCER CONTROL AMONG KOREAN AMERICANS

**Introduction:** In Los Angeles County, Koreans surpass all other groups with respect to liver cancer incidence and mortality. An estimated 80%–85% of all liver cancer is etiologically related to chronic hepatitis B viral infection. Hepatitis B serologic testing of adult immigrants from highly endemic areas such as Asia is recommended as the first step in the control of hepatitis B infection and associated morbidities including liver cancer.

**Objective:** To collect pilot data to obtain an initial understanding of hepatitis B serologic testing and vaccination rates and associated knowledge and beliefs in a community sample of Korean adults (N=141, 85% foreign born, mean age 45 years) in the greater Los Angeles area.

**Design:** Cross-sectional survey.

**Setting:** Five Korean Christian churches and one Korean-serving primary care clinic.

**Results:** The hepatitis B serologic testing rate in our sample was 56%. Approximately one quarter of those tested reported that they were either chronic carriers or were immune as a result of a previous infection. Of those who remained susceptible to future infections, only 38% reported having been vaccinated. Constructs from our conceptual model, the Health Behavior Framework, were significant predictors of serologic testing, including hepatitis B knowledge, barriers to testing, and receipt of a physician's recommendation to get tested.

**Conclusion:** Findings suggest that intervention research is urgently needed to increase hepatitis B awareness and testing among Korean American adults with subsequent vaccination and followup as indicated. (*Ethn Dis.* 2007;17:365–373)

**Key Words:** Health Behavior Framework, Hepatitis B Knowledge, Hepatitis B Serological Testing, Korean American Adults, Liver Cancer Control, Prevention

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## INTRODUCTION

Liver cancer rates vary 100-fold worldwide, with high-risk regions mainly concentrated in Asia.<sup>1</sup> In the United States, Asians have the highest liver cancer incidence and mortality rates compared to all other racial/ethnic populations.<sup>2,3</sup> Among Asians, Vietnamese have the highest incidence rates, followed by Koreans and Chinese.<sup>3</sup> However, in Los Angeles County, Koreans surpass all other groups with respect to both liver cancer incidence and mortality.<sup>1</sup> Incidence rates for liver and intrahepatic bile duct cancer among Koreans living in Los Angeles County have been estimated at 24.8 per 100,000 in comparison to 3.3 per 100,000 among Caucasians. Although liver cancers only account for 1.5% of all cancer cases, the prognosis for those who develop the disease is extremely poor, with five-year survival rates <10%.<sup>3</sup> An estimated 80%–85% of all liver cancer is etiologically related to chronic hepatitis B virus (HBV) infection.<sup>4–6</sup>

The hepatitis B virus (HBV) is a double-stranded DNA virus that is transmitted via bodily fluids. The virus can be transmitted vertically from mother to child during birth or horizontally through sexual exposures, percutaneous exposure (eg, blood transfusions and sharing intravenous or acupuncture needles), as well as by close person-to-person contact such as sharing a razor, toothbrush, or pierced earrings with infected persons, presum-

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*...in Los Angeles County, Koreans surpass all other groups with respect to both liver cancer incidence and mortality.<sup>1</sup>*

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ably through open cuts and sores.<sup>7,8</sup> The hepatitis B virus (HBV) is relatively stable in the environment and has been estimated to be 50–100 times more infectious than HIV.<sup>9</sup> Infection with HBV can cause a range of clinical manifestations, varying between acute and chronic disease. Following an acute episode, the infected individual may resolve the infection and acquire immunity, may resolve the infection but not acquire immunity, or continue to remain infected. Infected individuals can progress to chronic HBV infection with associated liver inflammation and other symptoms or remain in an inactive carrier status. Both groups can pass the virus to others they come in close contact with.<sup>10</sup> No curative treatments for chronic hepatitis B exist, but a few antiviral agents are available for suppression and remission of the disease in patients with certain clinical features.<sup>11</sup> Chronic HBV infection carries a liver cancer risk that is 200 times greater than among those not infected.<sup>12–14</sup>

