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ORIGINAL PAPER

The Jade Ribbon Campaign: A Model Program for Community Outreach and Education to Prevent Liver Cancer in Asian Americans

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Abstract The Jade Ribbon Campaign (JRC) is a culturally targeted, community-based outreach program to promote the prevention, early detection, and management of chronic hepatitis B virus (HBV) infection and liver cancer among Asian Americans. In 2001, 476 Chinese American adults from the San Francisco Bay Area attended an HBV screening clinic and educational seminar. The prevalence of chronic HBV infection was 13%; only 8% of participants showed serologic evidence of protective antibody from prior vaccination. Participants reported low preventive action before the clinic, but after one year, 67% of those with chronic HBV infection had consulted a physician for liver cancer screening, and 78% of all participants had encouraged family members to be tested for HBV. The increase in HBV awareness, screening, and physician follow-up suggests that culturally aligned interventions similar to the JRC may help reduce the disproportionate burden of disease to chronic HBV infection among Asian Americans.

Keywords Education · Hepatitis B virus · Liver cancer · Asian Americans · Chinese Americans · Screening · Prevention

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Introduction

Asian Americans are proportionally the fastest growing racial group in the US [1], and the majority are immigrants from eastern or southeastern Asia [2]—areas with a high prevalence of chronic hepatitis B virus (HBV) infection and, consequently, high incidence of liver cancer [3]. In these regions, the prevalence of chronic HBV infection is over 10%, whereas it is below 0.5% in the overall US [4, 5]. HBV infection is etiologically associated with the majority of liver cancer worldwide [6]. In the US, the incidence rate of liver cancer among Asian/Pacific Islander Americans is over three times that among non-Hispanic White Americans [7]. Of the most common cancers among Asian men in California, liver cancer is ranked second among Cambodian, Laotian, and Vietnamese, fourth in Chinese, and fifth in Filipino and Korean Americans [8]. Likewise, liver cancer is one of the top 10 cancers among Cambodian, Chinese, Japanese, Korean, Laotian, and Vietnamese women in California [8, 9]. In contrast, liver cancer ranks below the top 15 cancers among non-Hispanic White men and women [7].

Despite the major public health impact of liver disease, Asian American communities have low levels of awareness, knowledge, and preventive actions regarding

HBV and liver cancer [10–19]. Although significant progress has been made in infant and childhood immunization against HBV, catch-up vaccinations are not effectively implemented and adult vaccination remains unaddressed [20–23]. Furthermore, there are no official guidelines for health providers to routinely screen all Asian Americans for HBV infection, even though it is known that Asian Americans have a high prevalence of chronic HBV infection [23]. Because liver cancer is often asymptomatic until late in the disease process, many cases of liver cancer are diagnosed at an advanced stage when potential treatment options are limited [5, 24]. However, early detection of chronic HBV infection allows for treatment using effective antiviral therapies to decrease the risk of progression to cirrhosis and liver cancer [25]. HBV screening also enables identification and vaccination of unprotected individuals, which is particularly important for close contacts of chronic carriers [26]. Therefore, HBV screening of Asian American adults could potentially result in a substantial reduction in liver cancer incidence and mortality in this population [24].

In 2001, the Jade Ribbon Campaign (JRC) was implemented as a culturally targeted, educational outreach campaign, emphasizing prevention of and screening for HBV as important means of liver cancer prevention. The campaign initially targeted the Chinese American community in the San Francisco Bay Area, the area with the highest density of Asian Americans in the continental US and a Chinese American population of approximately 500,000 (over 10% of the total population and 39% of the Asian population) [27]. The campaign uses a mass-media campaign combined with local community-based outreach to provide information sensitive to cultural practices and appropriate to the transmission, disease course, and treatment of HBV and liver cancer in Asian American populations. Prior to the JRC, conventional sources of health information did not specifically address the Asian American public.

During the campaign, we organized a 1-day HBV screening clinic for Chinese Americans in the San Francisco Bay Area. The aims of this study were as follows: (1) to assess the prevalence of chronic HBV infection in a convenience sample of San Francisco Bay Area Chinese Americans; (2) to disseminate culturally targeted information on HBV infection, screening, medical surveillance, and prevention; and (3) to determine whether this approach was associated with improved health-seeking behaviors, including HBV prevention and clinical management.

