Human Papillomavirus Vaccine Initiation and Awareness
U.S. Young Men in the 2010 National Health Interview Survey

Peng-jun Lu, MD, PhD, Walter W. Williams, MD, MPH, Jun Li, MD, PhD, Christina Dorell, MD, MPH, David Yankey, MS, Deanna Kepka, PhD, MPH, Eileen F. Dunne, MD, MPH

Background: In 2009, the quadrivalent human papillomavirus (HPV) vaccine was licensed by the U.S. Food and Drug Administration for use in men/boys aged 9–26 years. In 2009, the Advisory Committee on Immunization Practices (ACIP) provided a permissive recommendation allowing HPV vaccine administration to this group.

Purpose: To assess HPV vaccination initiation and coverage, evaluate awareness of HPV and HPV vaccine, and identify factors independently associated with such awareness among men aged 18–26 years.

Methods: Data from the 2010 National Health Interview Survey were analyzed in 2011.

Results: In 2010, HPV vaccination initiation among men aged 18–26 years was 1.1%. Among the 1741 men interviewed in this age group, nearly half had heard of HPV (51.8%). Overall, about one third of these men had heard of the HPV vaccine (34.8%). Factors independently associated with a higher likelihood of awareness of both HPV and HPV vaccine among men aged 18–26 years included having non-Hispanic white race/ethnicity; a higher education level; a U.S. birthplace; more physician contacts; private health insurance; received other vaccines; and reported risk behaviors related to sexually transmitted diseases, including HIV.

Conclusions: HPV vaccination initiation among men aged 18–26 years in 2010 was low. HPV and HPV vaccine awareness were also low, and messages in this area directed to men are needed. Since ACIP published a recommendation for routine use of HPV4 among men/boys in December 2011, continued monitoring of HPV vaccination uptake among men aged 18–26 years is useful for evaluating the vaccination campaigns, and planning and implementing strategies to increase coverage.
(Am J Prev Med 2013;44(4):330–338) Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine

Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection in the U.S.; an estimated 6.2 million people aged 14–44 years are newly infected every year.[1,2] Of these new infections, 74% occur among people aged 15–24 years.[1] More than 50% of sexually active men and women will acquire HPV infection in their lifetime.[3]

Cancers related to HPV in men/boys include some anal, penile, and oropharyngeal cancers caused primarily by HPV type 16[4–8]; approximately 7000 HPV type 16– and 18–related cancers occur among men/boys each year.[4] Studies indicate that incidence of oropharyngeal and anal cancers in men are increasing[4,7,8]; an evaluation of data from 1973–2007 found increases of 1% per year for oropharyngeal cancers and 3% per year for anal cancers.[8] Additionally, approximately 250,000 cases of genital warts occur each year in the U.S. among sexually active men/boys.[9,10]

In June 2006, HPV vaccine (HPV4) directed against HPV types 6, 11, 16, and 18 was licensed by the U.S. Food

From the Immunization Services Division, National Center for Immunization and Respiratory Diseases (Lu, Williams, Dorell, Yankey), Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion (Li); Division of Sexually Transmitted Disease Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (Dunne), CDC, Atlanta, Georgia; and Division of Cancer Control and Population Sciences (Kepka), National Cancer Institute, Bethesda, Maryland

Address correspondence to: Peng-jun Lu, MD, PhD, National Center for Immunization and Respiratory Diseases, CDC, 1600 Clifton Road, NE, Mail Stop A-19, Atlanta GA 30333. E-mail: lhp8@cdc.gov.

0749-3797/$36.00
http://dx.doi.org/10.1016/j.amepre.2012.11.027

and Drug Administration (FDA) for use in women/girls.[1] In October 2009, the quadrivalent HPV vaccine was licensed by the FDA for use in men/boys aged 9−26 years for prevention of genital warts caused by HPV. Also in October 2009, the Advisory Committee on Immunization Practices (ACIP) voted and provided guidance that the HPV4 vaccine may be given to men/boys aged 9−26 years, noting that men who have sex with men (MSM) are particularly at risk for conditions associated with HPV infection. This guidance was officially published in May 2010.[11,12] The committee did not recommend routine use for men/boys at that time.[12]

In October 2011, ACIP recommended routine use of HPV4 among boys aged 11 or 12 years and recommended HPV4 for men/boys aged ≤21 years who have not been vaccinated previously or who have not completed the three-dose series. ACIP stated that men aged 22–26 years may also be vaccinated. HPV vaccination is recommended for men/boys aged ≤26 years if they have sex with men, or are immunocompromised (such as those with HIV infection), and have not been previously vaccinated.[4] Optimal use of vaccination strategies could potentially reduce the burden of HPV-related disease among men/boys.[11,12] Monitoring HPV vaccine initiation after vaccine licensure is important for evaluating the vaccination campaigns and planning and implementing strategies to increase coverage.