A safe and effective vaccine against HBV infection has been available since the early 1980s, and initial public health efforts in the United States were focused on vaccinating individuals engaged in high-risk drug and sexual behaviors. Since 1991, universal immunization of infants has been recommended by multiple organizations including the Centers for Disease Control and Pre-

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vention,<sup>7,15</sup> and current guidelines call for immunization of all infants and children <18 years of age.<sup>16-18</sup> In addition, most states now require HBV vaccination for entry into daycare, elementary school, and/or middle school.<sup>19</sup> For adults, guidelines recommend immunization of individuals considered at high risk for the disease including individuals with potential occupational exposure (ie, healthcare and public safety workers), certain patient populations (ie, hemodialysis patients and patients receiving routine blood products), individuals engaged in high-risk behaviors (ie, injection drug users, individuals engaging in high-risk sex), inmates of correctional facilities, international travelers to endemic countries, and individuals who have household or sexual contact with infected persons.<sup>8</sup> However, universal vaccination of Asian immigrant adults in the absence of serologic testing to determine HBV carrier status is not considered an adequate public health strategy because HBV infection is endemic in many parts of Asia, in which a substantial proportion of the population would derive no benefit from vaccination but could pass on the infection via vertical or horizontal transmission.

The 2001 Guidelines of the American Association for the Study of Liver Diseases recommend HBV serologic testing of adult immigrants from highly endemic areas such as Asia as the first step in the control of hepatitis B infection and associated morbidities including liver cancer.<sup>2</sup> Given the high rates of chronic HBV infection among Asians, testing is expected to yield a substantial number of cases, which should enable informed decision-making with respect to treatment of infected individuals and screening for liver cancer, as well as provide opportunities for counseling regarding the possibility of horizontal and vertical transmission. In addition, case identification would allow household and contact vaccinations to occur for prevention of trans-

mission. Finally, those who are seronegative can be counseled regarding the risks and benefits of HBV vaccination, considering their individual risk factors.<sup>20-22</sup>

Despite the disproportionate burden of hepatitis B and liver cancer among Asians in the United States, national data on the percentage of Asian adults who have obtained the recommended HBV testing is largely nonexistent. Regional studies among Vietnamese, Chinese, and Cambodian populations in the United States have reported rates ranging from 24% to 68%.<sup>23-28</sup> These studies have also shown that among individuals who have been tested and determined to be susceptible to future HBV infection (not immune, not chronic carrier), most have not received HBV vaccination and thus remain at risk for acquiring the virus.

Koreans are the third most populous Asian ethnic group in Los Angeles (after Chinese and Filipinos) and have the highest liver cancer incidence and mortality rates in the county.<sup>1</sup> These facts make them an important population to include in liver cancer prevention and control efforts. To date, no data are available on hepatitis B testing rates among Koreans. Therefore, we conducted a pilot study to obtain an initial understanding of hepatitis B serologic testing and vaccination rates and associated knowledge and beliefs in a community sample of Korean adults in the greater Los Angeles area.

## METHODS

### Participant Recruitment

A sample of 141 adult Koreans was recruited from five Korean Christian churches and one Korean-serving primary care clinic in Los Angeles. Participants recruited from the primary care clinic were approached by the interviewer in the waiting room and invited to participate in the study. Participants recruited from churches were invited to

participate through announcements made during church services or small group meetings. Participants were given the option to complete the questionnaire in Korean or English and received \$10 upon completion of the questionnaire. All data were collected in August and September of 2003. The study protocol was approved by the UCLA Institutional Review Board.