Methods

Screening and Informational Clinic

In July 2001, the JRC held a 1-day, 5-h clinic that included free HBV screening and educational seminars. Participant recruitment for the free HBV screening was through public service announcements placed in two local Chinese-language newspapers. A total of 486 adults who participated in this clinic were screened at no charge for the HBV surface antigen (HBsAg), which indicates the presence of chronic HBV infection. Among the participants, 195 chose to pay an additional 36 dollars for the entire HBV panel, including HBV surface antibody (HBsAb) and HBV core antibody—total (HBcAb). These markers indicate evidence of immunity against HBV and past infection with HBV, respectively. The clinic was coordinated by undergraduate staff and interns, and blood samples were drawn by trained phlebotomists. Serological testing was performed by the Stanford Hospital Clinical Laboratories. Of the 486 people tested for HBsAg, 10 had insufficient samples for analysis and were excluded from this analysis.

At clinic registration, participants filled out informed consent forms and an initial 15-item questionnaire asking about demographic characteristics, family history of HBV infection, and prior history of HBV diagnosis and vaccination. Participants were also asked to provide their telephone number.

Continuous physician-led seminars were held concurrently in Mandarin and English to provide comprehensive, targeted information regarding HBV and liver cancer detection, management, and prevention. JRC informational brochures about the risks of HBV were also distributed in Chinese (traditional and simplified) and English translations. These brochures were ethnically and culturally targeted to address disease incidence and progression in Asian Americans, and listed specific screening and treatment recommendations for patients to discuss with their physicians.

Approximately 4 weeks after the screening, participants received the written results of their serological test in the mail, accompanied by a detailed interpretation letter. Specific recommendations for follow-up health actions were made based on the following four groups of test results: those who tested HBsAg-positive, i.e., chronic HBV carriers; those who tested HBsAg-negative and did not have additional blood tests, i.e., non-carriers; those who tested negative for HBsAg but positive for HBsAb, i.e., immune individuals; and participants who tested negative for both

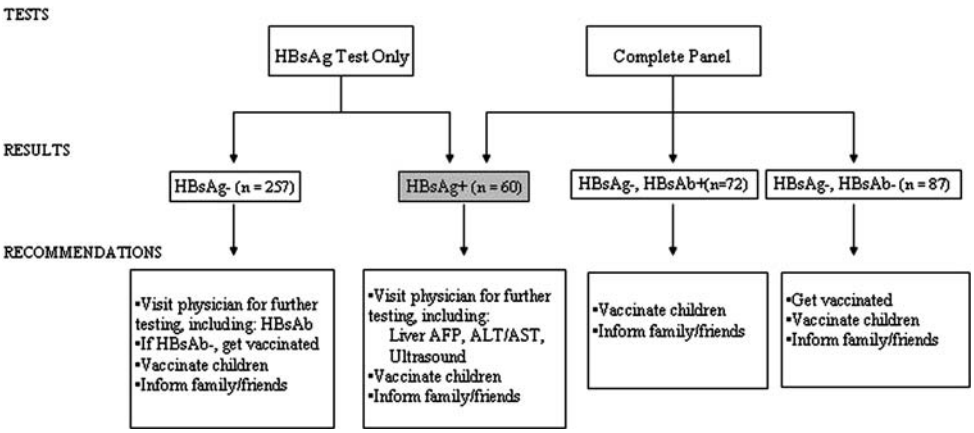

Fig. 1 Flowchart of follow-up recommendations by serological status. Study groups and recommendations based on tests done and serological results. Those who elected for the complete serological testing panel were tested for the presence of hepatitis B surface antigen (HBsAg), surface antibody (HBsAb), and core antibody (HBcAb). ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, AFP: Alpha-fetoprotein

HBsAg and HBsAb, i.e., susceptible individuals (Fig. 1). The aim of such tailored recommendations was to enhance compliance by providing immediately actionable health information, and decreasing confusion resulting from generic form letters with inappropriate recommendations.

