



Major Article

Characteristics associated with hepatitis A vaccination initiation and completion among adults traveling to a country of high or intermediate endemicity



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Key Words:

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Risk factor
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Background: Hepatitis A (HepA) vaccine is recommended for adults traveling to a country of high or intermediate endemicity.

Methods: The data from the 2016 and 2017 National Health Interview Survey were pooled in this analysis, and the weighted logistic regression model was adopted.

Results: Characteristics independently associated with HepA vaccination initiation (≥ 1 dose) (in descending order by odds ratio) include age, receipt of pneumococcal and influenza vaccine, education, sexual orientation, region, number of physician visits in the past 12 months, physical activity, marital status, computer use, ratio of family income to the poverty threshold, Hispanic ethnicity, and class of worker. Characteristics independently associated with HepA vaccination completion (≥ 2 doses) (in descending order by odds ratio) include age, receipt of pneumococcal and influenza vaccine, sexual orientation, education, region, marital status, number of physician visits in the past 12 months, ratio of family income to the poverty threshold, physical activity, Hispanic ethnicity, and computer use.

Conclusions: HepA vaccination initiation and completion was associated with a number of characteristics, which can be used to develop strategies to increase HepA vaccination coverage among adults traveling to a country of high or intermediate endemicity.

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Hepatitis A (HepA) is a vaccine-preventable communicable disease of the liver caused by the HepA virus. As a result of the routine use of HepA vaccine in children, the incidence of HepA virus infection in the United States has decreased from 6.0 cases per 100,000 in 1999 to 0.4 cases per 100,000 in 2011.¹ However, recent data documented not only a continuing increase in the number of HepA cases reported, but also an increase in the number of cases among older adults, from 2000 to 2013.² In addition, the mean age of all reported HepA cases also increased, from 29.7 years in 2000 to 43.6 years in 2013.² Furthermore, among reported HepA cases, there was an observed upward trend both in HepA-related hospitalizations (1.63% increase per year) and in the mean age of hospitalized cases (from 36.0 years in 1999 to 45.1 years in 2011).¹ In 2006, to reduce the health burden of HepA among adults, the Advisory Committee on Immunization

Practices recommended routine HepA vaccination for adults traveling to a country of high or intermediate endemicity of HepA, if some risk factor is present or for any person wishing to obtain immunity.^{3,4} Both 2-dose series of single-antigen HepA vaccine and 3-dose series of combined HepA and hepatitis B vaccine are available.^{3,4} Timely updates on vaccination coverage estimates are important to understand better the factors that contribute to low vaccination rates and to modify strategies and interventions to improve vaccination coverage.⁵ The National Health Interview Survey (NHIS) serves as an important source of information on the health of the civilian, noninstitutionalized population of the United States. The national vaccination coverage for 1 and ≥ 2 doses of HepA vaccine among adolescents was 73.9% and 64.4% in 2016,⁶ respectively. However, the most recent national estimate of HepA vaccination coverage (≥ 2 doses), based on the 2015 NHIS, was 9.0% for adults,⁵ and data from the 2017 NHIS have been released recently. In addition, information on factors associated with HepA vaccination coverage among US adults is limited.^{7,8} Therefore, based on the 2016 and 2017 NHIS, the objective of this study was to identify characteristics associated with HepA

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vaccination among US adults traveling to a country of high or intermediate endemicity of HepA.