### Measures

The questionnaire was based on constructs from the Health Behavior Framework<sup>29-33</sup> (Figure 1), which is a conceptual framework that synthesizes a number of commonly utilized health behavior models, including the Theory of Planned Behavior,<sup>34-36</sup> Social Cognitive Theory,<sup>37-38</sup> the Health Belief Model,<sup>39</sup> and Social Influence Theory.<sup>40-43</sup> Items were adapted from prior intervention and survey studies that used this conceptual framework. The framework has been used in studies targeting patients, the lay public, physicians, and other caregivers focused on breast, cervical, and colorectal cancer screening.<sup>29-33</sup> In addition, some items were adapted from studies on hepatitis B and liver cancer control conducted with other Asian populations<sup>25-28</sup> that also utilized the Health Behavior Framework. The survey took ≈15-20 minutes to complete and assessed sociodemographic information; HBV testing, vaccination, and infection history; serologic status; and knowledge, beliefs, and barriers related to hepatitis B, liver cancer, and serologic testing. Korean- and English-language versions of the survey instrument were developed and used for the study. Translations were conducted by trained, bilingual individuals and followed standard protocols recommended in the literature.<sup>44</sup> A variation of back translation was used. The documents were originally developed in English and translated into Korean by a bilingual individual. Two additional bilingual individuals then reviewed the Korean-language docu-

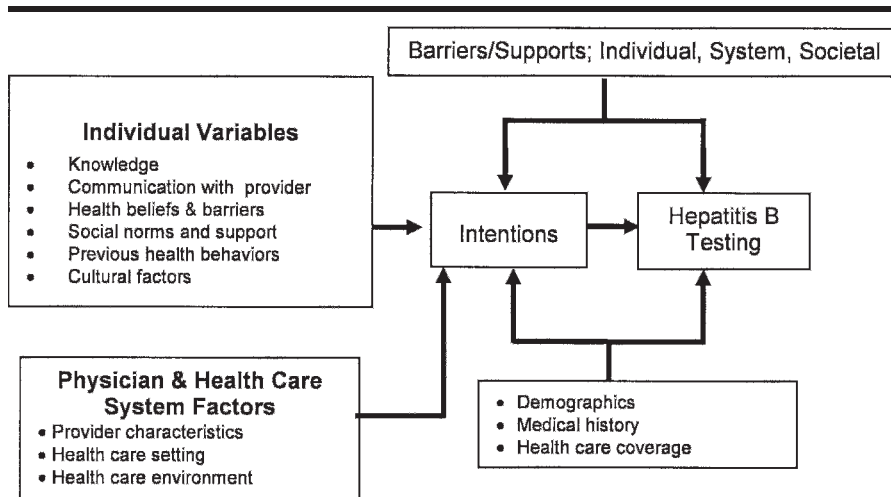


Fig 1. Health Behavior Framework<sup>29–33</sup>

ments to ensure that the translations were equivalent with the English versions and were culturally appropriate. According to the preferences of the participating sites, data were collected in three ways: in-person individual interviews, self-administered questionnaires, and mixed-mode interviews in which an interviewer read each questionnaire item and response option and participants, in a group setting, entered their responses on a hard copy of the questionnaire.

## Analyses

Following initial descriptive analyses, bivariate relationships between predictor variables (sociodemographic factors, knowledge, beliefs, and barriers) and our study outcome were assessed. Chi square tests for categorical variables and independent sample *t* tests for continuous variables were employed. Collinearity between related predictor variables was also assessed. A multiple logistic regression analysis was conducted to determine factors that independently predicted the outcome. To accommodate the relatively small sample size in the study, a variable reduction method was employed that involved selecting only predictors that were significant at the  $P \leq .25$  level in the bivariate analyses.<sup>45</sup> The outcome variable used in all analyses was self-

reported receipt of an HBV serologic screening test in the past. The following item was used to obtain this information: "Have you ever had a blood test to see if you currently have hepatitis B or have had hepatitis B in the past?"

## RESULTS

### Sample Characteristics

The mean age of the sample was 45 years (standard deviation [SD]=14.7, range=18–71), and half were men (52%,  $n=70$ ). Most participants were foreign born (86%), with an average length of stay in the United States of 17 years. Most (75%) interview/questionnaires were completed in the Korean language. The sample had a relatively high level of education (67% with some college) and most reported having some type of insurance (59%). Additional details regarding the characteristics of the sample appear in Table 1.