Few studies have evaluated and discussed HPV uptake and awareness of HPV and HPV vaccine among male adolescents.[13,14] Little is known regarding the national level of HPV vaccination uptake and awareness of HPV and HPV vaccine among younger U.S. men. The purpose of the current study is to address and examine the following questions using the 2010 National Health Interview Survey (NHIS) data: (1) What is the level of HPV vaccination initiation for men aged 18–26 years within 3–14 months after HPV4 was first licensed for men/boys? (2) What are awareness levels of HPV and HPV vaccine among men aged 18–26 years? and (3) What factors are independently associated with awareness of HPV and HPV vaccine among men aged 18–26 years? This study provides an opportunity to establish baseline indicators from which the impact of universal/routine recommendation can be determined. Also, opportunities are identified for future intervention focused on addressing low levels of awareness and HPV vaccination among men/boys.

Methods

The NHIS is an annual household survey conducted by the National Center for Health Statistics of the CDC.[15] The NHIS sample is selected through the use of a complex sampling design. Face-to-face interviews were conducted. In the sample adult core, one adult per sampled family was randomly selected and asked to complete the sample adult questionnaire.[15] In 2010, the final response rate for the sample adult core was 60.8%.[15] Data were collected in 2010 (in the NHIS survey); analyses were done in 2011.

To determine awareness of HPV, respondents were asked: *Have you ever heard of HPV? HPV stands for human papillomavirus.* To determine awareness of HPV vaccine, respondents were asked: *Have you ever heard of HPV vaccines or shots?* Finally, to determine HPV vaccine uptake, respondents were asked: *Have you ever received an HPV shot or vaccine?* Those who answered *yes* were asked: *How many HPV shots did you receive?*

Point estimates and 95% CIs were calculated (using SUDAAN) for vaccine uptake and awareness of HPV and HPV vaccine. All analyses were weighted to reflect the U.S. non-institutionalized, civilian population. Bivariable analysis was conducted and *t*-tests were used to test for difference in vaccine uptake and awareness of HPV and HPV vaccine for each variable. Because of the low levels of HPV vaccine initiation, it was not possible to conduct a multivariable analysis to further assess factors independently associated with HPV vaccine initiation. A multivariable logistic regression model was conducted to identify factors independently associated with awareness of HPV and the HPV vaccine among men aged 18–26 years, using adjusted prevalence ratios.

Results

The 2010 NHIS surveyed 1741 men aged 18–26 years. These men were mostly non-Hispanic white (60.7%); not married (86.4%); holders of private health insurance (54.2%); and employed (64.1%). Most lived at or above the federal poverty line (76.2%); were born in the U.S. (86.3%); had not been hospitalized within the past year (95.9%); and had a regular physician (64.3%; Table 1).

Vaccine Initiation

Results for initiation of HPV vaccine (≥1 dose) show (Table 2) that 1.1% (N=1741, 95% CI=0.6%, 2.2%) of men aged 18–26 years reported receiving ≥1 dose of HPV vaccine. Approximately 0.1% (95% CI=0.0%, 0.5%) of men aged 18–26 years reported receiving 3 doses of vaccine (series completion; data not shown). HPV vaccine initiation was higher among those living below the poverty level and those with awareness of HPV and HPV vaccine ($p<0.05$).

Awareness of Human Papillomavirus and the Vaccine

Overall, 51.8% men aged 18–26 years had ever heard of HPV, and 34.8% men aged 18–26 years had ever heard of HPV vaccine (Table 3). In bivariable analyses, among men aged 18–26 years, the following characteristics were associated with ever having heard of HPV and the HPV vaccine: non-Hispanic white race, higher educational level, higher income, birthplace in the U.S., increasing number of physician contacts, private insurance, past receipt of other recommended vaccinations, and reported STD/HIV-related high-risk behaviors (Table 3).

Table 1. Characteristics of U.S. men aged 18–26 years, NHIS 2010

Characteristic	Sample size, *n* (%)
Total	1741 (100)
Race/ethnicity	
Non-Hispanic white	881 (60.7)
Non-Hispanic black	243 (14.1)
Hispanic	469 (19.5)
Non-Hispanic Asian	101 (3.4)
Other	47 (2.3)
Marital status	
Married	221 (13.6)
Not married	1517 (86.4)
Education	
<high school	274 (15.8)
High school graduate	531 (32.1)
Some college	674 (40.0)
≥college graduate	257 (12.2)
Employment status	
Currently employed	1133 (64.1)
Not employed	607 (35.9)
Poverty level, %[a]	
≥300	444 (36.5)
200–<300	242 (16.3)
100–<200	388 (23.5)
<100	468 (23.8)
Immigration status	
Born in U.S.	1406 (86.3)
Born outside U.S. and stayed in U.S. ≤10 years	196 (7.1)
Born outside U.S. and stayed in U.S. >10 years	139 (6.6)
Hospitalization within past year	
Yes	64 (4.1)
No	1677 (95.9)
Physician contacts within past year	
0	759 (42.2)
1	383 (21.3)
2 or 3	335 (20.3)
4–9	190 (12.9)
≥10	55 (3.3)
Health insurance	
Private	902 (54.2)
Public	176 (10.1)
None	650 (35.7)
Having a regular physician for health care	
Yes	1038 (64.3)
No	692 (35.7)
One/more recommended vaccines in lifetime[b]	
Yes	1311 (78.0)
No	410 (22.0)
Cigarette use	
Current	408 (24.4)
Former	157 (8.5)
Never	1172 (67.1)
Month of interview	
January–May	691 (39.0)
June–December	1050 (61.0)
STD/HIV-related high-risk behavior[c]	
Yes	140 (6.6)
No	1574 (93.4)
Household with a female adolescent	
Yes	132 (10.5)
No	1609 (89.5)
Ever heard of HPV	
Yes	830 (51.8)
No	803 (48.2)
Ever heard of HPV vaccine	
Yes	546 (34.8)
No	1086 (65.2)

[a]Poverty level is determined by the U.S. Census Bureau based on household income and the number of people living in the household.