Participant Follow-up and Data Analysis

About 1 year after the screening, participants were called and asked to complete a short follow-up interview. Up to five attempts were made to contact participants using the telephone number provided at the screening clinic. Of the 476 participants who were screened for HBV, 309 (65%) completed the follow-up interview. Of the 167 participants who were not interviewed, 9% (n = 15) declined to participate; 57% (n = 96) could not be reached by telephone after five attempts; 32% (n = 54) had moved or had their phone line disconnected; one was deceased and one was incapacitated. Participation in the interview did not differ significantly by HBV serological status (P = .32), sex (P = .48), or country of birth (P = .16), but was more common in those aged 40 years or above (70%) than in those younger (57%; P = .005).

The telephone interviews were conducted in participants' preferred language (Mandarin, Cantonese, or English). Participants completed one of four survey variants based on their serological test results. Participants were asked about whether or not they followed the specific recommendations detailed in their results letters, barriers to follow-up care, primary sources of information about HBV, and sociodemographic information. All surveys were conducted with the approval of the institutional review board of the Stanford University School of Medicine and conducted after verbal informed consent was obtained.

Chi-square tests were used to evaluate differences in characteristics among groups according to HBV serological status. Multivariate logistic regression was performed to estimate relative risks (approximated by odds ratios [OR]), with corresponding 95% confidence intervals (CI), for associations with HBV chronic carrier status or vaccination behaviors. Estimates of association were adjusted for age (in 10-year categories, from <30 to 70+ years), sex, and country of birth (China, Taiwan, elsewhere in Asia [Hong Kong, Cambodia, Vietnam, Burma, Korea, Laos, Indonesia, or Malaysia], or US), with indicator variables for missing values. Statistical analyses were performed using SAS v.9.1 (Cary, NC).

Results

Serological Status

Among 476 samples tested, 13% were HBsAg-positive, reflecting chronic HBV infection (Table 1). A total of 18% of men versus 7% of women were chronically infected (adjusted RR = 3.0, 95% CI: 1.6–5.6). Among women who were chronically infected, 73% were of general reproductive age (18–49 years old). Participants who reported a family history of HBV infection were more likely to be chronically infected with HBV than those who did not have or were not aware of such a family history (adjusted RR = 2.0, 95% CI: 1.1–3.9).

Among the 195 participants who elected to be screened with the complete HBV panel (HBsAg, HBcAb, and HBsAb), 18% tested positive for HBsAg (Table 2). About 30% were immune due to natural infection and 7% were immune due to vaccination, while 45% remained susceptible to HBV infection. Participants who paid for the full HBV screening panel were significantly less likely to have been born in China than participants who received only the free HBsAg test (40% vs. 54%, P = .001), but did not differ significantly by age group or sex (data not shown). Those who received the full HBV panel were significantly more likely to be chronically infected with HBV, compared

Table 1 Characteristics of study participants at time of screening, by serological status

Characteristic	Hepatitis B virus antigen/antibody test result										
	Chronically infected (HBsAg+)		Non-infected (HBsAg-)[a]		Immune (HBsAg-, HBsAb+)		Susceptible (HBsAg-, HBsAb-)		*P*-value*	Total	
	N	(%)	*N*	(%)	*N*	(%)	*N*	(%)		*N*	(%)
Overall	60		257		72		87			476[b]	
Age (years)											
<30	8	(13)	32	(12)	8	(11)	15	(17)		63	(13)
30–39	19	(32)	64	(25)	13	(18)	17	(20)		113	(24)
40–49	11	(18)	62	(24)	17	(24)	25	(29)		115	(24)
50–59	11	(18)	43	(17)	21	(29)	19	(22)		94	(20)
60–69	7	(12)	39	(15)	10	(14)	6	(7)		62	(13)
70+	4	(7)	17	(7)	3	(4)	5	(6)	0.44	29	(6)
Sex											
Men	39	(65)	106	(41)	35	(49)	35	(40)		215	(45)
Women	15	(25)	129	(50)	32	(44)	45	(52)	0.002	221	(46)
Not reported	6	(10)	22	(9)	5	(7)	7	(8)		40	(8)
Country of birth											
China	26	(43)	141	(55)	26	(36)	37	(43)		230	(48)
Taiwan	25	(42)	77	(30)	31	(43)	36	(41)		169	(36)
Hong Kong	3	(5)	17	(7)	1	(1)	7	(8)		28	(6)
Other Asian country	6	(10)	5	(2)	9	(13)	4	(5)		22	(5)
United States	0	(0)	5	(2)	2	(3)	2	(2)	0.003	9	(2)
Not reported	2	(3)	12	(5)	3	(4)	1	(1)		18	(4)
Family history of HBV											
Yes	18	(30)	47	(18)	11	(15)	12	(14)	0.07	88	(18)