### HBV Testing and Vaccination Status

Figure 2 depicts the HBV serologic testing and vaccination status for the sample. Slightly over half of the sample (56%) reported receiving HBV serologic testing sometime in the past. Among

those tested, 19% were immune from a previously resolved infection, 4% were chronic carriers or chronically infected with the virus, and 10% were unaware of their status. Most of those tested (67%) were seronegative and therefore eligible to be vaccinated against future infection. In this group that remained vulnerable (ie, not immune or chronically infected), only a small minority (38%) reported receiving all three necessary vaccination shots to ensure long-term immunity to the virus.

### Knowledge and Beliefs

Most participants (85%) had heard of hepatitis B prior to participating in the present study. Although most (66%) were aware that Koreans are more likely to be infected with hepatitis B than Caucasians, slightly less than half (46%) were aware that hepatitis B is more easily transmittable compared to HIV. The majority of the sample was aware that individuals who appear healthy can spread the virus (81%), and that a person can die of hepatitis B (79%). Most participants were also aware of two of the most common routes of transmission, via sexual activity (64%) and from mother to child during birth (79%). However, only (36%) of the sample was aware that one can be infected for life. About three quarters of the sample was aware that hepatitis B can cause liver cancer whereas only a little over half believed that vaccination and testing for hepatitis B can help prevent the development of liver cancer. Only very small proportions of participants considered themselves to be very likely to develop hepatitis B (19%) or liver cancer (11%).

### Barriers to Receipt of Serologic Testing

A number of potential barriers to hepatitis B serologic testing were endorsed by our sample, including: fear of a bad diagnosis (75% very or somewhat concerned); concern about burdening the family if testing results revealed the

**Table 1. Sample characteristics and results of bivariate analyses predicting self-reported lifetime receipt of hepatitis B virus serologic testing**

	<i>n</i> (%)	% Tested	Significance
<b>Age</b>			
18–30 years	35 (25%)	43%	<i>P</i> =.0022
31–55 years	60 (43%)	73%	
56–71 years	45 (32%)	44%	
<b>Gender</b>			
Male	70 (52%)	61%	<i>P</i> =.25
Female	64 (48%)	51%	
<b>Marital status</b>			
Married	100 (71%)	57%	ns
Not married	40 (29%)	55%	
<b>Educational level</b>			
High school graduate or less	46 (33%)	39%	<i>P</i> =.004
Some college or more	94 (67%)	65%	
<b>Income</b>			
≤40,000 per year	103 (80%)	61%	<i>P</i> =.17
>40,000 per year	26 (20%)	46%	
<b>Insurance status</b>			
Some insurance	82 (59%)	59%	ns
No insurance	58 (41%)	54%	
<b>Country of birth</b>			
Foreign born	119 (86%)	68%	<i>P</i> =.23
Born in United States	19 (14%)	54%	
<b>English fluency</b>			
Well, like a native, or so-so	121 (86%)	56%	ns
Poor or not at all	19 (14%)	58%	
<b>Language of interview</b>			
Korean	105 (75%)	58%	ns
English	35 (25%)	51%	
<b>Recruitment site</b>			
Clinic	40 (29%)	48%	<i>P</i> =.18
Church	100 (71%)	60%	
<b>Interview format</b>			
Group-administered	30 (21%)	73%	<i>P</i> =.09
Individual interview	40 (29%)	48%	
Self-administered	70 (50%)	54%	
<b>Knowledge</b>			
Heard of hepatitis B			
Yes	119 (85%)	61%	<i>P</i> =.005
No	21 (15%)	29%	
Hepatitis B can be spread by sharing food/eating utensils			
Yes	84 (62%)	60%	ns
No	52 (38%)	52%	
Hepatitis B can be spread via toothbrushes			
Yes	97 (71%)	63%	<i>P</i> =.0284
No	40 (29%)	43%	
Hepatitis B can be spread via sexual intercourse			
Yes	87 (64%)	61%	<i>P</i> =.21
No	50 (36%)	50%	
Hepatitis B can be spread from mother to child at birth			
Yes	107 (79%)	59%	<i>P</i> =.24
No	28 (21%)	46%	

presence of hepatitis B (69%); the cost of obtaining the test (61%); the time it takes to get tested (49%); concerns about bringing shame to the family (41%); and feeling uncomfortable about having blood drawn (27%). On average, participants endorsed 3.25 barriers out of a total of 6 assessed (*SD*=1.75).