[b]Reported ever receiving hepatitis A (HepA); Hepatitis B (HepB); pneumococcal polysaccharide vaccine (PPV); or tetanus–diphtheria, or tetanus–diphtheria–acellular pertussis (Td/Tdap) vaccines

[c]Includes those who considered themselves at high risk for HIV infection, those who reported having an STD other than HIV/AIDS during the previous 5 years, and those who reported any one of the following risk factors: hemophilia with receipt of clotting factor concentrates, men who have sex with men, injecting street drugs, trading sex for money or drugs, testing positive for HIV, or having sex with someone with any of these risk factors

HPV, human papillomavirus; NHIS, National Health Interview Survey; STD, sexually transmitted disease

Table 2. Initiation of HPV among U.S. men aged 18–26 years, NHIS 2010

Characteristic	*n*	≥1 dose HPV vaccine, % (95% CI)	*p*-value
Total	1741	1.1 (0.6, 2.2)	
Race/ethnicity			
Non-Hispanic white[a]	881	0.9 (0.3, 2.3)	
Non-Hispanic black	243	1.0 (0.3, 3.4)	0.921
Hispanic	469	1.9 (0.5, 6.7)	0.488
Marital status			
Married[a]	221	0.9 (0.2, 3.7)	
Not married	1517	1.2 (0.5, 2.5)	0.776
Education			
<high school[a]	274	2.4 (0.7, 8.1)	
High school graduate	531	1.2 (0.3, 4.4)	0.446
Some college	674	0.6 (0.3, 1.3)	0.207
≥college graduate	257	1.1 (0.3, 3.7)	0.430
Employment status			
Currently employed	1133	1.0 (0.4, 2.4)	0.709
Not employed[a]	607	1.3 (0.5, 3.7)	
Poverty level, %[b]			
≥300	444	0.8 (0.1, 5.3)	0.197
200–<300	242	0.7 (0.2, 2.9)	0.110
100–<200	388	0.4 (0.1, 1.7)	**0.025***
<100[a]	468	2.1 (1.1, 4.1)	
Health insurance			
Private	902	1.4 (0.6, 3.5)	0.210
Public	176	1.8 (0.7, 4.5)	0.181
None[a]	650	0.6 (0.2, 1.6)	
Having a regular physician for health care			
Yes	1038	1.5 (0.7, 3.2)	0.125
No[a]	692	0.5 (0.2, 1.5)	
Month of interview			
January–May[a]	691	1.1 (0.5, 2.1)	
June–December	1050	1.1 (0.4, 3.2)	0.922
STD/HIV-related high-risk behavior[c]			
Yes	140	1.4 (0.3, 6.0)	0.809
No[a]	1574	1.1 (0.5, 2.3)	
Household with a female adolescent			
Yes	132	0.0 (—)[d]	N/A
No[a]	1609	1.2 (0.6, 2.5)	
Ever heard of HPV			
Yes	830	2.0 (1.0, 4.2)	**0.018***
No[a]	803	0.2 (0.0, 0.9)	
Ever heard of HPV vaccine			
Yes	546	2.8 (1.3, 5.9)	**0.020***
No[a]	1086	0.2 (0.1, 0.8)	

Note: Boldface indicates significance.
[a]Referent
[b]Poverty level is determined by the U.S. Census Bureau based on household income and the number of people living in the household.
[c]Includes those who considered themselves at high risk for HIV infection, who reported having an STD other than HIV/AIDS during the previous 5 years, and who reported any one of the following risk factors: hemophilia with receipt of clotting factor concentrates, men who have sex with men, injecting street drugs, trading sex for money or drugs, testing positive for HIV, or having sex with someone with any of these risk factors
[d]No respondents receiving vaccination in this group
*$p<0.05$ by *t*-test for comparisons within each variable with the indicated reference level
N/A, not applicable; HPV, human papillomavirus; NHIS, National Health Interview Survey; STD, sexually transmitted disease

Additionally, among men aged 18–26 years interviewed during January through May 2010, about 54% had heard of HPV, and 35% had heard of HPV vaccine. Among men aged 18–26 years interviewed during June through December 2010 (approximately 1 year after vaccine licensure), about 50% had heard of HPV, and 34% had heard of HPV vaccine. Thus, there was no difference between the two groups in awareness of HPV or HPV vaccine (Table 3).

In multivariable analysis among men aged 18–26 years, HPV awareness was lower among Hispanics and Asians compared to non-Hispanic whites (adjusted prevalence ratios 0.7 and 0.6, respectively, $p<0.05$). HPV awareness was lower among non-Hispanic blacks compared with non-Hispanic whites in bivariate analysis ($p<0.05$), but not after controlling for other factors. Awareness was higher among men with some college or more education compared to men with less than a high school education (adjusted prevalence ratios 1.6 and 1.6, respectively, $p<0.05$; Table 3).

