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Social Determinants of Health Associated with HBV Testing and Access to Care among Foreign-born Persons Residing in the United States: 2009 – 2012

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ABSTRACT

Objectives: To describe how select Social Determinants of Health (SDH) are associated with the burden of hepatitis B virus (HBV) infection among foreign-born persons residing in the United States.

Methods*:* Multivariate logistic regression was used to examine the Racial and Ethnic Approaches to Community Health (REACH) 2010 Risk Factor Survey data to investigate the independent relationship between SDH and HBV testing and access to care.

Results: HBV infected persons with insurance were more likely to see a physician than those without. Respondents worried about money to pay rent or mortgage were more likely to report HBV infection than individuals who reported they never worry. Compared to English speakers, Spanish-speakers were less likely to report HBV infection, Vietnamese-speakers were more likely to see a physician for HBV infection, and Khmer-speakers were less likely to be tested.

Conclusions: Health insurance coverage, worries about paying rent, and language of interview all differentially affect HBV testing and linkages to care among foreign–born persons. Multi-sectorial stakeholder collaborative efforts should integrate resources to provide culturally sensitive health promotion campaigns which may improve HBV related outcomes.

Keywords: Hepatitis B; foreign-born populations; Social Determinants of Health; health disparities; health inequity; immigrants

INTRODUCTION

Hepatitis B virus (HBV) infection is a significant public health problem and as such, testing and access to care are important. HBV is transmitted by exposure to infectious blood or body fluids (CDC, 2005; CDC, 2006; CDC, 2008). Worldwide, chronic HBV infection affects approximately 350 million persons (Sheiham, 2009) and contributes to over 600,000 deaths each

year (Goldstein et al., 2005; Ott, Stevens, Groeger, & Wiersma, 2012). In the United States (U.S.) about 850,000 – 2.2 million persons are estimated to have chronic HBV infection (Roberts et al., 2016; Kowdley et al., 2012). Moreover, about 2000-4000 persons die annually of HBV related complications, such as cirrhosis, liver failure, and HBV cancer (Vogt, Wise, Shih, & Williams, 2007).

The Centers for Disease Control and Prevention (CDC) and U.S. Preventive Services Task Force (USPSTF) both recommend testing for foreign-born persons from countries of high HBV infection prevalence (≥ 2%). Early testing could lead to vaccination for sero-negatives or treatment for sero-positives to prevent secondary transmission to others. However, approximately two-thirds of the overall U.S. population is unaware of their HBV infection status and foreign-born U.S. residents (FB) share a greater burden of HBV infection compared to native born residents (CDC, 2008).

Studies suggest that Social Determinants of Health (SDH), such as barriers to testing, lack of access to medical care, cultural factors, country of origin, and other social and ecological factors may play a role in the burden of HBV infection among foreign-born U.S. residents (Hu et al., 2013; Vijayadeva et al., 2014) SDH are defined as the complex, integrated, and overlapping social structures and political and economic systems that influence the health of an individual (CDC, 2010; Tarlov, 1999). Knowledge of the determinants that promote disparities in HBV testing and access to care may better inform the development of strategies to address these issues. This exploratory study will identify: what are the select SDH factors associated with HBV testing and access to care in foreign-born U.S. residents?

METHODS

Description of the Data Set / Sample Design / Sample Selection

Data were drawn from the CDC Racial and Ethnic Approaches to Community Health (REACH) 2010 Risk Factor Survey, Phase 1-4, 2009-2012. REACH was launched to support community coalitions in the design, implementation, and evaluation of community driven strategies to eliminate race/ethnic health disparities. The REACH initiative is comprised of 40 minority communities that are competitively funded to target racial and ethnic groups in the U.S. The survey was administered by mail and telephone, and conducted in the following languages: English, Chinese (Mandarin and Cantonese), Haitian Creole, Khmer, Spanish, Vietnamese, and Korean (Phase 2 only). Any potential respondents who could not speak the aforementioned languages were excluded. Further descriptions of the REACH surveys content and design have been detailed in other publications (Airhihenbuwa & Laveist, 2006; Giles et al., 2004; Hu et al., 2013; CDC, 2011).

For this exploratory study, data from individuals who emigrated from another country (foreign-born) were analyzed. This was identified from response to the survey question: "Were you born in the United States? (Yes/No). If a respondent replied affirmatively to receipt of HBV testing, analyses were conducted to determine SDH associations with HBV testing. If a respondent was ever told they were positive for HBV infection, subsequent analyses were conducted to assess SDH associations with access to care. This will identify the potential independent effects of SDH factors on HBV testing and access to care.