### Predictors of Hepatitis B Serologic Testing

Bivariate relationships between sociodemographics, knowledge, beliefs, and barriers to serologic testing are displayed in Table 1. The following factors were significantly ( $P<.05$ ) associated with receipt of hepatitis B testing: higher education, having heard of hepatitis B, knowing that hepatitis B is more common among Koreans, and can be spread via toothbrushes, knowing hepatitis B spreads more easily than HIV, knowing that people who appear healthy can be infected and spread the virus, being aware that one can die of hepatitis B, being aware that hepatitis B can cause liver cancer, and having a physician recommendation to pursue testing. Age was significantly related to testing, but this relationship was non-linear. Individuals between the ages of 31 and 55 years were considerably more likely to be tested (75%), compared to younger (43%) or older (44%) individuals. We constructed two additive summary scores by combining the 10 items assessing knowledge and six items assessing barriers to testing. The knowledge score and the barrier score both significantly predicted serologic testing (Table 1).

Given the modest sample size in this study, we limited the number of variables that were entered into the logistic regression analysis. Among the demographic factors, we selected age, gender, education, and insurance status. This selection was made based on statistical significance in the bivariate analysis and conceptual considerations, mainly based upon the demonstrated importance of the variables (eg, insurance) in the



Table 1. Continued

	<i>n</i> (%)	% Tested	Significance
Hepatitis B spreads more easily than HIV			
Yes	64 (46%)	69%	<i>P</i> =.007
No	74 (54%)	46%	
Hepatitis B is more common among Koreans than Caucasians			
Yes	91 (66%)	64%	<i>P</i> =.017
No	47 (34%)	43%	
Hepatitis B patients can appear healthy and be contagious			
Yes	112 (81%)	61%	<i>P</i> =.039
No	26 (19%)	38%	
One can be infected for life with hepatitis B			
Yes	50 (36%)	62%	ns
No	88 (64%)	53%	
Hepatitis B can cause liver cancer			
Yes	103 (75%)	65%	<i>P</i> =.0005
No	35 (25%)	31%	
<b>Sum of Knowledge</b> (included 10 items above, range 0–9)			
Mean knowledge of tested = 6.9 ( <i>n</i> =79, <i>SD</i> =1.74)			<i>P</i> <.0001
<b>Perceived Severity</b>			
Believe a person can die from hepatitis B			
Yes	107 (79%)	63%	<i>P</i> =.0038
No	28 (21%)	32%	
<b>Perceived Efficacy of Hepatitis B Testing &amp; Vaccination</b>			
Vaccination and testing can prevent liver cancer			
Yes	86 (62%)	56%	ns
No	53 (38%)	58%	
<b>Perceived Susceptibility</b>			
Likely to get hepatitis B in lifetime			
Very likely	23 (19%)	65%	ns
Somewhat/Not likely	99 (81%)	60%	
Likely to get liver cancer in lifetime			
Very likely	13 (11%)	38%	<i>P</i> =.14
Somewhat/not likely	110 (89%)	61%	
<b>Barriers</b>			
<3 barriers endorsed	44 (33%)	73%	<i>P</i> =.017
≥3 or more barriers endorsed	90 (67%)	51%	
<b>Doctor Recommendation</b>			
Doctor recommended you get tested			
Yes	34 (25%)	76%	<i>P</i> =.008
No	103 (75%)	50%	
<b>Cultural Beliefs</b>			
Getting hepatitis B is a matter of karma or fate			
Agree	37 (27%)	54%	ns
Disagree	101 (73%)	57%	
People with hepatitis B are avoided by others			
Agree	52 (38%)	62%	ns
Disagree	85 (62%)	54%	