For men in this age group, awareness of HPV vaccine was lower among Hispanics compared to non-Hispanic whites (adjusted prevalence ratios 0.7, $p<0.05$). Awareness was higher among men with some college or more education compared to men with less than a high school education (adjusted prevalence ratios 1.4 and 1.6, respectively, $p<0.05$; Table 3). Other characteristics independently associated with a

Table 3. Awareness of HPV and HPV vaccine among men aged 18–26 years, NHIS 2010, % (95% CI)

Characteristic	Awareness of HPV	Prevalence ratio (adjusted)	Awareness of HPV vaccine	Prevalence ratio (adjusted)
Total	51.8 (48.7, 54.8)		34.8 (31.7, 38.0)	
Race/ethnicity				
Non-Hispanic white[a]	60.0 (55.8, 64.1)	ref	40.0 (35.7, 44.4)	ref
Non-Hispanic black	**46.1 (37.9, 54.4)***	1.0 (0.8, 1.2)	33.1 (26.1, 40.9)	1.0 (0.8, 1.3)
Hispanic	**31.6 (26.8, 36.9)***	**0.7 (0.6, 0.9)***	**21.4 (16.7, 27.0)***	**0.7 (0.6, 1.0)***
Non-Hispanic Asian	**31.9 (19.8, 47.2)***	**0.6 (0.4, 0.9)***	**24.5 (15.0, 37.5)***	0.8 (0.5, 1.3)
Other	70.2 (48.0, 85.7)	1.4 (1.1, 1.7)	37.4 (21.8, 56.1)	1.1 (0.7, 1.7)
Marital status				
Married[a]	45.9 (38.1, 53.9)	ref	28.4 (22.0, 36.0)	ref
Not married	52.7 (49.4, 56.1)	1.1 (0.9, 1.3)	35.8 (32.5, 39.3)	1.1 (0.9, 1.4)
Education				
Less than high school[a]	32.4 (25.6, 40.1)	ref	22.4 (16.7, 29.4)	ref
High school graduate	**45.6 (40.1, 51.2)***	1.3 (1.0, 1.6)	26.0 (21.1, 31.4)	1.0 (0.7, 1.4)
Some college	**60.9 (55.9, 65.6)***	**1.6 (1.2, 2.0)***	**43.0 (37.9, 48.3)***	**1.4 (1.0, 1.9)***
≥College graduate	**65.0 (57.4, 71.9)***	**1.6 (1.3, 2.1)***	**48.8 (39.8, 57.8)***	**1.6 (1.1, 2.2)***
Employment status				
Currently employed[a]	52.4 (48.5, 56.4)	ref	37.1 (33.3, 41.2)	ref
Not employed	50.7 (45.8, 55.5)	1.0 (0.9, 1.2)	**30.7 (26.2, 35.6)***	0.8 (0.7, 1.0)
Poverty level, %[c]				
≥300	**59.4 (53.5, 65.2)***	1.1 (0.9, 1.3)	**42.9 (36.7, 49.3)***	1.2 (0.9, 1.5)
200–<300	51.1 (43.3, 58.8)	1.1 (0.9, 1.3)	**38.2 (31.1, 46.0)***	1.2 (1.0, 1.6)
100–<200	45.7 (39.5, 52.0)	1.1 (0.9, 1.2)	30.1 (25.1, 35.6)	1.0 (0.8, 1.3)
<100[b]	43.6 (37.6, 49.9)	ref	27.4 (22.7, 32.7)	ref
Immigration status				
Born in U.S.[a]	55.0 (51.5, 58.5)	ref	37.4 (34.0, 41.0)	ref
Born outside U.S. and stayed in U.S. ≤10 years	**19.0 (13.7, 25.7)***	**0.6 (0.5, 0.9)***	**9.6 (5.7, 15.7)***	**0.5 (0.3, 0.8)***
Born outside U.S. and stayed in U.S. >10 years	44.6 (34.2, 55.4)	1.1 (0.9, 1.4)	27.3 (18.0, 39.2)	0.9 (0.6, 1.3)
Hospitalization within past year				
Yes	61.4 (45.3, 75.4)	0.9 (0.6, 1.2)	36.8 (22.9, 53.4)	1.0 (0.6, 1.5)
No[a]	51.4 (48.2, 54.5)	ref	34.7 (31.5, 38.0)	ref
Physician contacts within past year				
None[a]	43.2 (38.6, 47.9)	ref	27.4 (23.5, 31.8)	ref
1	51.7 (44.4, 58.9)	1.1 (0.9, 1.3)	32.5 (26.3, 39.3)	1.1 (0.9, 1.4)
2 or 3	**59.0 (52.2, 65.4)***	**1.2 (1.0, 1.4)***	**46.0 (39.4, 52.7)***	**1.4 (1.2, 1.8)***
4–9	**66.4 (58.3, 73.6)***	**1.3 (1.1, 1.6)***	**46.9 (37.8, 56.1)***	**1.3 (1.0, 1.7)***
>10	**66.1 (48.8, 80.0)***	1.4 (1.0, 1.8)	31.8 (18.6, 48.7)	1.1 (0.7, 1.8)