METHODS

The NHIS is a nationally representative, cross-sectional household interview survey.^{9,10} The sample design follows a multistage area probability design. To increase the sample size, we combined the merged data (Family File, Person File, and Sample Adult File) from the 2016 and 2017 NHIS. The conditional response rates for the Family section were 98.9% in 2016 and 98.9% in 2017, and 80.9% in 2016 and 80.7% in 2017 for the Sample Adult section. Questions related to adult HepA immunizations included if they have ever received the HepA vaccine and number of HepA shots received. This article was reported following the Strengthening the Reporting of Observational Studies in Epidemiology checklist items. The NHIS was approved by the National Center for Health Statistics Research ethics review board. Adults who traveled to regions with intermediate or high prevalence of HepA virus infection were defined as those who had traveled outside of the United States since 1995 to locations other than Europe, Japan, Australia, New Zealand, or Canada.^{7,8}

For this study, the 2 dichotomous outcomes of interest were the initiation (≥ 1 dose) and completion (≥ 2 doses) of the HepA vaccine.^{7,8} According to previous studies,^{7,8} we included 6 demographic characteristics (sex, age, region, race, Hispanic ethnicity, and nativity disparity), 6 socioeconomic characteristics (marital status, class of worker, education, computer usage, health insurance coverage, and ratio of family income to the poverty threshold), 5 health behavior characteristics (smoking, drinking, light/moderate physical activity, pneumonia vaccine, and influenza vaccine), 2 health care characteristics (having a usual place for sick care and number of physician visits in the past 12 months), as well as specific risk factors for HepA infection, including sexual orientation, chronic liver disease (defined as those who answered “Yes” to the question, “Has a doctor or other health professional ever told you that you had any kind of chronic or long-term liver condition?”^{7,8} and “Have you ever lived with someone with hepatitis?”) Characteristics with 3 or more categories were treated as indicator (dummy) variables in the logistic analysis. We first conducted individual univariate logistic models (1 variable once), and characteristics with P values $< .10$ were then included in the multivariate model. According to the NHIS, survey procedures were used to account for the multistage, clustered, and stratified sample design. In addition, to achieve annualized results, the sampling weight for the pooled data were adjusted by dividing by 2. To explore the issue of collinearity, pairwise correlation coefficients between the variables were calculated. The results showed that the pairwise correlation coefficients ranged from -0.32 – 0.39 , and most of the pairwise correlation coefficients ranged from -0.05 – 0.05 . Statistical tests were performed using Stata 12.0 (College Station, TX), and $P \leq .05$ was considered statistically significant.

RESULTS

After excluding respondents who answered, “Don’t know,” who refused to respond, or whose responses were not ascertained (weighted percentage = 14.23%), a total of 158,562,952 (weighted number) adults aged ≥ 18 years traveling to a country of high or intermediate endemicity were included in this analysis. The weighted prevalence of HepA vaccination initiation was 23.61% in 2016 and 27.78% in 2017, and the weighted prevalence of HepA vaccination completion was 15.78% in 2016 and 18.78% in 2017. The unweighted number of participants, weighted percentage, and weighted proportion of HepA vaccination initiation and completion are shown in Table 1. The adjusted odds ratios (OR) and 95% confidence interval from multivariate analysis are shown in Table 2. Overall, there was

not too much change between the crude and adjusted results, and the fact that several variables with significant findings in univariate analysis showed no significant associations could arise from the relatively wider range of the 95% confidence intervals.

Adults who have a specific risk

Gay, lesbian, and those of bisexual orientation showed a higher likelihood of HepA vaccination initiation (1.50 [1.16–1.94]) and completion (1.67 [1.20–2.34]). Subjects with chronic liver disease and those who ever lived with someone with hepatitis showed no significant higher likelihood of HepA vaccination initiation and completion, respectively.

Demographic characteristics

Subjects living in the western United States had a higher likelihood of HepA vaccination (initiation: 1.45 [1.20–1.75]), (completion: 1.59 [1.27–1.98]). Subjects aged ≥ 80 years (initiation: 0.15 [0.10–0.22], completion: 0.13 [0.08–0.21]), 60–79 years (initiation: 0.23 [0.20–0.27], completion: 0.23 [0.19–0.29]), and 40–59 years (initiation: 0.45 [0.41–0.51], completion: 0.45 [0.40–0.51]) had a lower likelihood of HepA vaccination. Subjects of non-Hispanic ethnicity showed a higher prevalence of HepA vaccination initiation (1.24 [1.05–1.47]) and completion (1.33 [1.07–1.67]).