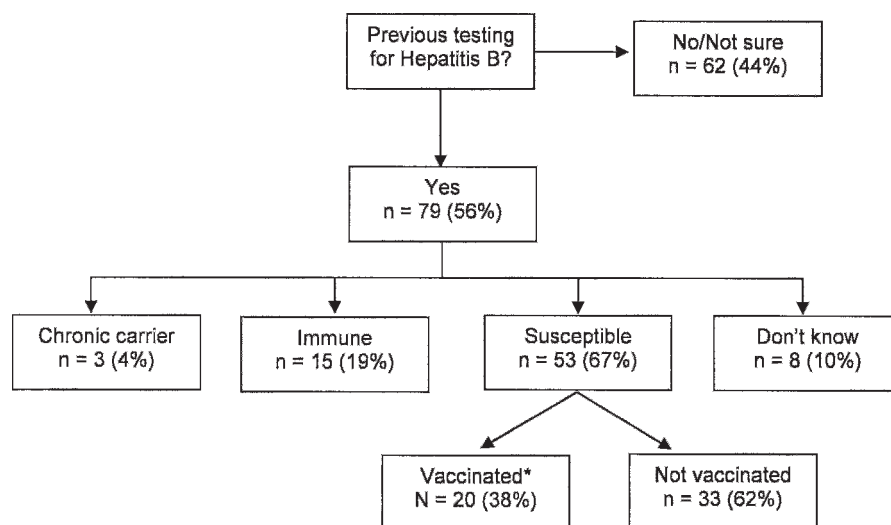
general literature on participation in health behaviors. We made the decision to exclude income due to its correlation with education (*P*=.08) and the fact

that income information was missing for a substantial portion of the sample (9% missing income vs 0% missing education). All nondemographic factors

that were significant in the bivariate analysis at *P*<.25 were included in a logistic regression analysis. Interview format was excluded from the model because of its strong correlation with recruitment site (100% of the group interviews were conducted at churches). The results of this regression appear in Table 2. Six factors emerged as independent predictors of receipt of serologic testing: being male, being between the ages of 31–55 years compared to being younger than 30 years, having health insurance, having received a recommendation from a physician to obtain screening, having been recruited from a church vs a health center, and having a higher level of knowledge regarding hepatitis B. Believing that one can die from hepatitis B was marginally significant at *P*<.07.

## DISCUSSION

This study is one of the first to focus on HBV and liver cancer prevention among Koreans living in the United States. Although previous studies have observed high rates of HBV infection among Koreans living in Korea and the United States, we were unable to find any published study that examined the rates of HBV testing in this high-risk population. The overall HBV serologic testing rate in our sample was 56%, which is within the range observed among other Asian subgroups. At the lower end, Taylor et al<sup>25</sup> reported a testing rate of 38% among Cambodian women in Seattle, and Thompson et al<sup>46</sup> reported a rate of 39% among Chinese Canadian women in Vancouver. More recently, Taylor et al<sup>27,28</sup> reported a serologic testing rate of 67% among Vietnamese males and females residing in the Seattle area. In general, the studies conducted a few years ago tend to report lower rates than more recent studies, reflecting a secular trend likely stimulated by more attention in the ethnic media regarding this disease.



\*Received all 3 recommended vaccination shots

Fig 2. Summary of hepatitis B testing and vaccination (N=141)

Another explanation may lie in the increase in the number of ethnically targeted HBV education and testing campaigns in areas with high concentrations of Asians. For example, the Jade Ribbon Campaign was initiated in 2001 by the Asian Liver Center at Stanford University to increase awareness of HBV and liver cancer among Asians. However, we are not aware of the occurrence of any efforts specifically targeting Koreans in the Los Angeles area during the time this study was conducted. Differences in the rates observed in these studies may also be

related to differences in sampling methods, socioeconomic factors, length of stay in the United States, and acculturation in the target populations.

In our study, approximately one quarter of those who received serologic testing reported that they were either chronic carriers or were immune as a result of a previous infection. Of those who remained susceptible to future infections, only 38% reported having been vaccinated. These findings are similar to those reported by others,<sup>24,25</sup> and argue for more attention to issues of adequate followup after screening.