(continued on next page)

Table 3. *(continued)*

Characteristic	Awareness of HPV	Prevalence ratio (adjusted)	Awareness of HPV vaccine	Prevalence ratio (adjusted)
Health insurance				
Private	**61.4 (57.1, 65.6)***	**1.3 (1.1, 1.6)***	**43.4 (38.8, 48.2)***	**1.4 (1.1, 1.7)***
Public	40.4 (32.1, 49.3)	1.0 (0.8, 1.3)	24.0 (17.4, 32.1)	1.1 (0.8, 1.5)
None[a]	40.7 (35.9, 45.7)	ref	24.6 (20.5, 29.3)	ref
Having a regular physician for health care				
Yes[a]	53.8 (49.8, 57.8)	ref	36.4 (32.5, 40.4)	ref
No	48.3 (43.4, 53.1)	**0.9 (0.8, 1.0)***	32.1 (27.8, 36.7)	**0.8 (0.7, 1.0)***
One/more recommended vaccines in lifetime[c]				
Yes	**56.0 (52.6, 59.5)***	**1.3 (1.1, 1.5)***	**37.4 (34.0, 41.0)***	**1.3 (1.0, 1.6)***
No[a]	36.5 (30.5, 43.0)	ref	25.2 (19.4, 32.0)	ref
Cigarette use				
Current[a]	52.6 (46.7, 58.5)	ref	33.1 (27.1, 39.6)	ref
Former	61.0 (51.8, 69.4)	1.0 (0.8, 1.2)	32.3 (23.8, 42.1)	0.8 (0.6, 1.2)
Never	50.3 (46.3, 54.3)	0.9 (0.8, 1.0)	35.8 (32.0, 39.7)	1.0 (0.8, 1.3)
Month of interview				
January–May[a]	54.4 (50.0, 59.3)	ref	35.2 (30.3, 40.3)	ref
June–December	50.0 (45.8, 54.3)	0.9 (0.8, 1.0)	34.1 (30.1, 38.4)	1.0 (0.8, 1.2)
STD/HIV-related high-risk behavior[d]				
Yes	**62.5 (52.9, 71.3)***	**1.3 (1.1, 1.5)***	45.6 (36.0, 55.4)[b]	**1.3 (1.0, 1.7)***
No[a]	51.0 (47.8, 54.2)	ref	34.0 (30.8, 37.4)	ref
Household with a female adolescent				
Yes	45.4 (34.8, 56.3)	1.0 (0.8, 1.3)	34.3 (24.7, 45.3)	1.2 (0.9, 1.6)
No[a]	52.5 (49.3, 55.7)	ref	34.5 (31.3, 37.9)	ref

Note: Boldface indicates significance.
[a]Reference level for comparison of percentage of awareness of HPV and HPV vaccine from bivariable analysis
[b]Poverty level is determined by the U.S. Census Bureau based on household income and the number of people living in the household.
[c]Reported ever receiving hepatitis A (HepA); Hepatitis B (HepB); pneumococcal polysaccharide vaccine (PPV); or tetanus–diphtheria, or tetanus–diphtheria–acellular pertussis (Td/Tdap) vaccines
[d]Includes those who considered themselves at high risk for HIV infection, who reported having an STD other than HIV/AIDS during the previous 5 years, and who reported any one of the following risk factors: hemophilia with receipt of clotting factor concentrates, men who have sex with men, injecting street drugs, trading sex for money or drugs, testing positive for HIV, or having sex with someone with any of these risk factors
*$p<0.05$ by *t*-test for comparisons within each variable with the indicated reference level
HPV, human papillomavirus; NHIS, National Health Interview Survey; STD, sexually transmitted disease

higher likelihood of awareness of both HPV and HPV vaccine among men aged 18–26 years included being born in the U.S., having a greater number of physician contacts, having private health insurance, having received other vaccines, and reporting STD/HIV-related high-risk behaviors (Table 3).

Discussion

The current study presents an important source of baseline data that can be used to monitor HPV vaccination initiation and awareness among men. The timing of this analysis, which is post-licensure for HPV vaccine in men/boys, is critical, given that the ACIP has subsequently issued a routine recommendation.[4] In this national assessment of interviews conducted about 3–14 months after the quadrivalent HPV vaccine was first licensed in men/boys and after ACIP provided guidance on the use of the vaccine in men/boys, awareness of HPV and of HPV vaccine in men aged 18–26 years was 52% and 35%, respectively. Only 1.1% of men aged 18–26 years had initiated HPV vaccination. Results from the current

study are not surprising because although the vaccine was licensed, ACIP recommended only that the HPV vaccine could be used in men/boys aged 9–26 years at the time of the survey. Coverage may increase in the next several years, as ACIP subsequently issued a recommendation for routine vaccination in December 2011.[4]

