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Human papillomavirus (HPV) awareness and vaccination initiation among women in the United States, National Immunization Survey—Adult 2007

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ABSTRACT

Objectives. To report awareness of human papillomavirus (HPV) and HPV vaccine among women aged 18–49 years and, for recommended women aged 18–26 years, estimate initiation of HPV vaccination and describe factors associated with vaccination initiation among a national sample.

Methods. Data were analyzed from the National Immunization Survey—Adult, a nationally representative telephone survey conducted May–August 2007. Questions were asked about awareness of HPV and HPV vaccine and vaccine receipt.

Results. A total of 1102 women aged 18–49 years were interviewed, 168 were aged 18–26 years. Overall, awareness of HPV (84.3%) and of HPV vaccine (78.9%) were high. Among women 18–26 years of age, vaccination initiation (≥1 dose) was 10%. Factors associated with vaccination included not being married, living ≥200% of the federal poverty index, having health insurance, and vaccination with hepatitis B vaccine. HPV vaccination initiation among women aged 27–49 years was 1%.

Conclusions. Awareness of HPV and HPV vaccine were high. Two to 5 months after national HPV vaccination recommendations were published, one in ten women 18–26 years old had initiated the HPV vaccine series. Women at a higher socio-economic level were more likely to receive the vaccination. Vaccination initiation and completion will likely increase over the next years. Monitoring uptake is important to identify sub-groups that may not be receiving the vaccination.

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Introduction

A quadrivalent human papillomavirus (HPV) vaccine (Gardasil®) that prevents four HPV types was licensed in 2006. In June 2006, the Advisory Committee on Immunization Practices (ACIP) recommended routine vaccination of girls 11–12 years old and catch-up vaccination for females 13–26 years old. Recommendations were published by the Centers for Disease Control and Prevention (CDC) in March 2007 (CDC, 2007).

HPV infection is a highly prevalent sexually transmitted infection. Up to 80% of sexually active females have been exposed to the virus by age 50 years (Meyers et al., 2000). While HPV infection is common in all socio-demographic groups, higher prevalence has been found among women who are unmarried, have lower education, have lower socio-economic status, and belong to certain racial/ethnic groups (Dunne et al., 2007). HPV vaccine has high efficacy for prevention of HPV vaccine types and related outcomes (Future II Study Group, 2007; Garland et al., 2007). Barriers to vaccination include costs, limited vaccine availability, and lack of vaccine awareness (Herzog et al., 2008). Women are more likely to accept vaccination if they believe they are at risk of HPV infection and the vaccine is effective and if a provider recommends it (Brewer and Fazekas, 2007).

Our objectives are to report awareness of HPV and HPV vaccine among a nationally representative sample of U.S. women aged 18–49 years. We estimate HPV vaccination series initiation and describe factors associated with early uptake among women aged 18–26 years. We also present "off-label" use of HPV vaccine among women aged 27–49 years (use of vaccine among a group not licensed nor included in the ACIP recommendations).

Methods

We used data collected by the National Immunization Survey—Adult (NIS—Adult), a national telephone survey of 7055 respondents aged 18 years and older conducted May through August 2007. The NIS—Adult sampled adults from two targeted lists: age and race targeted from the National Health Interview Survey (NHIS), a national household survey conducted face-to-face (http://www.cdc.gov/nchs/nhis.htm), and age-targeted from Survey Sampling International (SSI) (http://www.surveysampling.com).

Both sample lists included information about adults in the household. From the NHIS list, one individual was selected from each household based on an unequal probability of selection within age and race/ethnicity stratum. The NHIS list was considered the primary sample and the SSI list was used to fill strata that fell short of target stratum specific sample sizes of telephone numbers from the

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Table 1
Questions about human papillomavirus (HPV) and HPV vaccination on the National Immunization Survey—Adult, United States, 2007

Q1. The human papillomavirus is a common virus known to cause genital warts and some cancers, such as cervical cancer in women. Before today, have you ever heard of the human papillomavirus or HPV? This is not HIV.
Q2. A vaccine to prevent HPV infection is available and is called the cervical cancer vaccine, HPV shot, or GARDASIL®. The vaccine was licensed and approved in June 2006. Before today, have [you] heard of the cervical cancer vaccine, HPV shot, or GARDASIL®? If no: SKIP to Q6.
Q3. Have you ever had the HPV vaccination? If no: SKIP to Q5.
If yes: Q4. How many HPV shots did you receive?
Q5. Has a doctor or other health professional ever recommended that you get the HPV vaccination? If yes: Go to Q7. If no: Go to Q6.
Q6. Would you get the HPV vaccination if your doctor or other health professional recommended it? If yes: STOP If no: Go to Q7.
Q7. What is the main reason you would/did not receive HPV vaccination? (Verbatim response recorded).