Socioeconomic characteristics

Government employment (initiation: 1.24 [1.10–1.40]), use of a computer on a daily basis (initiation: 1.29 [1.13–1.47], completion: 1.27 [1.08–1.49]), education of associate’s degree or higher (initiation: 1.59 [1.36–1.87], completion: 1.61 [1.29–2.00]) or some college, no degree (initiation: 1.27 [1.06–1.53]) were associated with a higher adjusted OR of HepA vaccination initiation and/or completion. However, being married/living with partner (initiation: 0.80 [0.71–0.92], completion: 0.83 [0.70–0.97]) or widowed/divorced/separated (initiation: 0.75 [0.63–0.90], completion: 0.72 [0.57–0.90]) and a higher ratio of family income to the poverty threshold of ≥ 4 (initiation: 0.78 [0.64–0.96]), 2–4 (initiation: 0.80 [0.65–0.98]) and 1–2 (initiation: 0.79 [0.64–0.97], completion: 0.75 [0.58–0.97]) were associated with a lower adjusted OR of HepA vaccination initiation and/or completion.

Health behavior characteristics

Subjects engaged in more physical activity of ≥ 5 times/week (initiation: 1.37 [1.20–1.58], completion: 1.34 [1.13–1.59]) and 1–4 times/week (initiation: 1.23 [1.08–1.41], completion: 1.19 [1.00–1.42]), and subjects ever receiving pneumococcal vaccine (initiation: 1.82 [1.60–2.07], completion: 1.97 [1.67–2.31]) and influenza vaccine (initiation: 1.39 [1.25–1.55], completion: 1.48 [1.30–1.68]) had a higher likelihood of HepA vaccination initiation and/or completion. Smoking and alcohol drinking were not significantly associated with likelihood of HepA vaccination initiation and completion in multivariate analysis.

Health care characteristics

Compared with those having no physician visit in the past 12 months, adults having 1 physician visit (initiation: 1.26 [1.06–1.50]), and ≥ 4 physician visits (initiation: 1.40 [1.17–1.67]), completion: 1.34 [1.09–1.64]) in the past 12 months had a higher likelihood of HepA vaccination initiation and/or completion.

Table 1
Sample characteristics of participants among adults traveling to a country of high or intermediate endemicity, 2016–2017 NHIS