HBsAg: Hepatitis B surface antigen, HBsAb: Hepatitis B surface antibody, HBcAb: Hepatitis B core antibody

* *P*-value for χ^2 test of differences by serological status (excluding missing values)

[a] HBsAb and HBcAb not tested in this group

[b] Excludes 10 participants with insufficient samples for analysis

with those who were tested for HBsAg alone (adjusted RR = 2.5, 95% CI: 1.4–4.4).

Among those who received the full HBV panel, serologic evidence of past HBV infection (HBcAb+) was detected in 19% of participants below age 30 years, increased to 65% among participants ages 40–49 years, and 69% among those ages 60 years and above (Table 2). For each 10-year increase in age above 18–29 years, the adjusted RR of previous HBV infection was 1.7 (95% CI: 1.3–2.2).

Self-reporting of Chronic HBV Infection and Vaccination

Among the 56 participants who reported a prior diagnosis of chronic HBV infection, 57% (n = 32) had a positive blood test for HBsAg. Of those who reported having been vaccinated against HBV and who were tested for the complete HBV panel (n = 18), only 50% had serological evidence of antibody against HBV. Among 271 respondents with children, 44% reported that their children had received the HBV vaccine. Vaccinated adults were more likely to report that their children were vaccinated (n = 15/22, 68%) than were unvaccinated adults (n = 95/236, 40%) (adjusted RR = 1.9, 95% CI: .7–5.3).

Follow-up Telephone Interview

Of the 309 participants who completed the 1-year follow-up interview, the great majority (92%) preferred to speak Chinese at home, but most (70%) reported also being proficient or fluent in English (Table 3). The majority had completed college or an advanced degree, had medical insurance, and saw a physician on a regular basis (Table 3).

Table 2 Characteristics of study participants at time of screening for full hepatitis B virus panel, by serological status

Characteristic	Hepatitis B virus antigen/antibody test result										
	Chronically infected (HBsAg+)		Immune by infection (HBcAb+, HBsAb+)		Immune by vaccination (HbcAb–, HBsAb+)		Susceptible (HBsAg–, HBcAb–, HBsAb–)		*P*-value*	Total	
	N	(%)	*N*	(%)	*N*	(%)	*N*	(%)		*N*	(%)
Overall	36		59		13		87			195	
Age (years)											
<40	15	(42)	14	(24)	7	(54)	32	(37)		68	(35)
40–49	9	(25)	13	(22)	4	(31)	25	(29)		51	(26)
50–59	7	(19)	20	(34)	1	(8)	19	(22)		47	(24)
60+	5	(14)	12	(20)	1	(8)	11	(13)	0.28	29	(15)
Sex											
Men	24	(67)	30	(51)	5	(38)	35	(40)		94	(48)
Women	11	(31)	25	(42)	7	(54)	45	(52)	0.08	88	(45)
Not reported	1	(3)	4	(7)	1	(8)	7	(8)		13	(7)
Country of birth											
China	15	(42)	21	(36)	5	(38)	37	(43)		78	(40)
Taiwan	15	(42)	26	(44)	5	(38)	36	(41)		82	(42)
Hong Kong	1	(3)	0	(0)	1	(8)	7	(8)		9	(5)
Other Asian country	4	(11)	9	(15)	0	(0)	4	(5)		17	(9)
United States	0	(0)	0	(0)	2	(15)	2	(2)	0.01	4	(2)
Not reported	1	(3)	3	(5)	0	(0)	1	(1)		5	(3)
Family history of HBV											
Yes	14	(39)	7	(12)	4	(31)	12	(14)	0.003	37	(19)

HBsAg: Hepatitis B surface antigen, HBsAb: Hepatitis B surface antibody, HBcAb: Hepatitis B core antibody

* *P*-value for χ^2 test of differences by serological status (excluding missing values)

