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Human papillomavirus vaccine knowledge and hypothetical acceptance among women in Appalachia Ohio

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Abstract

Objective—To assess hypothetical acceptance of the human papillomavirus (HPV) vaccine for themselves and a daughter age 9–12 years among Appalachia Ohio women.

Methods—Women with an abnormal Pap smear and randomly selected women with a normal Pap smear from 17 clinics completed an interview in 2006–2008.

Results—From 1131 original study participants, 807 (71%) completed a survey about the HPV vaccine for their daughters and themselves. Nearly half, 380 (47%), of the participants had heard of a vaccine to prevent cancer, and 362 (95%) of respondents had heard of HPV. The participants were then told that the FDA had approved a vaccine to prevent HPV. Only 379 (38%) participants identified girls ages 9–12 years as a group who should get the vaccine. After being given the official HPV vaccine recommendation statement, 252 (31%) wanted the vaccine; 198 (25%) were “not sure”; and 353 (44%) did not want the vaccine for themselves. With respect to giving the HPV vaccine to a daughter ages 9–12 years, participants responded “yes” 445 (55%); “not sure” 163 (20%); or “no” 185 (23%). Numerous reasons were provided supporting and opposing vaccine acceptance for themselves and for a daughter. Their physician’s recommendation for the HPV vaccine increased vaccine acceptance to 86% for themselves and 90% for a daughter.

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Conclusion—Knowledge, acceptance, and barriers about the HPV vaccine vary among women living in Appalachia Ohio. Physician recommendation is a key facilitator for vaccine diffusion in this region.

Keywords

Human Papillomavirus; Papillomavirus Vaccines; Women; Rural Population; Attitude to Health

Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States (U.S.) [1]. It is well established that high-risk HPV types (16 and 18), account for approximately 70% of cervical cancers [2], and low-risk HPV types (6 and 11) cause genital warts and low-grade cervical lesions, but do not lead to cervical cancer [3]. A quadrivalent vaccine, Gardasil, was licensed by the U.S. Food and Drug Administration (FDA) in June 2006 and protects against HPV types 6-, 11-, 16- and 18-related disease in young women [4] and men [5]. The Advisory Committee on Immunization Practices (ACIP) currently recommends vaccination of females who are 11–12 years old, but the vaccine can be administered as early as age 9 [6]. Catch-up vaccinations are recommended for females' ages 13–26 who have not been previously vaccinated [6]. In 2009, ACIP told clinicians that the vaccine could be given to young men ages 9–26 but did not make a recommendation for routine use at that time [7]. Additionally, in 2009 a second vaccine to prevent only HPV types 16- and 18-related diseases was approved for use for young women [8].

Prior to FDA approval of HPV vaccines, numerous studies were completed to assess parental acceptance of a theoretical HPV vaccine. Overall, this research suggested that most parents would be accepting of having their adolescents and pre-adolescents vaccinated against HPV [9–15]. While parents in general are accepting of HPV vaccination for their daughters [16, 17], some parents are concerned that the HPV vaccine may lead to earlier sex initiation or increased risky sexual behaviors [10, 14]. Since the approval of the HPV vaccine, data from focus groups of parents, community leaders, and healthcare providers throughout Ohio Appalachia reported unique themes of barriers (healthcare access, poor provider-patient communication, not having time), lack of knowledge (about cervical cancer, HPV, and HPV vaccine), and cultural attitudes (pride, religious, conservative) [18]. Appalachian self-identification may be a marker of these values and beliefs that may represent women not receptive to HPV vaccination [19].

From interviews of 52 mothers, others have identified lack of knowledge about HPV, age-related concerns, and low perceived risk of infection as reasons for declining vaccination [20]. Parents' religiosity, perceived perception that their child is susceptible to HPV, and perceived negative consequences of HPV infection were significant predictors of parents' intent to vaccinate as well [21]. In another survey, among parents aware of the HPV vaccine, 19% had already vaccinated their daughter(s), 34% intended to, 24% were undecided, and 24% had decided against vaccination [22].

Decision-making authority for vaccination and other medical services given to an individual younger than 18 years old is generally placed with parents or those responsible for their care [22, 23]. One-fourth (25.1%) of adolescent females aged 13–17 years initiated the vaccine series (1 dose) in 2007 [24]. Between 2008 and 2009, National Immunization Survey-Teen data showed an increase in HPV vaccine initiation from 37.2% to 44.3% and in HPV vaccine series completion (3 doses) from 17.9% to 26.7% among adolescent females [25]. Still, coverage remains far from the Healthy People 2010 objective of increasing HPV vaccine series completion to 80% among females aged 13–15 [26].