Characteristics	Initiation (≥ 1 dose)			Completion (≥ 2 doses)		
	Unweighted N	Weighted (%) ^a	Weighted proportion (%)	Unweighted N	Weighted (%)	Weighted proportion
Chronic liver diseases						
No	18,062	98.74	25.68	16,253	98.77	17.24
Yes	232	1.18	31.75	210	1.17	23.10
Ever lived with someone with hepatitis						
No	16,946	95.78	25.44	15,264	95.84	17.06
Yes	740	3.78	30.19	660	3.72	21.00
Sexual orientation						
Not gay(man)/lesbian(woman)	17,390	97.23	25.35	15,668	97.36	16.94
Gay(man)/lesbian(woman)/bisexual	557	2.77	41.04	479	2.64	31.11
Sex						
Man	8,744	50.38	75.01	7,860	50.59	16.80
Woman	9,560	49.62	24.99	8,612	49.41	17.82
Born in the United States						
No	4,157	27.47	22.22	3,752	27.80	14.41
Yes	14,143	72.51	27.10	12,716	72.17	18.42
Age (y)						
18–39	6,561	39.56	36.27	5,585	37.58	25.28
40–59	6,298	36.33	21.08	5,772	37.15	14.04
60–79	4,776	21.53	16.06	4,481	22.54	10.73
≥ 80	669	2.58	11.14	634	2.72	6.14
Region						
Northeast	2,972	18.13	23.44	2,688	18.22	15.11
Midwest	3,840	19.61	24.31	3,484	19.70	16.08
South	5,912	32.83	24.66	5,298	32.72	15.81
West	5,580	29.43	29.36	5,002	29.37	21.24
Race						
Black	1,359	8.65	25.56	1,214	8.54	16.09
White	15,054	79.28	25.33	13,597	79.56	17.13
Asian	1,683	10.86	28.99	1,468	10.68	19.57
Hispanic ethnicity						
Yes	2,760	19.89	21.87	2,509	19.74	13.65
No	15,544	80.41	26.70	13,963	80.26	18.20
Marital status						
Never married	3,760	18.76	36.11	3,215	17.79	24.96
Married/living with partner	10,764	68.37	24.27	9,771	69.00	16.43
Widowed/divorced/separated	3,755	12.75	18.66	3,461	13.07	11.66
Class of worker						
Employee of private company	14,106	81.33	25.05	12,780	81.84	17.06
Government employee	3,467	17.99	29.65	3,046	17.51	19.53
Computer use						
Not everyday	4,613	25.75	16.89	4,310	26.71	10.76
Everyday	13,624	73.84	28.84	12,101	72.88	19.70
Education						
High school or below	4,012	23.56	16.72	3,736	24.36	10.30
Some college, no degree	3,371	17.64	26.44	3,017	17.49	17.35
Associate degree or higher	10,882	58.50	29.18	9,686	57.87	20.26
Health insurance						
None	1,281	7.79	19.93	1,163	7.86	11.53
Private	14,136	77.34	27.48	12,635	76.89	18.75
Public	2,830	14.43	19.59	2,627	14.86	12.99
Ratio of family income to the poverty threshold						
<1	1,672	7.37	30.05	1,455	7.18	20.05
1–2	2,066	11.27	21.68	1,871	11.30	12.96
2–4	3,928	21.21	25.90	3,532	20.99	16.63
≥ 4	8,441	47.25	27.03	7,623	47.49	19.15
Drinking						
Abstainer	2,612	15.57	24.98	2,376	15.63	16.76
Former	1,814	9.51	21.21	1,662	9.73	14.18
Current	13,769	74.41	26.53	12,339	74.15	17.88
Smoking						
Never	11,968	68.20	27.60	10,699	67.69	18.75
Current	1,910	9.66	23.02	1,739	9.79	15.39
Former	4,417	22.10	21.28	4,026	22.48	13.82
Light/moderate activity (times per wk)						
Never	4,832	28.04	20.11	4,449	28.68	12.99
1–4	6,735	36.81	27.48	6,021	36.50	18.55
≥ 5	6,016	31.36	29.07	5,350	31.01	20.11
Pneumococcal vaccine						
Never	13,125	74.68	24.56	11,822	74.91	16.23
Ever	4,678	22.14	28.14	4,242	22.19	20.14

(continued)

Table 1 (Continued)

Characteristics	Initiation (≥ 1 dose)			Completion (≥ 2 doses)		
	Unweighted N	Weighted (%) [*]	Weighted proportion (%)	Unweighted N	Weighted (%)	Weighted proportion
Influenza vaccine						
Never	9,636	54.73	71.02	8,703	54.99	14.74
Ever	8,626	44.97	28.98	7,735	44.74	20.48
No. of physician visits in the past 12 mo						
0	2,524	14.95	22.22	2,293	15.22	14.87
1	3,306	19.46	26.60	2,933	19.20	17.11
2-3	5,238	28.95	24.66	4,731	28.97	16.16
≥ 4	7,215	36.53	27.62	6,496	36.51	19.34
Having a usual place for sick care						
No	2,203	12.26	26.97	1,915	11.92	16.35
Yes	16,096	86.29	25.60	14,293	86.60	17.43

NHIS, National Health Interview Survey.

^{*}The sum of weighted percentage is not necessarily 100% because the information is missing for some participants.