Questionnaire

Dependent Variables. Two outcome measures, or dependent variables, were used to determine HBV testing and access to care. The first dependent variable assessed whether the

foreign-born (FB) respondent had been tested for HBV and was determined by the survey question: "Have you ever had a blood test for hepatitis B? (Yes/No)." The second dependent variable assessed whether the respondent saw a doctor for HBV. Access to care was assessed by the survey question: "Are you currently seeing a doctor for your hepatitis B? (Yes/No)."

Independent Variables. Demographic variables included age, sex, and race/ethnicity. Age was measured in number of years and was assessed with the survey question "What is your age?" Sex, or gender, was asked "Are you male or female?" (Male/Female). Race and ethnicity was determined by the questions: "Are you Hispanic or Latino?" (Yes/No) and "Which one or more of the following would you say is your race?" (Black/African American, Hispanic, Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaska Native (AI/AN), White/Other).

Socioeconomic status (SES) variables included: educational level, annual household income, employment status, and home status. Education level was assessed by one survey question that captured the highest grade completed by the respondent. Annual household income was arranged by discreet categorical variables in segments of income <$25,000; $25,000-$49,999; $50,000-$74,999; and ≥$75,000. Employment status was measured by the question "Are you currently: (employed for wages/self-employed/out of work for more than 1 year/out of work for less than 1 year/homemaker/student/retired/unable to work)". Home status was assessed by the question "Do you own or rent your home? (own/rent/other arrangement)."

Psychosocial stressors were framed as social environmental factors or circumstances that can solicit a psychological response, such as anxiety or depression. In this analysis, psychosocial stressor was measured by the question "How often in the past 12 months would you say you were worried or stressed about having enough money to pay your rent/mortgage?" The response category was "Always/Usually/Sometimes/Rarely/Never/Not Applicable." Acculturation of the respondent was determined by the question "Language of interview" (English/Spanish/Vietnamese/Khmer/Chinese/Haitian Creole), a proxy for country of origin.

Data Analysis

SUDAAN statistical software version 11.0 was used for all analyses (Research Triangle Institute, 2008). Data analysis was restricted to FB residents. All data were weighted to the civilian, non-institutionalized U.S. Census population to account for oversampling and non-response rates from participants. SAS callable procedure CROSSTAB was applied to calculate either column or row weighted proportions, with 95% confidence intervals, to describe the sample characteristic of HBV testing and access to care as associated with demographic, SES, and SDH. Procedure RLOGIST was applied for multivariate logistic model to calculate odds ratios with 95% confidence intervals to identify factors that were associated with HBV testing and access to care.

Weighted proportions were calculated to describe the sample characteristic of adults age ≥18 years. The reported sample (n) represents the respondents who were interviewed. The sample distributions of FB individuals were tested using a Wald Chi square. Variables were considered statistically significance if the reported p-value was ≤ .05.

The prevalence of HBV testing and access to care as associated with demographic, SES, and SDH factors among foreign-born were calculated. Specifically, a t-test was used to assess the prevalence of HBV testing and access to care as determined by SDH and within each associated factor. Testing the difference between proportions was conducted using the t-test option of SUDAAN. This option is comparable to the chi-square test utilized in other statistical software packages. Statistical significance was reported at a p-value of ≤ .05 for associated variables and

95% confidence intervals along with weighted proportions. The initial multivariate logistic regression model included all variables of interest to assess association with the outcome measures and for inclusion in subsequent models. A backward elimination approach was utilized to complete the final multivariate logistic regression model that represents the best fit model of independently associated SDH variables with HBV testing and access to care among FB persons over the period of 2009-2012.

RESULTS

A total of 31,031 foreign-born persons were interviewed (Table 1). Overall, 13,717 (44.2%) respondents reported HBV testing with the percentages varying from 52.1% among Asians to 42.8% among Native Hawaiian/other Pacific Islander. The lowest reported rates of HBV testing was among White/Other FB subpopulation (37%). The most common settings for all HBV testing was a doctor office/lab (23.7%) and medical clinics (10.6%). Whereas, hospitals were the least likely site for HBV testing (6.9%).