Awareness of HPV and HPV vaccine affect vaccination coverage.[16] Assessing awareness of HPV and HPV vaccine is important for developing tailored intervention programs to improve HPV-related knowledge and vaccine uptake. In contrast to the findings from surveys of women taken 1 year after vaccine licensure, which indicate that >80% are aware of both HPV and HPV vaccine,[16] the current study found that men had lower HPV and HPV vaccine awareness (51.8% and 34.8%, respectively, 3–14 months after vaccine licensure). One reason may be that women are more concerned about cervical cancer and thus may have comparatively better knowledge of HPV and HPV vaccine.[17,18] Another reason could be that there was marketing about HPV disease (pre–vaccine licensure) and about the vaccine (post-licensure) directed specifically to women.[19–31]

In addition, after vaccine licensure, ACIP recommended routine vaccination for women/girls but not for men/boys, stating only that the HPV4 vaccine may be given to men/boys aged 9–26 years.[1,12] This difference in recommendation may affect awareness of HPV and HPV vaccine between the genders, and may confuse people and affect vaccine initiation for men/boys. Other studies have similarly reported that women/girls had more HPV-related knowledge than men/boys.[17,18,20]

Several characteristics were independently associated with higher awareness of HPV and HPV vaccine. Racial and ethnic disparities were noted; non-Hispanic white men had higher HPV and HPV vaccine awareness compared to Hispanic, non-Hispanic Asian, and non-Hispanic black men aged 18–26 years, although there was no disparity for non-Hispanic black men after controlling for other factors. Higher education was also associated with higher HPV and HPV vaccine awareness among this age group, consistent with other studies.[16,21]

Education programs, materials, and information about HPV and the vaccine have been disseminated and provided to providers, patients/parents, and the general public.[4,22–26] Such information may improve HPV and HPV vaccine knowledge for diverse racial/ethnic groups and all educational levels.[27,28] Educating men is particularly important because the HPV vaccine has been targeted toward women, mothers and adolescent girls, with a focus on prevention of cervical cancer.[22–26] With the addition of men/boys in vaccine recommendations, newer materials need to address the issues and concerns of men.

Men with a greater number of physician contacts had higher awareness of HPV and HPV vaccine. People who have more frequent physician contact have more opportunities to discuss their health status and thus may know or understand more about vaccination. Studies have shown that a doctor's recommendation is a key determinant of HPV vaccine acceptability and uptake among women/girls.[32,33] Healthcare providers are one of the main sources of HPV vaccine information among women/girls[34] and may play an important role in vaccine uptake among men/boys. Future interventions targeting healthcare providers might help increase HPV vaccine uptake among men/boys. For example, physician vaccination reminder systems may help increase vaccination coverage, but they are underused by healthcare providers.[35,36]

Lack of medical insurance has been associated with not being vaccinated among adults.[16,37–44] The current study indicated that approximately 36% of men aged 18–26 years had no medical insurance. For uninsured individuals, there are limited opportunities to access a medical home or usual sources of care, and this lack has been associated with lower vaccination coverage.[45–47] Vaccination may need to be paid for out-of-pocket for those without medical insurance and for some with medical insurance that does not cover the cost of the vaccine.

The vaccine manufacturer has implemented a program (Merck Vaccine Patient Assistance Program) that provides free vaccines including the HPV vaccine to all adults who are uninsured and have a household income of less than $20,800 for individuals, $28,000 for couples, or $42,400 for a family of four.[48] The CDC's Section 317 Grants Program provides the immunization infrastructure to deliver vaccines to underinsured children, and uninsured and underinsured adults.[49] This program might help improve vaccination coverage among uninsured and poor adult populations; however, variation by state in how funds are used for HPV vaccination may affect coverage. Although these programs help provide vaccines for adults, there is a recognized gap in coverage for adult immunizations.[38–44,50] The Affordable Care Act may help improve vaccination coverage because the expanded enrollment in public and private insurance programs expected from its provisions is likely to improve access to healthcare services, including vaccination.[51]

Limitations

The findings in this study are subject to limitations. Data for this study were collected by self-report, and vaccination was not verified by medical records. Previous studies have found that self-report of pneumococcal vaccination by adults was moderately or highly sensitive and moderately specific compared with reviews of medical records,[52,53] and self-report of influenza vaccination by adults also has been shown to have high sensitivity and moderate specificity.[52] Validity studies regarding self-reported HPV vaccination among adults have not been reported; however, one study showed that

parent-reported HPV vaccination was highly sensitive and specific compared with provider report.[54] Additionally, few men reported HPV vaccine initiation, precluding further evaluation of predictors of HPV vaccine initiation.

Conclusion

Soon after the vaccine was licensed, only 1.1% of men aged 18–26 years had initiated HPV vaccination, and awareness of HPV and HPV vaccine among men were low. Efforts should be directed toward providing comprehensive, accessible, and appropriate messages on HPV and HPV vaccine directed to men. Greater use of strategies demonstrated to improve vaccination coverage are needed, including use of implementation of standing orders programs, use of media promotions and educational programs, and financing to reduce client out-of-pocket expenses.[34,55]

The authors thank James A. Singleton, Stacie M. Greby, and Mary M. McCauley for their thoughtful review of the paper.

No financial disclosures were reported by the authors of this paper.