DISCUSSION

The prevalence of HepA vaccination completion among travelers to countries with high or intermediate endemicity of HepA was 16.0% in 2015,⁵ and during 2010–2015, the prevalence of HepA vaccination completion remained stable among travelers to countries with high or intermediate endemicity.⁵ In this analysis, a slight increase of HepA vaccination initiation and completion was observed from 2016–2017 among adults traveling to a country of high or intermediate endemicity of HepA. The slight increase may be anticipated because special efforts have been recommended to vaccinate travelers to countries with high or intermediate endemicity (<https://wwwnc.cdc.gov/travel>).

Studies on characteristics associated with HepA vaccination among US adults are very limited. For demographic characteristics, based on the 2014 and 2015 NHIS, higher ≥ 2 dose HepA vaccination was associated with being younger and living in the West among adults with chronic liver disease.⁷ Among adults without chronic liver disease, higher ≥ 2 dose HepA vaccination was associated with being younger, being of non-Hispanic ethnicity, and living in regions other than the northeast.⁷ Based on 2010 NHIS, among travelers to countries with high or intermediate endemicity of HepA, characteristics independently associated with a higher likelihood of HepA vaccination initiation included Asian race/ethnicity, male sex, and living in the western United States,⁸ whereas only living in the western United States was associated with HepA vaccination completion.⁸ Nativity was not associated with HepA vaccination initiation and completion.⁸ Data from the 2007 National Immunization Survey-Adult data showed that persons aged 18–49 years showed a higher likelihood of HepA vaccination (≥ 2 doses), whereas sex and race/ethnicity were not associated with the likelihood of HepA vaccination.¹¹ This analysis with the most recent data from NHIS confirmed that the receipt of HepA vaccine among international travelers did not differ significantly by sex, nativity, and race, whereas being younger and of non-Hispanic ethnicity showed a higher likelihood of HepA vaccination initiation and completion.

For socioeconomic characteristics, being a high school graduate, having a college education, or higher were associated with a higher likelihood of HepA vaccination (≥ 2 doses) among adults with chronic liver disease.⁷ Having a high school education or higher, being employed, having private health insurance, and never having been married were associated with a higher likelihood of HepA vaccination (≥ 2 doses) among adults without chronic liver disease.⁷ Among international travelers, characteristics independently associated with a higher likelihood of HepA receipt (≥ 1 doses) included never having been married and having a higher education, and similar associations were seen for series completion (≥ 2 doses) among travelers.⁸ Persons at or above poverty level and persons with public medical insurance

showed a higher likelihood of HepA vaccination (≥ 2 doses) in the 2007 National Immunization Survey-Adult.¹¹ In addition, education was also found associated with receipt of other recommended vaccines such as the influenza vaccine.¹² In this analysis, we found that never having been married, having a higher education, government employment, daily computer use, and a lower ratio of family income to the poverty threshold were associated with a higher likelihood of HepA vaccination initiation and completion.

For health behavior characteristics, having received influenza vaccination in the past 12 months was associated with a higher likelihood of HepA vaccination (≥ 2 doses) among adults without chronic liver disease but not among adults with chronic liver disease.⁷ Receipt of influenza vaccination in the previous year was independently associated with a higher likelihood of HepA vaccination initiation and completion among travelers.⁸ Persons who received influenza vaccination in the past season also showed a higher likelihood of HepA vaccination (≥ 2 doses) in the 2007 National Immunization Survey-Adult.¹¹ In this analysis, we confirmed that receipt of influenza vaccination in the past 12 months was associated with a higher likelihood of HepA vaccination initiation and completion, and also found that persons having more physical activity also showed a higher likelihood of HepA vaccination initiation and completion, whereas smoking and alcohol drinking were not associated with likelihood of HepA vaccination. In addition, physical activity was also associated with receipt of other recommended vaccines such as the influenza vaccine.¹³

For health care characteristics, having had at least 1 medical office visit in the past 12 months was associated with a higher likelihood of HepA vaccination (≥ 2 doses) among adults without chronic liver disease but not among adults with chronic liver disease.⁷ Having a greater number of physician contacts was also independently associated with a higher likelihood of HepA vaccination initiation and completion among international travelers.⁸ In addition, doctor recommendation also had a pivotal importance in acceptance of other recommended vaccines such as influenza vaccine and pneumococcal vaccine.^{14,15} In this analysis, we confirmed that greater number of physician visits in the past 12 months was associated with a higher likelihood of HepA vaccination initiation and completion, whereas having a usual place for sick care was not associated with likelihood of HepA vaccination.