Of those reported having been tested for HBV, 1,285 (9.5%) reported HBV infection, with the highest reported prevalence among Asians (15.3%). HBV testing was highest among the 45-54 age cohort at 47.4%. Within this age cohort, 10.5% reported having HBV infection and 43.4% reported currently seeing a doctor. Among the next oldest age cohort (55-64 years), 44.1% respondents were tested for HBV, 13.7% report HBV infection, and 50.0% of these respondents were linked to care and saw a doctor.

As for health insurance coverage; 22,924 respondents (74.4 %) indicated they had health insurance and of these respondents, 47.5% had been tested for HBV. Of those tested, 9.7% reported having HBV infection and 46% were currently seeing a doctor for their HBV infection. Conversely, 7,867 respondents (25.6%) did not have health insurance; of these, 34.7% reported they have been tested for HBV infection. Of respondents with no health insurance, 8.2% reported HBV infection and 26.6% reported currently seeing a doctor.

TABLE 1 - Hepatitis B Virus Testing, Infection and Access to Care among Foreign-Born Persons Residing in the United States, REACH[1] 2009-2012

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
Overall	31031 (100.0)	13717 [44.2 (43.5 -44.9)]	1285 [9.5 (9.0 -10.0)]	578 [42.4 (39.6 -45.3)]
Age (Years)				
18 - 34	8010 (25.8)	3297 [41.2 (39.6 -42.7)]	173 [5.3 (4.4 -6.4)]	76 [39.6 (30.7 -49.2)]
35 - 44	7753 (25.0)	3585 [46.2 (44.8 -47.7)]	302 [8.5 (7.5 -9.7)]	105 [33.3 (27.5 -39.7)]

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
45 - 54	6088 (19.6)	2886 [47.4 (46.1 -48.7)]	301 [10.5 (9.5 -11.7)]	139 [43.4 (38.3 -48.7)]
55 - 64	5334 (17.2)	2350 [44.1 (42.7 -45.4)]	317 [13.7 (12.4 -15.1)]	169 [50.0 (44.8 -55.2)]
65 - older	3847 (12.4)	1599 [41.6 (40.2 -42.9)]	192 [12.3 (10.9 -13.8)]	89 [45.0 (39.2 -50.9)]
Sex of Respondent				
Male	15525 (49.8)	6646 [42.8 (41.8 -43.8)]	696 [10.6 (9.8 -11.5)]	332 [44.7 (40.7 -48.7)]
Female	15619 (50.2)	7117 [45.6 (44.8 -46.4)]	595 [8.4 (7.8 -9.1)]	251 [40.0 (36.2 -43.8)]
Race/Ethnicity				
Black or African American	3529 (11.3)	1614 [45.7 (43.5 -48.0)]	48 [3.0 (2.2 -4.1)]	24 [47.4 (33.3 -62.0)]
Hispanic	1295 (4.2)	483 [37.3 (34.2 -40.4)]	17 [3.5 (2.3 -5.3)]	13 [54.4 (34.9 -72.6)]
Asian	12493 (40.1)	6504 [52.1 (51.1 -53.1)]	986 [15.3 (14.4 -16.3)]	450 [44.2 (40.9 -47.5)]
Native Hawaiian or other Pacific Islander	385 (1.2)	165 [42.8 (37.2 -48.5)]	19 [11.4 (7.3 -17.5)]	7 [36.8 (17.8 -61.0)]

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
American Indian or Alaska Native	244 (0.8)	117 [48.0 (40.5 -55.5)]	2 [1.7 (0.5 -5.3)]	2 [61.5 (13.9 -94.0)]
White or Other	13198 (42.4)	4881 [37.0 (36.0 -38.0)]	219 [4.5 (4.0 -5.2)]	87 [34.0 (28.2 -40.2)]
Language of Interview				
English	18514 (60.0)	8311 [44.9 (44.0 -45.7)]	802 [9.7 (9.1 -10.5)]	313 [36.6 (33.2 -40.2)]
Spanish	8616 (27.9)	3116 [36.2 (35.0 -37.4)]	126 [4.1 (3.4 -4.9)]	77 [51.2 (42.7 -59.6)]
Vietnamese	1585 (5.1)	1013 [64.0 (61.1 -66.7)]	159 [15.9 (13.6 -18.6)]	104 [66.5 (58.6 -73.5)]
Khmer	27 (0.1)	19 [68.9 (47.4 -84.5)]	3 [13.8 (4.5 -34.9)]	1 [76.4 (21.6 -97.4)]
Chinese	1524 (4.9)	871 [57.1 (54.3 -59.9)]	175 [20.6 (17.7 -23.8)]	80 [45.2 (37.1 -53.6)]
Haitian Creole	591 (1.9)	258 [43.7 (38.4 -49.1)]	0 [0.1 (0.0 -0.6)]	0 [100.0 (. -.)]
Education Level				
Never attended school or only attended kindergarten	572 (1.8)	191 [33.4 (29.4 -37.6)]	20 [10.4 (6.6 -16.0)]	12 [53.6 (32.0 -73.9)]