Currently, one area with high cervical cancer mortality in the U.S. is Appalachia, a geographic region that stretches from southern New York to northern Georgia, Alabama, and Mississippi [27, 28]. Young women living in the Appalachian region may have the greatest potential to benefit from widespread diffusion and uptake of the HPV quadrivalent vaccine given the high cervical cancer and high HPV infection rates in this region. However, there are limited data on the knowledge and acceptance of the HPV vaccine from women living in Appalachia [18]. From our experience in this rural, conservative population, we hypothesized that women would not be familiar with HPV or the vaccine. We also hypothesized that they would not be interested in receiving the vaccine for themselves or for a daughter. We sought to describe and characterize women who were familiar with the vaccine, those who would want the vaccine for themselves and those who would want it for a daughter, and the reasons for these responses. Finally, we hypothesize that women with a current abnormal Pap smear or a history of abnormal Pap smears would be more likely to want the vaccine for themselves or a daughter, given the exposure to abnormal screening tests.

Materials and Methods

The Community Awareness, Resources and Education (CARE) Project, was one of eight National Institutes of Health-funded Centers for Population Health and Health Disparities. The goal of the CARE project was to investigate and characterize the environmental, societal, behavioral, and biological mechanisms of cervical abnormalities among women living in Appalachia Ohio. This paper reports on research conducted in one of the CARE projects, a case-control study designed to examine factors related to the risk of an abnormal Pap test. The present study was conducted as an ancillary study to this project. The Institutional Review Boards of The Ohio State University, the University of Michigan, and the Centers for Disease Control and Prevention (CDC) approved this study.

Women were eligible to participate in the CARE case-control study if they were age 18 or older, a resident of Appalachia Ohio, had an intact uterine cervix and corpus, were not pregnant, and did not have a history of cervical cancer. Women scheduled for a routine Pap smear on a day that a study nurse was in 1 of 17 clinics located throughout Appalachia Ohio were asked to participate in the parent study. On the day of the Pap smear, women signed a written informed consent, completed a short self-administered questionnaire prior to undergoing cervical cancer screening, and provided blood and saliva samples (self-reported smokers only). A unique demographic question in the survey was Appalachian self-identity [19]. The Appalachian self-identity question, “Do you consider yourself to be Appalachian?” A participant could answer “Yes,” “No,” or “Don’t know” to this item. The responses were dichotomized into yes and no/don’t know.

During the scheduled exam, an additional cytology sample was taken and the physician obtained a sample for HPV typing.

All women with an abnormal Pap smear according to the 2001 Bethesda System for Reporting Pap Smear Results [29] were considered cases, and controls were sampled from recruited patients who had normal Pap results. For each case, three controls were randomly selected from all normal Pap smear results from the same clinic as the case. Controls were selected from within a three-month window around the time the case received her Pap smear. The HPV types were determined using the commercially manufactured PCR-based Roche AMPLICOR [30, 31].

After cytology review, women selected as cases and controls were asked to complete a second survey. Questions assessing HPV vaccine knowledge and behavioral intentions (for

self and a daughter age 9–12 years) were developed in collaboration with behavioral scientists in the National Cancer Institute's Applied Cancer Screening Research Branch. The items were adapted from responses to the 2005 Health Information National Trends Survey (HINTS) including the reasons to and not vaccinate [32]. The questions are available in the supplemental information. The primary survey collection method was telephone interviews from January 2006 to December 2008.

The medical records of the study participants were reviewed for evidence of completing (or starting) or declining to receive the HPV quadrivalent vaccine. Participants age 18–26 years with no medical record evidence of completing (or starting) or declining the HPV quadrivalent vaccine were contacted by mail or telephone to determine if they had completed or declined the vaccine series. Participants who had started or completed the HPV vaccination series were classified as having exposure to the vaccine. The remaining study participants were classified as having no exposure to the HPV vaccine.

Statistical Analysis

Univariable logistic regression models that incorporated a random effect for clinic were used to determine crude associations between outcomes (want the HPV vaccine for self, or want the HPV vaccine for a daughter 9–12 years old, or awareness of a vaccine to prevent cancer) and potential correlates. To characterize women who were aware of a vaccine to prevent cancer, those who would want the vaccine for themselves and for those who would want it for a daughter 9–12 years old and for those who report a doctor had recommended the vaccine (grouped as yes/no), multivariable logistic regression models were constructed. Covariates that were most influential from the estimated crude associations were entered first into the model (ordered by the overall covariate p-value from univariable models), with subsequent covariates added thereafter. We note that although the poverty income ratio was collected and is described in univariable analyses, this potential covariate was missing for a large proportion of participants and is not included in modeling. Potential interactions were considered. The final multivariable models included a random effect for clinic of recruitment to reflect the sampling structure of the study. Model diagnostics and goodness of fit were verified for all final models. All reported p-values are two-sided; analyses were performed using SAS v9.2 (SAS Institute, Inc., Cary, NC). All women who responded to the HPV perception questions were included in the analyses presented. When information was missing on individual items, we explored how missing values were associated with the outcome of interest. Missing data was largely limited to only a few covariates, including poverty income ratio and health insurance status.