Overall, this analysis based on the 2016 and 2017 NHIS provides updated information on HepA vaccination coverage estimates, as well as the characteristics associated with the coverage among travelers to countries with high or intermediate endemicity of HepA. However, there are several limitations. First, HepA vaccination was based on self-report and may be subject to recall bias. Overall agreement between self-reported HepA receipt and serological results was 63.6% (61.9–65.2) in the 2007–2012 National Health and Nutrition Examination Survey.¹⁶ Second, the interval between doses of HepA vaccination is not available. Therefore, the important issue that whether the

Table 2

Adjusted odds ratios and 95% confidence intervals from weighted logistic regression with hepA vaccination initiation and completion among adults traveling to a country of high or intermediate endemicity, 2016–2017 NHIS

Characteristics	Initiation (≥ 1 dose)		Completion (≥ 2 doses)	
	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Chronic liver diseases				
No	1.00		1.00	
Yes	1.29 (0.83-2.03)	.26	1.18 (0.68-2.05)	.55
Ever lived with someone with hepatitis				
No	1.00		1.00	
Yes	1.20 (0.95-1.53)	.12	1.22 (0.92-1.61)	.16
Sexual orientation				
Not gay(man)/lesbian(woman)	1.00		1.00	
Gay(man)/lesbian(woman)/bisexual	1.50 (1.16-1.94)	<.01	1.67 (1.20-2.34)	<.01
Sex				
Man	1.00		—	
Woman	1.03 (0.93-1.14)	.58	—	
Born in the United States				
No	1.00		1.00	
Yes	1.00 (0.87-1.15)	1.00	0.97 (0.79-1.19)	.78
Age (y)				
18-39	1.00		1.00	
40-59	0.45 (0.41-0.51)	<.01	0.45 (0.40-0.51)	<.01
60-79	0.23 (0.20-0.27)	<.01	0.23 (0.19-0.29)	<.01
≥ 80	0.15 (0.10-0.22)	<.01	0.13 (0.08-0.21)	<.01
Region				
Northeast	1.00		1.00	
Midwest	1.01 (0.84-1.21)	.93	1.05 (0.85-1.31)	.64
South	1.13 (0.95-1.34)	.17	1.11 (0.90-1.36)	.34
West	1.45 (1.20-1.75)	<.01	1.59 (1.27-1.98)	<.01
Race				
Black	—		1.00	
White	—		0.99 (0.76-1.28)	.92
Asian	—		0.91 (0.65-1.28)	.60
Hispanic ethnicity				
Yes	1.00		1.00	
No	1.24 (1.05-1.47)	.01	1.33 (1.07-1.67)	.01
Marital status				
Never married	1.00		1.00	
Married/living with partner	0.80 (0.71-0.92)	<.01	0.83 (0.70-0.97)	.02
Widowed/divorced/separated	0.75 (0.63-0.90)	<.01	0.72 (0.57-0.90)	<.01
Class of worker				
Employee of private company	1.00		1.00	
Government employee	1.24 (1.10-1.40)	<.01	1.13 (0.97-1.31)	.12
Computer use				
Not everyday	1.00		1.00	
Everyday	1.29 (1.13-1.47)	<.01	1.27 (1.08-1.49)	<.01
Education				
High school or below	1.00		1.00	
Some college, no degree	1.27 (1.06-1.53)	<.01	1.24 (0.98-1.59)	.08
Associate degree or higher	1.59 (1.36-1.87)	<.01	1.61 (1.29-2.00)	<.01
Health insurance				
None	1.00		1.00	
Private	1.22 (0.97-1.53)	.09	1.25 (0.94-1.65)	.13
Public	1.08 (0.83-1.41)	.57	1.14 (0.81-1.59)	.46
Ratio of family income to the poverty threshold				
<1	1.00		1.00	
1-2	0.79 (0.64-0.97)	.03	0.75 (0.58-0.97)	.03
2-4	0.80 (0.65-0.98)	.03	0.81 (0.63-1.03)	.08
≥ 4	0.78 (0.64-0.96)	.02	0.87 (0.68-1.10)	.25
Drinking				
Abstainer	1.00		1.00	
Former	0.89 (0.73-1.09)	.27	0.89 (0.69-1.15)	.37
Current	0.93 (0.79-1.09)	.37	0.92 (0.75-1.12)	.39
Smoking				
Never	1.00		1.00	
Current	0.90 (0.76-1.06)	.19	0.93 (0.75-1.15)	.49
Former	0.90 (0.79-1.01)	.07	0.89 (0.77-1.02)	.09
Light/moderate activity (times per wk)				
Never	1.00		1.00	
1-4	1.23 (1.08-1.41)	<.01	1.19 (1.00-1.42)	.05
≥ 5	1.37 (1.20-1.58)	<.01	1.34 (1.13-1.59)	<.01
Pneumococcal vaccine				
Never	1.00		1.00	
Ever	1.82 (1.60-2.07)	<.01	1.97 (1.67-2.31)	<.01