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
Grades 1 through 8 (Elementary)	4592 (14.8)	1641 [35.7 (34.2 -37.2)]	154 [9.6 (8.2 -11.1)]	97 [54.6 (47.0 -61.9)]
Grades 9 through 11 (Some high school)	3505 (11.3)	1381 [39.4 (37.5 -41.3)]	145 [10.7 (9.1 -12.5)]	73 [47.5 (39.4 -55.7)]
Grade 12 or GED (High school graduate)	6966 (22.5)	2895 [41.6 (40.2 -43.0)]	298 [10.4 (9.2 -11.7)]	143 [46.2 (40.1 -52.4)]
College: 1 year to 3 years (Some college or technical school)	6584 (21.2)	3063 [46.5 (45.1 -48.0)]	279 [9.2 (8.2 -10.4)]	111 [37.9 (32.4 -43.8)]
College: 4 years or more (College graduate)	8686 (28.0)	4483 [51.6 (50.4 -52.9)]	383 [8.6 (7.7 -9.6)]	141 [35.1 (30.3 -40.3)]
Refused	82 (0.3)	42 [51.2 (37.7 -64.6)]	0 [0.8 (0.1 -5.9)]	0 [0.0 (. -.)]
Annual household income				
Less than $25,000	13362 (46.0)	5585 [41.8 (40.8 -42.8)]	568 [10.3 (9.5 -11.2)]	282 [46.7 (42.5 -51.0)]
$25,000-$49,999	7718 (26.5)	3333 [43.2 (41.9 -44.5)]	291 [8.8 (7.8 -9.9)]	138 [42.4 (36.7 -48.3)]
$50,000-$74,999	3188 (11.0)	1497 [47.0 (44.9 -49.1)]	154 [10.3 (8.8 -12.1)]	59 [37.1 (29.6 -45.2)]
$75,000 or more	4806 (16.5)	2567 [53.4 (51.7 -55.1)]	232 [9.1 (7.9 -10.4)]	86 [37.4 (30.7 -44.5)]

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
Employ Status				
Employed for wages	15098 (49.4)	6885 [45.6 (44.6 -46.6)]	597 [8.7 (8.0 -9.5)]	249 [39.6 (35.4 -44.0)]
Self-employed	2337 (7.7)	1022 [43.7 (41.3 -46.1)]	114 [11.2 (9.3 -13.5)]	42 [32.4 (24.5 -41.4)]
Out of work for more than 1 year	2010 (6.6)	907 [45.1 (42.6 -47.7)]	87 [9.8 (7.9 -12.2)]	35 [38.4 (28.3 -49.6)]
Out of work for less than 1 year	1592 (5.2)	650 [40.8 (37.8 -43.9)]	64 [10.2 (7.9 -13.1)]	27 [40.4 (28.8 -53.2)]
Homemaker	2808 (9.2)	1157 [41.2 (39.3 -43.1)]	82 [7.1 (5.8 -8.8)]	39 [45.9 (35.4 -56.7)]
Student	1664 (5.4)	684 [41.1 (37.7 -44.5)]	39 [5.8 (3.9 -8.4)]	15 [37.2 (21.1 -56.8)]
Retired	3013 (9.9)	1284 [42.6 (41.0 -44.2)]	179 [14.2 (12.5 -16.0)]	94 [50.3 (43.8 -56.7)]
Unable to work	2020 (6.6)	934 [46.3 (44.0 -48.5)]	105 [11.5 (9.6 -13.6)]	68 [60.3 (51.5 -68.5)]
Worried enough money to pay rent/mortgage in past 12 months				
Always	4013 (13.9)	1732 [43.2 (41.4 -45.0)]	179 [10.4 (9.0 -12.0)]	71 [35.5 (29.1 -42.3)]
Usually	2726 (9.4)	1180 [43.3 (41.1 -45.5)]	132 [11.3 (9.5 -13.5)]	65 [45.7 (36.9 -54.7)]