NHIS list. Within each household on the SSI list, one adult was randomly selected. Trained personnel conducted interviews in English and Spanish using a computer-assisted telephone interview system.

Questions

The questionnaire asked about socio-demographic characteristics and medical insurance coverage. Questions were designed and refined in an iterative process by physicians and scientists from CDC, National Opinion Research Centers (NORC), the National Institutes of Health (NIH) and the California Department of Health Services. Questions were cognitively and field tested. Only women aged 18–49 years were asked questions about HPV and the vaccine (Table 1). Verbatim responses for "the main reasons to not receive HPV vaccination"(Q7) were categorized by at least two CDC staff.

Statistical analyses

Analyses were weighted to reflect differential probabilities of selection, unit nonresponse, multiple telephone lines, and noncoverage of adults in nonlandline households (Hartley, 1962; Smith et al., 2005; Wolter, 2007). In addition, weights were adjusted by independent estimates of the size of the eligible adult population by age, sex, race, educational attainment, census region, and telephone interruption status. SAS was used for statistical analyses. SUDAAN (Research Triangle Institute, Research Triangle Park, NC) was used to calculate point estimates and 95% confidence intervals accounting for the complex sample design. Chi-square tests were used to determine associations between variables and *t*-tests were used to determine significance within strata with multiple levels; cut off statistical significance was $p<0.05$. We conducted multivariable logistic regression analyses to determine factors independently associated with HPV and HPV vaccine awareness and to determine factors independently associated with initiation of the HPV vaccine series among women aged 18–26 years old. However, because of lack of reliability due to small sample sizes, the results of the analysis of factors associated with HPV vaccine initiation are not presented.

Results

Of all telephone numbers, 64.4% were determined to be either residential or business (resolution rate); 63.9% of these were successfully screened (screening rate); and the interview completion rate among eligible households was 74.2%. Among adults in households interviewed, 1102 were women aged 18–49 years. Their unweighted and weighted demographic characteristics representing the U.S. population are shown in Table 2.

Awareness of HPV

Awareness of HPV was high. Overall, 84.3% of women had heard of HPV. More women aged 18–26 years had heard of HPV than women aged 27–49 years (88.6% vs. 82.9%, $p<0.05$). HPV awareness varied by racial/ethnic group, highest education level obtained, household federal poverty index, and medical insurance coverage depending on the age group in the bivariate analysis (Table 3).

Multivariable logistic regression analysis showed that among women aged 18–26 years, Hispanic women were less likely to be aware of HPV compared to non-Hispanic white women. Among

Table 2
Unweighted[a] and weighted[b] demographic characteristics of women aged 18–26 years and 27–49 years, National Immunization Survey—Adult, United States, 2007 ($n=1102$)

Characteristic	18–26 years ($n=168$)			27–49 years ($n=934$)		
	n	%	Weighted % (95% CI)	*n*	%	Weighted % (95% CI)
Race/ethnicity	168			934		
White, non-Hispanic		30.0	53.5 (43.7–63.0)		38.9	61.2 (56.5–65.7)
Black, non-Hispanic		19.6	17.5 (11.4–25.8)		21.3	12.7 (10.1–15.8)
Hispanic		42.3	15.5 (11.6–22.4)		30.8	14.5 (12.2–17.2)
Other, non-Hispanic		10.1	12.8 (7.5–20.8)		9.0	11.7 (8.8–15.4)
Educational level	168			929		
>High school		49.9	49.9 (38.8–59.2)		67.0	61.8 (56.9–66.5)[c]
Marital status	168			929		
Married		19.7	18.4 (12.1–27.1)		72.8	72.0 (67.8–75.9)[c]
Poverty index	130			830		
≤100%		21.5	20.6 (13.6–30.0)		15.8	15.9 (12.5–20.0)
100% to <200%		24.5	24.0 (15.1–36.0)		15.0	16.8 (13.3–20.9)
≥200%		54.0	55.4 (43.7–66.4)		69.3	67.3 (62.4–71.9)
Residence within city limits	166			921		
Yes		75.5	74.2 (64.0–82.4)		71.2	70.4 (65.6–74.8)
Medical insurance	168			934		
Yes		75.0	76.6 (67.0–84.0)		85.1	85.1 (81.6–88.1)
Ever received ≥1 hepatitis B vaccination	150			825		
Yes		73.9	75.2 (65.2–83.0)[c]		46.6	47.7 (42.9–52.6)

n = sample size; % = percentage.
95% CI = 95% confidence interval.
[a] Percentages in the columns titled with "%" are unweighted for the race/ethnicity variable, but partially weighted for the other variables. The partial weights adjust for the oversampling of Hispanics and for non-response, but are not post-stratified.
[b] Percentages in the "Weighted %" columns use the partial weights after post-stratification (adjusted to the control population—the U.S. population—distribution).
[c] Differences between 18–26 year-olds and 27–49 year-olds significant by χ^2 test; $p\leq0.05$.