Compliance with Recommendations

Visit a Physician

All participants were given specific recommendations in their result letters to visit their physicians for appropriate further follow-up (Fig. 1). Among the chronic HBV carriers, 26 out of 39 (67%) went to see their physician. Of these, the majority reported receiving a liver ultrasound or a test for alanine aminotransferase/aspartate aminotransferase (ALT/AST) or alpha-fetoprotein (AFP), and one-third reported being vaccinated against hepatitis A (Table 3). The majority of these subjects reported normal results for ultrasound, ALT/AST, or AFP (95, 80, and 88%, respectively). One participant was placed on the liver transplant waiting list. Of the 13 participants who tested positive for HBsAg but had not seen their physician, three said they planned to go soon, five said they did not know or did not feel it was necessary, two did not have a doctor, two did not have time, and one reported that his doctor said it was not necessary. Among individuals who tested negative for HBsAg, 30% visited their physicians to receive further testing, and 19 subsequently received the HBV vaccine. Of those who showed no evidence of chronic infection or immunity, 25% visited their physician and received the HBV vaccine.

Tell Family and Friends to Get Tested

Since HBV can be transmitted through close contact with infected individuals, participants in all four serological groups were advised to tell their family and friends to be screened for HBV. The majority of participants interviewed (78%) urged their family members to be tested for HBV (Table 3). Of these, 17% reported that a family member or members tested positive for chronic HBV infection. The most common family member to test HBV positive was a sibling (60%), followed by a parent (20%) and a child (20%).

Table 3 Results of telephone follow-up interviews 1 year after screening, by serological status

Characteristic/Preventive action	Hepatitis B antigen/antibody test result										
	Chronically infected (sAg+)		Non-infected (sAg–)[a]		Immune (sAg–, sAb+)		Susceptible (sAg-, sAb-)		*P*-value*	Total	
	N	(%)	*N*	(%)	*N*	(%)	*N*	(%)		*N*	(%)
Overall (% of those screened)	39	(65)	158	(61)	51	(71)	61	(70)		309	(65)
Sociodemographics											
Primary language spoken at home											
Chinese	32	(82)	149	(94)	49	(96)	54	(89)		284	(92)
English	2	(5)	9	(6)	2	(4)	4	(7)		17	(6)
Other	0	(0)	0	(0)	0	(0)	3	(5)	0.05	3	(1)
Not reported	5	(13)	0	(0)	0	(0)	0	(0)		5	(2)
English fluency											
Fluent	11	(28)	59	(37)	16	(31)	33	(54)		119	(39)
Proficient	15	(38)	61	(39)	12	(24)	10	(16)		98	(32)
Some	4	(10)	31	(20)	22	(43)	14	(23)		71	(23)
None at all	3	(8)	7	(4)	1	(2)	2	(3)	<0.001	13	(4)
Not reported	6	(15)	0	(0)	0	(0)	2	(3)		8	(3)
Level of education											
High school or less	6	(15)	30	(19)	11	(22)	13	(21)		60	(19)
College	14	(36)	78	(49)	25	(49)	23	(38)		140	(45)
Advanced degree	17	(44)	50	(32)	15	(29)	23	(38)	0.13	105	(34)
Not reported	2	(5)	0	(0)	0	(0)	2	(3)		4	(1)
Insurance											
Yes	36	(92)	133	(84)	42	(82)	54	(89)		265	(86)
No	3	(8)	24	(15)	9	(18)	7	(11)	0.49	43	(14)
Not reported	0	(0)	1	(1)	0	(0)	0	(0)		1	(0)
Regular physician											
Yes	32	(82)	112	(71)	36	(71)	49	(80)		229	(74)
No	7	(18)	46	(29)	15	(29)	12	(20)	0.30	80	(26)
Recommendation compliance											
Visited physician for further testing	NA	47	(30)	NA	NA						
HBsAb-negative on further testing[b]	NA	28	(60)	NA	NA						
Obtained hepatitis B vaccine for self[c]	NA	19	(68)	NA	15	(25)					
Had liver cancer screening	26	(67)	NA		NA		NA				
Received ALT/AST test[d]	20	(77)	NA		NA		NA				
Received AFP test[d]	17	(65)	NA		NA		NA				
Received ultrasound test[d]	20	(77)	NA		NA		NA				
Received hepatitis A vaccine[d]	7	(27)	NA		NA		NA				