Factors	Overall n (col%)	Tested for hepatitis B n [row % (95%CI)]	Reported HBV[2] n [row % (95%CI)]	Currently seeing doctor n [row % (95%CI)]
Sometimes	8058 (27.9)	3529 [43.8 (42.5 -45.1)]	340 [9.7 (8.7 -10.9)]	166 [46.7 (40.8 -52.6)]
Rarely	4539 (15.7)	1999 [44.0 (42.3 -45.8)]	163 [8.2 (7.1 -9.6)]	71 [41.1 (33.6 -49.0)]
Never	8510 (29.4)	4011 [47.1 (45.9 -48.4)]	347 [8.8 (7.9 -9.8)]	159 [43.7 (38.4 -49.2)]
Not Applicable	868 (3.0)	331 [38.1 (34.8 -41.6)]	45 [13.8 (10.6 -17.7)]	17 [38.6 (26.3 -52.7)]
Don't Know	149 (0.5)	57 [38.2 (30.2 -46.9)]	7 [13.9 (7.1 -25.2)]	3 [37.7 (13.6 -69.9)]
Refused	42 (0.1)	20 [47.9 (32.7 -63.5)]	0 [0.0 (. -.)]	0 [. (. -.)]
Health Coverage/Insurance				
Yes	22924 (74.4)	10892 [47.5 (46.8 -48.3)]	1041 [9.7 (9.1 -10.3)]	501 [46.0 (42.8 -49.1)]
No	7867 (25.6)	2730 [34.7 (33.4 -36.1)]	219 [8.2 (7.1 -9.4)]	65 [26.6 (21.1 -33.1)]

[1]REACH: Racial and Ethnic Approaches to Community Health
[2]HBV: Hepatitis B Virus

There were no significant age differences except for respondents aged ≥55 years (Table 2). Respondents who were aged 55-64 years (OR_{adj} = 1.65) were more likely to report HBV infection than those aged 18-34 years. Compared to respondents aged 18-34 years, those aged ≥65 years were least likely to report currently seeing a doctor for HBV infection (OR_{adj} = 0.32). Also, men were more likely than women to report having HBV infection (OR_{adj} = 1.37). Hispanics were more likely to be tested for HBV (OR_{adj} = 11.28) compared to African Americans. API were more likely to be tested (OR_{adj} = 7.97) and report having HBV infection (OR_{adj} = 3.30) compared to African Americans. When compared to African Americans, AI/AN were less likely to report HBV infection (OR_{adj} = 0.11) and less likely to report currently seeing a doctor for HBV infection (OR_{adj} = 0.07).

Spanish speaking respondents were less likely to report HBV infection (OR_{adj} = 0.68), yet were more likely to be currently seeing a doctor for HBV infection (OR_{adj} = 3.45). Vietnamese were two times more likely to be seeing a doctor for HBV infection (OR_{adj} = 2.72) than other groups. Lastly, respondents with insurance were significantly more likely to report seeing a doctor for HBV infection (OR_{adj} = 2.19) than those with no health insurance coverage.

A strong association was found for respondents interviewed in the Khmer language as less likely to be tested for HBV (OR_{adj} = 0.15). Lastly, Haitian Creoles were significantly less likely to be tested for HBV (OR_{adj} = 0.18) and less likely to report HBV infection (OR_{adj} = 0.03).

Psychosocial measure, worry about money to pay rent/mortgage, increases the likelihood to report HBV infection for those who always worry (OR_{adj} = 1.93), usually worry (OR_{adj} = 1.61), and sometimes worry (OR_{adj} = 1.31), compared to individuals that never worry. Respondents who rarely worried about paying mortgage/rent in the last 12 months were more likely to be tested for HBV (OR_{adj} = 1.89) than those who never worried.