References

1. CDC. Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2007;56(RR-2):1–24.
2. Schiffman M, Kjaer SK. Natural history of anogenital human papillomavirus infection and neoplasia. J Natl Cancer Inst Monogr 2003;31:14–9.
3. Koutsky L. Epidemiology of genital human papillomavirus infection. Am J Med 1997;102:3–8.
4. CDC. Recommendations on the use of quadrivalent human papillomavirus vaccine in males—Advisory Committee on Immunization Practices (ACIP), 2011. MMWR Morb Mortal Wkly Rep 2011;60(50):1705–8.
5. Joseph DA, Miller JW, Wu X, et al. Understanding the burden of human papillomavirus-associated anal cancers in the U.S. Cancer 2008;113(10S):2892–900.
6. Gillison ML, Chaturvedi AK, Lowy DR. HPV prophylactic vaccines and the potential prevention of noncervical cancers in both men and women. Cancer 2008;113(10S):3036–46.
7. Chaturvedi AK, Engels EA, Pfeiffer RM, et al. Human papillomavirus and rising oropharyngeal cancer incidence in the U.S. J Clin Oncol 2011;29:4294–301.
8. Saraiya M. Burden of HPV-associated cancers in the U.S. Presentation before the Advisory Committee on Immunization Practices (ACIP), February 24, 2011. Atlanta GA: DHHS, CDC, 2011. www.cdc.gov/vaccines/recs/acip/downloads/mtg-slides-feb11/11-2-hpv-rela-cancer.pdf.
9. Hu D, Goldie S. The economic burden of noncervical human papillomavirus disease in the U.S. Am J Obstet Gynecol 2008;198:500–7.
10. Hoy T, Singhal PK, Willey VJ, Insinga RP. Assessing incidence and economic burden of genital warts with data from a U.S. commercially insured population. Curr Med Res Opin 2009;25:2343–51.
11. CDC. The Advisory Committee on Immunization Practices (ACIP): summary report, October 27−28, 2010, Atlanta GA. www.cdc.gov/vaccines/recs/acip/downloads/min-archive/min-oct10.pdf.
12. CDC. FDA licensure of quadrivalent human papillomavirus vaccine (HPV4, Gardasil) for use in males and guidance from the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep 2010;59(20):630–2.
13. Gutierrez B Jr, Leung A, Jones KT, et al. Acceptability of the human papillomavirus vaccine among urban adolescent males. Am J Mens Health 2013;7(1):27–36.
14. Reiter PL, McRee AL, Kadis JA, Brewer NT. HPV vaccine and adolescent males. Vaccine 2011;29(34):5595–602.
15. CDC. National Health Interview Survey. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2010/srvydesc.pdf.
16. Jain N, Euler GL, Shefer A, Lu P, Yankey D, Markowitz L. Human papillomavirus (HPV) awareness and vaccination initiation among women in the U.S., National Immunization Survey-Adult 2007. Prev Med 2009;48(5):426–31.
17. Medeiros R, Ramada D. Knowledge differences between male and female university students about human papillomavirus (HPV) and cervical cancer: implications for health strategies and vaccination. Vaccine 2010 16;29(2):153–60.
18. Marek E, Dergez T, Rebek-Nagy G, et al. Adolescents' awareness of HPV infections and attitudes towards HPV vaccination 3 years following the introduction of the HPV vaccine in Hungary. Vaccine 2011;29(47):8591–8.
19. Pitching protection, to both mothers and daughters. www.nytimes.com/2007/02/18/arts/television/18dede.html?_r=2.
20. Oh JK, Lim MK, Yun EH, Lee EH, Shin HR. Awareness of and attitude towards human papillomavirus infection and vaccination for cervical cancer prevention among adult males and females in Korea: a nationwide interview survey. Vaccine 2010;28:1854–60.
21. Tiro JA, Meissner HI, Kobrin S, Chollette V. What do women in the U.S. know about human papillomavirus and cervical cancer? Cancer Epidemiol 2007;16(2):288–94.
22. CDC. Education & training: 2012 epidemiology & prevention of vaccine-preventable diseases. www.cdc.gov/vaccines/ed/epivac/default.htm.
23. CDC. Education & training: vaccine-preventable diseases: HPV vaccination. www.cdc.gov/vaccines/vpd-vac/hpv/default.htm.
24. HPV vaccine now recommended for boys and young men. www.medscape.com/viewarticle/759820.
25. HPV4 vaccine information statement. www.cdc.gov/vaccines/pubs/vis/downloads/vis-hpv-gardasil.pdf.
26. HPV vaccines offer disease protection pre-teens can grow into—now for girls and boys. www.cdc.gov/media/subtopic/matte/pdf/2010/hpvvaccine_preteens.pdf.
27. Callahan ST, Cooper WO. Gender and uninsurance among young adults in the U.S. Pediatrics 2004;113(2):291–7.
28. Sherris J, Friedman A, Wittet S, Davies P, Steben M, Saraiya M. Chapter 25: Education, training, and communication for HPV vaccines. Vaccine 2006;24(S3):S210–S218.
29. Cui Y, Baldwin SB, Wiley DJ, Fielding JE. Human papillomavirus vaccine among adult women: disparities in awareness and acceptance. Am J Prev Med 2010;39(6):559–63.
30. Niccolai LM, Mehta NR, Hadler JL. Racial/ethnic and poverty disparities in human papillomavirus vaccination completion. Am J Prev Med 2011;41(4):428–33.
31. Liddon NC, Leichliter JS, Markowitz LE. Human papillomavirus vaccine and sexual behavior among adolescent and young women. Am J Prev Med 2012;42(1):44–52.
32. Reiter PL, Brewer NT, Gottlieb SL, McRee AL, Smith JS. Parents' health beliefs and HPV vaccination of their adolescent daughters. Soc Sci Med 2009;69(3):475–80.
33. Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: a theory informed, systematic review. Prev Med 2007;45(2–3):107–14.