*[In our study...] of those who remained susceptible to future infections, only 38% reported having been vaccinated.*

Our findings indicate that many constructs from our conceptual model, the Health Behavior Framework, were significant predictors of HBV serologic testing in our Korean sample. Among the demographic variables, age, gender, insurance status emerged as independent predictors of testing. The bivariate relationship between age and outcome is captured in Table 1, and indicates that participants in the middle age category (31–55 years) were much more likely to obtain serologic testing compared to younger or older individuals. Age also emerged as significant in the multivariate analysis, although only the comparison between the 31- to 55-year-olds vs the 18- to 30-year-olds achieved statistical significance. This observation may be related to the interaction of age with other variables such as gender, perceived susceptibility, or knowledge. Several studies conducted with other Asian subgroups have found age to be a significant predictor of HBV testing.<sup>25–26</sup> Men were significantly more likely to be screened compared to women. This finding is somewhat unexpected given that women tend to have higher rates of receipt of preventive procedures. A possible explanation is that men and their physicians may be quite aware that males are at higher risk for liver cancer compared to females.<sup>47</sup> Men are also more likely to be carriers of the virus and to engage in high-risk behaviors. Therefore, physicians may be more likely to recommend testing for Korean men (vs women), or Korean men may be more motivated to receive testing. In the multivariate analysis, being insured was negatively related to outcome, although bivariate data in-

Table 2. Logistic regression analysis predicting self-reported lifetime receipt of a hepatitis B serologic test

Variable	OR	95% CI	P value
Age 1 (age <31 vs age 31–55)	.19	.06–.65	P=.0078
Age 2 (age > 55 vs age 31–55)	.38	.11–1.35	ns
Male (vs female)	3.83	1.34–10.94	P=.0122
Insured (vs uninsured)	.21	.06–.78	P=.0194
Some college (less than high school degree)	2.09	.69–6.31	ns
Doctor recommended testing (vs none received)	3.07	.99–9.50	P=.0523
Believed one can die from hepatitis B (vs did not believe)	3.92	.87–17.70	P=.0754
Somewhat/not likely to get liver cancer (vs very)	3.25	.57–18.66	ns
≥3 barriers (vs <3)	.75	.27–2.09	ns
Recruitment at clinic (vs church)	.21	.06–.75	P=.0162
Knowledge score	1.50	1.06–2.12	P=.0205

icate a positive relationship. This contradictory finding suggests confounding or interactions with other variables in the regression, making it unwise to interpret the regression coefficient. Given the modest sample size in this study, we could not include interaction terms in the regression analyses performed.

Although receipt of preventive care procedures is often higher in clinical vs nonclinical settings, we found the reverse to be true in our study. Participants recruited from the primary care clinic had a significantly lower rate of screening than did those recruited from the churches. A possible explanation is related to differences in participation rates and participant characteristics in the two types of settings. In the clinic, participants were recruited in waiting rooms and interviewed on site. Very few potential subjects approached refused to participate in the study through this strategy. To accommodate the organizational structure of churches, announcements about the study were made to large groups of potential participants during church services and meetings, and we were only able to collect data from individuals who chose to actively approach us about study participation. Therefore, the church sample may have included more individuals interested in the topic of hepatitis B than the clinic sample. Other explanations for the differences in the rates observed between the clinic and church samples include more co-morbid conditions among clinic participants or potential differences in socioeconomic factors between the two groups. Providing some support for this notion we found that subjects recruited from churches had higher incomes and were more fluent in English than subjects recruited from the primary care clinic.