TABLE 2 – Factors Associated with Hepatitis B Testing, Infection, and Access to Care among Foreign-Born Persons Residing in the United States: REACH[1] 2009-2012

	Tested for Hepatitis B		**Reported HBV[2] Positive**		**Currently seeing a Physician For HBV Infection**	
Factors	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**
Age (Years)						
18 - 34	ref	.	ref	.	ref	.
35 - 44	1.54 (0.73 – 3.25)	0.26	1.34 (0.97 – 1.85)	0.076	0.60 (0.32 –1.11)	0.101
45 - 54	1.16 (0.51 – 2.63)	0.72	1.37 (0.99 – 1.90)	0.059	0.90 (0.49 –1.65)	0.74
55 - 64	1.61 (0.72 – 3.59)	0.25	1.65 (1.16 – 2.34)	0.005*	0.60 (0.31 –1.14)	0.120
65 - older	0.88 (0.33 – 2.31)	0.79	1.10 (0.72 – 1.69)	0.66	0.32 (0.14 –0.71)	0.006*

	Tested for Hepatitis B		Reported HBV[2] Positive		Currently seeing a Physician For HBV Infection		
Factors	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**		**P-value**
Sex of Respondent							
Male	0.96 (0.61 – 1.49)		0.84	1.37 (1.13 – 1.66)	0.001*	1.45 (0.98 –2.15)	0.061
Female	ref	.		ref	.	ref	.
Race/Ethnicity							
Black or African American	ref	.		ref	.	ref	.
Hispanic	11.28 (2.17 – 58.77)		0.004*	0.61 (0.29 – 1.25)	0.178	0.87 (0.15 –5.03)	0.88
Asian	7.97 (1.76 – 36.05)		0.007*	3.30 (2.22 – 4.91)	<0.001*	0.48 (0.21 –1.10)	0.083
Native Hawaiian or other Pacific Islander	6.02 (0.78 – 46.21)		0.084	1.31 (0.54 – 3.16)	0.55	0.33 (0.06 –1.75)	0.190
American Indian or Alaska Native	0.92 (0.19 – 4.37)		0.91	0.11 (0.01 – 0.84)	0.033*	0.07 (0.01 –0.83)	0.035*
White or Other	6.70 (1.46 – 30.72)		0.014*	0.93 (0.60 – 1.46)	0.76	0.12 (0.04 –0.33)	<0.001*
Language of Interview							
English	ref	.		ref	.	ref	.
Spanish	0.56 (0.28 – 1.12)		0.100	0.68 (0.48 – 0.97)	0.035*	3.45 (1.49 –7.99)	0.004*
Vietnamese	1.52 (0.64 – 3.61)		0.34	1.04 (0.78 – 1.39)	0.78	2.72 (1.59 –4.65)	<0.001*

	Tested for Hepatitis B		Reported HBV[2] Positive		Currently seeing a Physician For HBV Infection		
Factors	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**		**P-value**
Khmer	0.15 (0.03 – 0.61)		0.009*	0.44 (0.09 – 2.04)	0.29	0.76 (0.00 – 301.3)	0.93
Chinese	1.54 (0.71 – 3.35)		0.28	1.33 (0.98 – 1.79)	0.063	0.89 (0.50 –1.58)	0.69
Haitian Creole	0.18 (0.05 – 0.71)		0.014*	0.03 (0.00 – 0.24)	<0.001*	. (. – .)	.
Education Level							.
Never attended school or only attended kindergarten	ref		.	ref	.	ref	.
Grades 1 through 8 (Elementary)	2.33 (0.38 – 14.07)		0.36	2.43 (0.75 – 7.81)	0.137	0.54 (0.10 –2.96)	0.48
Grades 9 through 11 (Some high school)	3.82 (0.63 – 22.98)		0.143	2.82 (0.87 – 9.09)	0.083	0.28 (0.05 –1.60)	0.154
Grade 12 or GED (High school graduate)	3.15 (0.52 – 18.91)		0.21	3.02 (0.95 – 9.65)	0.062	0.24 (0.04 –1.33)	0.103
College: 1 year to 3 years (Some college or technical school)	4.63 (0.77 – 27.92)		0.095	2.27 (0.71 – 7.30)	0.168	0.23 (0.04 –1.27)	0.092
College: 4 years or more (College graduate)	2.59 (0.43 – 15.72)		0.30	1.61 (0.50 – 5.18)	0.43	0.20 (0.04 –1.13)	0.068
Refused	0.22 (0.03 – 1.42)		0.111	2.15 (0.20 – 23.12)	0.53	. (. – .)	.