(continued)

Table 2 (Continued)

Characteristics	Initiation (≥ 1 dose)		Completion (≥ 2 doses)	
	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Influenza vaccine				
Never	1.00		1.00	
Ever	1.39 (1.25-1.55)	<.01	1.48 (1.30-1.68)	<.01
No. of physician visits in the past 12 mo				
0	1.00		1.00	
1	1.26 (1.06-1.50)	.01	1.10 (0.90-1.36)	.35
2-3	1.12 (0.94-1.35)	.21	1.03 (0.83-1.28)	.78
≥ 4	1.40 (1.17-1.67)	<.01	1.34 (1.09-1.64)	<.01

CI, confidence interval; HepA, hepatitis A; NHIS, National Health Interview Survey; OR, odds ratio.

— These 2 characteristics were not included in multivariate analysis because the *P* values from univariate analysis were $>.10$. In addition, the variable of 'having a usual place for sick care' was also not included in multivariate analysis because the *P* value from univariate analysis was $>.10$.

multidose HepA vaccine was administered within the recommended schedule^{17,18} cannot be assessed in this analysis. Third, influences of knowledge on awareness of HepA and HepA vaccine on the HepA vaccination coverage cannot be assessed,¹⁹ and knowledge and beliefs on vaccines were found associated with other recommended vaccines.^{20,21} Finally, in this analysis, persons self-reporting receipt of 2 doses or more of HepA vaccine were considered to be completion of HepA vaccine. Although information of vaccine type are not available, persons self-reporting receipt of 2 doses of HepA vaccine were considered to be fully vaccinated for HepA in previous publications with the NHIS data.^{7,8}

CONCLUSIONS

To improve the coverage of HepA vaccination initiation among adults traveling to a country of high or intermediate endemicity, in addition to the specific risk factors of HepA infection, policymakers, researchers, and primary care providers could focus on the barriers of being older, living in the northeastern, midwestern, and southern United States, being of Hispanic ethnicity, having been married, being employed by private company, not having daily computer use, having a lower education, having a higher ratio of family income to the poverty threshold, having less physical activity, having no receipt of influenza vaccine and pneumococcal vaccine, and having less number of physician visits. Overall, the earlier mentioned recommendations could also be applicable to improve the coverage of HepA vaccination completion. Better education materials and communication methods focusing on these barriers could be developed to improve the coverage of HepA vaccination initiation and completion among adults traveling to a country of high or intermediate endemicity.

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