In general, knowledge regarding hepatitis B was fairly high; participants correctly answered an average of 6 of the 10 knowledge items assessed. Although 85% of respondents had heard of

hepatitis B, significant knowledge gaps were observed. For example, a third of the sample was unaware that Koreans are at higher risk of developing hepatitis B than Caucasians, or that HBV could be spread via sexual intercourse. Most did not know that one could be infected for life, and more than half the sample did not know that HBV could be spread more easily than HIV. Knowledge emerged as a significant positive predictor of testing in bivariate and multivariate analyses. Our findings are similar to the few published hepatitis B studies conducted among Asians that have found knowledge to be a significant predictor of testing.<sup>26,46</sup> Fear of a bad diagnosis was the most commonly reported barrier (75%), followed by concerns about burdening ones family (69%) and cost (61%). Although the barriers score was bivariate related to outcome, it did not emerge as significant in the multivariate analysis. Several health beliefs emerged as influences on testing receipt. Believing that one can die of hepatitis B was associated with testing receipt in bivariate analyses and remained marginally significant as an independent predictor in multivariate analyses. Perceived likelihood of developing liver cancer was inversely related to testing receipt in the bivariate analysis. Individuals who perceived themselves to be very likely to develop liver cancer were actually less likely to be screened compared to individuals who perceived themselves to be somewhat or not likely to develop liver cancer. One explanation for this finding is that individuals who believe they are more likely to develop liver cancer may feel helpless to prevent it and less motivated to pursue testing. This finding may reflect a fatalistic attitude related to one's health that has been observed among Koreans and other ethnic minority populations in previous studies.<sup>48-52</sup> Fatalism regarding hepatitis B was assessed more directly in this study by asking participants if they agreed with the statement, "Getting hepatitis B

is a matter of karma or fate." However, when measured in this manner, fatalism did not emerge as a significant predictor of HBV testing. Another explanation is that given the cross-sectional nature of the data, testing status may have affected perceptions of risk. Subjects who had not received testing may have perceived themselves to be more likely to develop liver cancer, especially since they may have become more aware of the link between liver cancer and HBV as a result of study participation. A recent study conducted by Brewer et al<sup>53</sup> provides support for this risk appraisal hypothesis, finding that individuals vaccinated for Lyme disease perceived themselves to be less at risk for future infection than those who had not been vaccinated.

Although only a quarter of the sample reported that they had received a recommendation from a physician for HBV screening, this factor was a strong predictor of testing. This low rate of physician recommendation is a cause for concern given the high prevalence of HBV infection among Korean Americans and the seriousness of liver cancer. Although not statistically significant, the rate of physician recommendation tended to be higher among subjects recruited from the primary care clinic (38%) as compared to those recruited from churches (19%). Previous studies conducted with other high-risk Asian groups have found similarly low rates of physician recommendation regarding testing. Recent studies by Taylor et al found that only 33% of a sample of Vietnamese American men<sup>26</sup> and 44% of a sample of Vietnamese American women<sup>28</sup> had received a physician recommendation to be tested.

Several limitations of the present study should be considered including the cross-sectional design and the modest sample size, which limit the conclusions that can be drawn. Our results may not generalize to all Korean Americans living in Los Angeles or other parts of the country. Another limitation is our reliance on self-

reported serologic testing receipt as our main outcome, although this is a common weakness of studies conducted within community settings where accessing medical records is not feasible. The use of multiple methods to collect data, including individual interviews, self-administered questionnaires and mixed-mode interviews in a group setting, could also be considered a limitation. Some differences observed between sites (clinic vs church) could be due to differences in the methods used to collect the data. However, given that this is a pilot study, use of multiple methods provided useful information about the plausibility of using such methods in future research. Using multiple methods also allowed us to gather data from a broader sample than generally possible in a small-budget pilot project.

Overall, the results of this study suggest that a significant portion of Korean Americans likely have not received HBV serologic testing and as a consequence do not know their HBV status. This finding is of great concern given the high prevalence of HBV infection among Korean Americans and its link to liver cancer and other serious medical complications. The fact that only 25% of our sample had received a physician recommendation for testing is also very troubling. Although most study participants had heard of hepatitis B, significant gaps in knowledge about the virus and its sequelae were observed. Intervention research is urgently needed to increase HBV awareness and testing among Korean American adults with subsequent vaccination and followup as indicated. Patient-targeted and physician-targeted interventions both have the potential to significantly contribute to the prevention and control of HBV and liver cancer among Koreans.

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