	Tested for Hepatitis B		Reported HBV[2] Positive		Currently seeing a Physician For HBV Infection		
Factors	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**		**P-value**
Income							
Less than $25,000	ref		.	ref	.	ref	.
$25,000-$49,999	1.29 (0.77 – 2.14)		0.33	0.88 (0.70 – 1.10)	0.27	1.17 (0.74 –1.86)	0.50
$50,000-$74,999	1.34 (0.60 – 3.00)		0.48	1.07 (0.79 – 1.44)	0.67	0.77 (0.43 –1.39)	0.39
$75,000 or more	1.69 (0.84 – 3.43)		0.143	0.91 (0.67 – 1.23)	0.53	0.90 (0.49 –1.63)	0.72
Employ Status							
Employed for wages	ref		.	ref	.	ref	.
Self-employed	1.35 (0.61 – 2.96)		0.46	1.18 (0.88 – 1.58)	0.26	1.05 (0.60 –1.84)	0.86
Out of work for more than 1 year	0.98 (0.33 – 2.89)		0.97	0.95 (0.68 – 1.33)	0.78	0.77 (0.38 –1.57)	0.48
Out of work for less than 1 year	0.54 (0.14 – 2.12)		0.37	0.96 (0.64 – 1.43)	0.84	1.02 (0.43 –2.45)	0.96
Homemaker	0.66 (0.25 – 1.76)		0.40	0.73 (0.53 – 1.01)	0.054	1.40 (0.73 –2.70)	0.31
Student	0.92 (0.19 – 4.39)		0.91	0.67 (0.36 – 1.25)	0.21	1.42 (0.39 –5.19)	0.60
Retired	1.69 (0.82 – 3.49)		0.157	1.22 (0.89 – 1.68)	0.21	1.99 (1.07 –3.70)	0.031*
Unable to work	2.02 (1.01 – 4.01)		0.045*	1.00 (0.68 – 1.46)	0.99	2.13 (1.02 –4.42)	0.043*
Worried Home							

	Tested for Hepatitis B		Reported HBV[2] Positive		Currently seeing a Physician For HBV Infection		
Factors	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**	**P-value**	**adjOR (95%CI)**		**P-value**
Always	1.80 (0.75 – 4.32)		0.185	1.93 (1.36 – 2.73)	<0.001*	0.68 (0.33 –1.44)	0.32
Usually	1.09 (0.39 – 3.03)		0.87	1.61 (1.13 – 2.30)	0.009*	1.24 (0.60 –2.54)	0.56
Sometimes	1.58 (0.78 – 3.22)		0.20	1.31 (1.00 – 1.70)	0.046*	1.04 (0.62 –1.76)	0.88
Rarely	1.89 (1.01 – 3.56)		0.048*	1.07 (0.82 – 1.40)	0.64	0.77 (0.44 –1.35)	0.37
Never	ref		.	ref	.	ref	.
Not applicable	0.96 (0.36 – 2.54)		0.94	1.02 (0.64 – 1.63)	0.95	0.72 (0.34 –1.53)	0.40
Don't know	0.14 (0.06 – 0.34)		<0.001*	1.27 (0.41 – 3.91)	0.68	0.14 (0.01 –2.04)	0.149
Refused	0.31 (0.10 – 0.95)		0.041*	. (. – .)	.	1.00 (1.00 –1.00)	.
Health Coverage/Insurance							
Yes	1.15 (0.62 – 2.14)		0.65	1.14 (0.89 – 1.47)	0.29	2.19 (1.36 –3.55)	0.001*
No	ref		.	ref	.	ref	.

[1]REACH: Racial and Ethnic Approaches to Community Health
[2]HBV: Hepatitis B Virus

DISCUSSION

Our findings for FB persons living in the U.S. demonstrate that Hispanic, Asian, and White respondents were more likely to be tested for HBV than Blacks. The individual characteristics of being male, Asian, and aged 55-64 years increased the likelihood of reports of HBV infection, similar to other studies (Hu et al., 2013). White, AI/AN, and those aged ≥65 years were more likely to be linked to care and to be currently seeing a physician for HBV infection, similar to other epidemiological findings (CDC, 2008; Ma et al., 2011). Therefore,

among foreign-born residents susceptible to HBV infection, targeted cultural and linguistically-appropriate messaging campaigns with an SDH focus to increase awareness may promote testing within this population (CDC, 2010; Ward, Lok, Thomas, El-Serag, & Kim, 2012). However, diverse languages, cultures, and low-English proficiency may inhibit message dissemination. As such, organized grassroots advocacy efforts or local/state collaborative campaigns can utilize targeted social media or customized strategies for public health education, testing, clinical monitoring, preventative, and therapeutic interventions that reflect the need to address region-specific prevention efforts (Ward et al., 2012). Evaluation efforts should measure the impact of culturally-specific messaging to vulnerable populations to assess efficacy.