Table 3 continued

Characteristic/Preventive action	Hepatitis B antigen/antibody test result										
	Chronically infected (sAg+)		Non-infected (sAg–)[a]		Immune (sAg–, sAb+)		Susceptible (sAg-, sAb-)		*P*-value*	Total	
	N	(%)	*N*	(%)	*N*	(%)	*N*	(%)		*N*	(%)
Advised family/friends to get tested	29	(74)	126	(80)	40	(78)	46	(75)	0.91	241	(78)
Family/friends tested positive[e]	5	(17)	27	(21)	4	(10)	4	(9)	0.15	40	(17)
Had children vaccinated after clinic[f]	2	(7)	15	(12)	6	(14)	5	(12)	0.80	28	(12)

HBsAg: Hepatitis B surface antigen, HBsAb: Hepatitis B surface antibody, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, AFP: Alpha-fetoprotein, NA: Not applicable

* *P*-value for χ^2 test of differences by serological status (excluding missing values)

[a] HBsAb and HBcAb not tested in this group

[b] HBsAb testing done at follow-up with own provider, among non-infected participants who visited a physician to determine antibody status

[c] Among participants who tested HBsAg-negative and HBsAb-negative

[d] Among participants who underwent liver cancer screening

[e] Among participants who advised family/friends to get tested

[f] Among participants with children

Get Children Vaccinated

Participants in all four serological groups were given a recommendation in their result letters to vaccinate their children against HBV. Among participants with children 12% reported vaccinating their children against HBV after the screening clinic.

Role of Jade Ribbon Campaign in Mobilizing HBV Prevention Practices

Among participants who completed the follow-up interview, 45% reported that their first exposure to information about HBV was through the JRC. About 71% reported that they had never discussed HBV with their doctor before the campaign; this included 50% of the participants found to be chronically infected. About 75% reported that they attended the clinic and screening as a direct result of JRC media campaign; 48% reported that they would not have been tested for HBV without the free screening clinic.

Discussion

Our study examined the prevalence of chronic HBV infection in a sample of Chinese Americans in the San Francisco Bay Area, and evaluated the compliance of screened subjects with targeted, culturally appropriate recommendations for further medical surveillance, vaccination, and family notification. We found that 13% of participants demonstrated serologic evidence of chronic HBV infection, which is consistent with globally reported prevalences, ranging from 10% to 15%, among ethnic Chinese [3, 4, 28, 29]. The higher prevalence in men than women is in line with previous findings [29, 30], as is the rising prevalence of HBcAb seropositivity with increasing age [13, 31, 32].

Notably, two-thirds of participants found to be chronically infected with HBV followed our recommendation to visit a physician for liver cancer screening, and one individual was placed on the liver transplant waiting list. These results demonstrate that HBV serological screening, when supplemented with tailored recommendations for clinical follow-up, can lead patients to seek appropriate medical management of chronic HBV infection and liver cancer [24, 33]. Proper monitoring and treatment of chronic HBV infection are necessary in order to reduce the one-in-four probability of death from liver disease among those with undetected chronic infection [34].

Although most chronically infected adults complied with our recommendation to visit a physician, poor communication with physicians may explain why most individuals reported completing only one of six recommended follow-up actions. As most participants took the first step to visit a physician, the failure to follow the remaining recommendations may be due, at least in part, to barriers at the physician's level. Such impediments to HBV management may be attributed to several factors. Historically, there has been a lack of professional consensus regarding the proper management of chronic HBV and screening for liver cancer, and universally accepted guidelines for both issues have yet to be established [33, 35, 36]. Nevertheless, two consensus conferences have recommended liver cancer screening in high-risk patients using alpha-fetoprotein and ultrasound [37, 38]. Additionally, we have found that many providers lack awareness of the disproportionate burden of chronic HBV infection and liver cancer, and how to manage these diseases, in Asian Americans (So, unpublished data). Thus, effective management of HBV will require augmented and sustained dialogue among healthcare providers to increase knowledge and create an acceptable standard of care.