34. Hughes J, Cates JR, Liddon N, Smith JS, Gottlieb SL, Brewer NT. Disparities in how parents are learning about the human papillomavirus vaccine. Cancer Epidemiol Biomarkers Prev 2009;18(2):363–72.
35. Briss PA, Rodewald LE, Hinman AR, et al. Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. The Task Force on Community Preventive Services. Am J Prev Med 2000;18(1S):97–140.
36. Tierney CD, Yusuf H, McMahon SR, et al. Adoption of reminder and recall messages for immunizations by pediatricians and public health clinics. Pediatrics 2003;112(5):1076–82.
37. Anhang Price R, Tiro JA, Saraiya M, Meissner H, Breen N. Use of human papillomavirus vaccines among young adult women in the U.S.: an analysis of the 2008 National Health Interview Survey. Cancer 2011;117(24):5560–8.
38. Miller BL, Kretsinger K, Euler GL, Lu PJ, Ahmed F. Barriers to early uptake of tetanus, diphtheria and acellular pertussis vaccine (Tdap) among adults—U.S., 2005–2007. Vaccine 2011;29(22):3850–6.
39. Lu PJ, Euler GL, Hennessey KA, Weinbaum CM. Hepatitis A vaccination coverage among adults aged 18-49 years in the U.S. Vaccine 2009;27(9):1301–5.
40. Bednarczyk RA, Birkhead GS, Morse DL, Doleyres H, McNutt LA. Human papillomavirus vaccine uptake and barriers: association with perceived risk, actual risk and race/ethnicity among female students at a New York State university, 2010. Vaccine 2011;29(17):3138–43.
41. Taylor LD, Hariri S, Sternberg M, Dunne EF, Markowitz LE. Human papillomavirus vaccine coverage in the U.S., National Health and Nutrition Examination Survey, 2007–2008. Prev Med 2011;52(5):398–400.
42. Stokley S, Cohn A, Dorell C, et al. Adolescent vaccination-coverage levels in the U.S.: 2006−2009. Pediatrics 2011;128(6):1078–86.
43. Egede LE, Zheng D. Racial/ethnic differences in adult vaccination among individuals with diabetes. Am J Public Health 2003;93(2):324–9.
44. Smith PJ, Stevenson J, Chu SY. Associations between childhood vaccination coverage, insurance type, and breaks in health insurance coverage. Pediatrics 2006;117(6):1972–8.
45. Kempe A, Beaty B, Englund BP, Roark RJ, Hester N, Steiner JF. Quality of care and use of the medical home in a state-funded capitated primary care plan for low-income children. Pediatrics 2000;105(5):1020–8.
46. Holl JL, Szilagyi PG, Rodewald LE, et al. Evaluation of New York State's Child Health Plus: access, utilization, quality of health care, and health status. Pediatrics 2000;105(3S E):711–8.
47. Dombkowski KJ, Lantz PM, Freed GL. Role of health insurance and a usual source of medical care in age-appropriate vaccination. Am J Public Health 2004;94(6):960–6.
48. Merck Vaccine Patient Assistance Program. www.merck.com/merckhelps/vaccines/qualify.html.
49. CDC. Immunization Grant Program (Section 317). www.cdc.gov/NCIRD/progbriefs/downloads/grant-317.pdf.
50. CDC. Adult vaccination coverage, U.S., 2010. MMWR Morb Mortal Wkly Rep 2012;61(4):66–72.
51. The Affordable Care Act. www.healthcare.gov/law/full/index.html.
52. Donald RM, Baken L, Nelson A, Nichol KL. Validation of self-report of influenza and pneumococcal vaccination status in elderly outpatients. Am J Prev Med 1999;16(3):173–7.
53. Shenson D, Dimartino D, Bolen J, Campbell M, Lu PJ, Singleton JA. Validation of self-reported pneumococcal vaccination in behavioral risk factor surveillance surveys: experience from the sickness prevention achieved through regional collaboration (SPARC) program. Vaccine 2005;23(8):1015–20.
54. Dorell CG, Jain N, Yankey D. Validity of parent-reported vaccination status for adolescents aged 13-17 years: National Immunization Survey-Teen, 2008. Public Health Rep 2011;126(S2):60–9.
55. Poland GA, Shefer AM, McCauley M, et al. Standards for adult immunization practice. Am J Prev Med 2003;25(2):144–50.

Did you know?
The latest *AJPM* news is available online.
Visit www.ajpmonline.org to see the "News from *AJPM*" section on the homepage.