The SDH psychosocial variable of "worry about paying rent" represents the Social Environment domain, specifically socioeconomic conditions, and is associated with lower HBV testing (CDC, 2010). Specifically, respondents that were worried about money to pay rent/mortgage had an increased likelihood of reporting HBV infection. Increased anxiety due to fiscal uncertainty may force individuals to prioritize needs and health promotion may be considered secondary to food and housing. When respondents were rarely concerned about paying rent, HBV testing improved. This indicates that monetary concerns have an empirical and concrete influence on behavior and decision-making. Having less economic challenges and high SES improved HBV testing practices and access to healthcare.

Language of the interview, proxy for country of origin, had a decreased likelihood for receipt of HBV testing. This may result from culturally influenced stigma that affects HBV testing uptake. Cultural stigma towards HBV infection and the increased likelihood of exposure in endemic countries may create a fear of being tested and potentially exacerbate infection (Blanas et al, 2013; Cotler et al., 2012; Russ et al., 2012). Stakeholder assessments of population perceived risk by country of origin, may provide some insight of factors that influence the chances of HBV testing. Stakeholders may include grassroots and community-based organizations on the local level; public health departments and agencies on the state and federal levels; as well as health systems, healthcare organizations, and medical professionals (Blanas et al., 2013; Cotler et al., 2012; Russ et al., 2012; Ward et al., 2012).

Also, language discordance with the healthcare provider, immigration status and distrust of Western medicine may influence the decision to test for HBV (Russ et al., 2012). For example, respondents interviewed in the Khmer (Cambodian) and Haitian Creole languages followed a similar pattern of decreased likelihood of testing for HBV. Also, Spanish and Haitian Creole speakers were less likely to report HBV infection than other groups. Conversely, HBV infected Spanish speakers were more likely to report currently seeing a doctor. This increased likelihood to see a doctor also was evident among Vietnamese speakers alluding to high endemicity of HBV infection in Southeast Asia and increased awareness of potential HBV exposure and treatment. It is unclear which social determinants cause poor HBV outcomes in Spanish-speaking countries. This warrants further investigation to understand how SDH factors may differentially affect immigrants from these diverse ethnic regions.

Our results suggest that SDH factors that impact HBV testing and access to care are modifiable. Insurance status, anxiety, language, and cultural assimilation are all modifiable through stakeholder intervention unlike characteristics such as age, race, and genetics which are immutable. This observation may potentially inform policy and inform culturally-appropriate interventions to ameliorate socially-deterministic barriers. This study supports the influence of

SDH on HBV related health outcomes and the importance of national guidelines to improve HBV diagnosis and treatment (CDC, 2008).

There are some limitations to this study. The use of self-reported data leads to recall and social desirability bias, potentially skewing this analysis' associations. Also, the lack of diagnostic data (i.e. laboratory test results) makes it difficult to distinguish between chronic and resolved HBV, potentially leading to misclassification. The final limitation is the cross-sectional design which prohibits determining any causal effects and can only assess associations between variables.

CONCLUSION

In summary, this study assessed select SDH effects on HBV testing and access to care for a large sample of FB persons residing in U.S. Many individuals emigrate from countries that have high HBV endemicity and this study provides an exploratory snapshot of the challenges to achieving health equity. The findings demonstrate the association between health insurance coverage, psychosocial worries, language spoken, and stigma with associated HBV infection may affect healthcare access and outcomes (Sheiham, 2009). Both decreased access to healthcare and low SES are known factors that contribute to social vulnerability leading to disparities in health outcomes (Phelan, 2010). To address this disparity, collaborative efforts among stakeholders (federal, state, local) from multi-sectors and varying jurisdictions can contribute to SDH interventions, as needed. For example, public health and medical professionals may integrate their resources to focus on health promotion and health communication campaigns to raise awareness of the need for increased HBV testing, and subsequent linkages to care and treatment for vulnerable populations from high hepatitis B endemic areas. This exploratory study illustrate some variation among the different populations of FB residents and may inform future studies and interventions. Through comparative analyses between FB and non-FB persons and better understanding of the regional dynamics of risk, in highly endemic areas, targeted interventions can be developed to address the needs of specific FB populations. Potential adoption of culturally sensitive interventions such as early diagnosis of Hepatitis B and access to medical care can help reduce health inequalities and lead to better health outcomes, despite country of birth.

FOOTNOTES

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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