Of those who reported prior vaccination against HBV, only half demonstrated serologic evidence of vaccination, illustrating a lack of knowledge regarding the respondents' own health status. Likewise, almost half of participants who reported a prior diagnosis of chronic HBV infection tested negative for HBsAg. These inconsistencies may also be due to miscommunication between physicians and their patients, as well as confusion between HBV and hepatitis A virus. Although all newborns in the US have been vaccinated since 1991 [26], and vaccination of all school-age children has been required in California since 1999 [39], the fact that some parents reported not having had their children vaccinated reveals either noncompliance with this law, incomplete vaccination of children born outside the US or older than school-age, or a lack of communication between physicians and parents about what vaccines their children had received.

The large proportion of respondents who reported first learning about HBV, getting screened for HBV, and discussing HBV with their doctors as a result of the JRC demonstrates the lack of general knowledge and patient-provider communication about HBV in this population, while also highlighting the need for a culturally targeted approach to increase HBV awareness, screening, and medical care. Exploration of patient beliefs and patient-provider barriers among Asian Americans may be informative about the reasons for the initially low level of HBV awareness, as well as how to overcome it. The direct impact of our health clinic was the screening and education of nearly 500 people during a 5-h event, resulting in increased awareness, vaccination, and communication with physicians. Indirectly, the clinic also promoted HBV screening, vaccination, and education among family members due to word-of-mouth spread

by participants. The sustainability of the JRC approach is demonstrated by the continuance of the campaign to this day: we have now performed HBV testing and education in over 4,000 Asian American adults in the San Francisco Bay Area [30]. In addition, the reproducibility of our screening and education model is evidenced by the expansion of the JRC throughout the US and Asia, including San Diego, Orange County, Los Angeles, Arizona, New York, Hawaii, China, and the Philippines [40].

Limitations of the study, nevertheless, are worthy of mention. First, due to the public service nature of the screening clinic, there was no randomization of participants to a non-intervention group to assess the effectiveness of event activities. However, the lack of awareness and inaction reported by study participants prior to attending the JRC event compared with post-event actions attest that the intervention did increase HBV awareness and preventive action. Second, compliance with recommended follow-up actions was assessed only by self-report, which is subject to error, and was not verified by review of medical records. The importance of validation through medical records is underscored by our finding of inconsistencies between self-reported and serologically detected infection and vaccination status. Third, most participants were well educated, the majority having a college or advanced degree, and nearly all were born in Asia. In the 2000 US Census, 50% of adult Chinese males and 40% of adult Chinese females in the San Francisco Bay Area reported having received a bachelor's or higher-level degree, and they were less likely to be foreign-born (68%) than our study population [41]. However, compared with study participants, Bay Area Chinese adults had a similar percentages of males (49%) and individuals who spoke English very well or well (69%) [41]. The high level of education and immigrant status among participants in our clinic reflects the fact that they were not a random cross-sectional sample of the Chinese American population, but rather were a convenience sample of volunteers, not a cross-section of the general population. Finally, Asian Americans are a heterogeneous population, and in many ways Chinese Americans are not representative of other Asian ethnic subgroups. The compliance with follow-up recommendations may vary by level of education, nativity, and ethnicity; therefore, interventions targeting less well educated, US-born, and other Asian American populations may need to adjust promotional and informational materials accordingly.

In summary, our study demonstrates that the prevalence of chronic HBV infection is high among ethnic Chinese in the US, and offers a community-based approach to address this critical health issue. The majority of individuals followed our recommendations, which included getting vaccinated if they were susceptible, visiting a physician for liver cancer screening if they were chronically infected, and, in general, advising their family and friends to get tested. Based on our findings that serological testing, education, and provision of tailored recommendations can promote clinical follow-up among chronically infected individuals, we advocate that future guidelines for HBV screening and management should include recommendations for screening of all Asian American adults. In addition, because the majority of clinic participants reported never having discussed HBV with a physician, and most chronically infected individuals did not undergo comprehensive screening for liver cancer, there is a concomitant need to improve physicians' knowledge, communication with patients, and consensus about HBV and liver cancer management in the Asian American community. We submit that the JRC approach of integrating mass media with local outreach is a useful, reproducible, and sustainable model for improving disease detection, awareness, and prevention.

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