Results

Of the 3421 women who were eligible and contacted to participate, 2394 of these women agreed to participate, for a study participation rate of 70% (Figure 1). Following cytology review 284 women had an abnormal Pap test, and were categorized as cases, while 847 of the 2081 women with normal Pap tests were selected as control participants. Among the women with abnormal cervical cytology, atypical squamous/glandular cells were found in 153 (54%), low grade squamous intraepithelial lesion in 115 (41%), and high grade squamous intraepithelial lesion and cervical cancer in 16 (6%) women.

From the 1131 original case control study participants, 80% completed a survey about the HPV vaccine. The demographic characteristics of the survey respondents are summarized in Table 1. Of the study participants, 313 (39%) were ages 18–26 years and only 7 (2%) reported or had documentation of HPV vaccine exposure. We were not able to document in 156 participants whether they received the HPV vaccine. In the remaining 150, we confirmed they had not had the HPV vaccine. There were no significant differences by race,

employment, marital status, current abnormal Pap status, smoking, Appalachian identity, or in the percentage of women with daughters between the women with no HPV vaccine and women we were unable to document exposure. Given the limited number of women having gotten the HPV vaccine, we were not able to determine the effect of this exposure.

Without providing the participants with any HPV or HPV vaccine information, nearly half, 380 (47%) of the participants had heard of a vaccine to prevent cancer, with 362 (95%) of these respondents having heard of HPV or HPV vaccination. Of respondents who reported that they had heard of a vaccine to prevent cancer, 272 (72%) reported the target cancer for the vaccine as cervical. Women with more education (some college/college graduate vs. < high school: OR=3.86, 95% CI: 2.24–6.65); those with full or part-time employment (vs. those with other types of employment: OR=1.45, 95% CI: 1.06–2.00); those with a previous abnormal Pap result (OR=1.34, 95% CI: 1.01–1.78); or women who self-identified as Appalachian (OR=2.10 vs. those who do not/don't know, 95% CI: 1.52–2.89) had higher odds of reporting awareness of a vaccine to prevent cancer. In a multivariable model controlling for clinic, we found when modeled together, women with more education (some college/college graduate vs. < high school OR=3.57, 95% CI: 2.05–6.24 & HS vs. < HS OR=2.15, 95% CI: 1.21–3.82), those who self-identified as Appalachian (OR=1.80, 95% CI: 1.30–2.51) and those who had a previous abnormal Pap result (OR=1.29, 95% CI: 0.96–1.73) had higher odds of being aware of the HPV vaccine.

The participants were then told that the FDA had approved a vaccine to prevent cervical cancer. The respondents identified the following as individuals who should get the HPV vaccine: young women ages 13–26 years (n=715; 89%); people who have a family history of cervical cancer (n=697; 86%); people with many sexual partners (n=619; 77%); people who have sexual partners with HPV (n=609; 76%); girls ages 9–12 years (n=379; 38%); all people who have had sex (n=410; 51%); all adult men and women (n=322; 40%); people who smoke cigarettes (n=208; 26%); and adult women only (n=227; 28%).

Next, the participants were provided with the following information, “HPV shots were recently approved and recommended by the U.S. Government for women age 9 to 26 years to prevent cervical cancer, abnormal Pap smears, and genital warts caused by human papillomavirus or HPV,” and subsequently asked if they would get the HPV vaccine. After being given this official HPV vaccine recommendation statement, 252 (31%) wanted the vaccine; 198 (25%) were “not sure;” and 353 (44%) did not want the vaccination for themselves. In univariable analysis, Appalachian women who were younger (158 (50%) 18–26 vs. 94 (19%) 27, OR=4.15, 95% CI 3.00–5.74); those who were single, divorced, widowed or separated compared to those who were married (160 (41%) versus 83 (21%) OR=2.44, 95% CI 1.75–3.37); those who did not self-identify as Appalachian (196 (34%) versus 53 (23%) OR=1.54 95% CI 1.06–2.23); those who had not heard of the vaccine (148 (35%) versus 100 (26%) OR=0.66 95% CI 0.50–0.93); or if their physician recommended the vaccine (4 (4.4%) versus 245 (35%) OR=8.96 95% CI 4.44–18.06) had higher odds of expressing a desire for the vaccine themselves. A multivariable model of all study participants adjusting for age, marital status, education, heard of vaccine to prevent cancer, and response to physician recommendation for the vaccine was fit to the data. In this model, younger age (adjusted OR=3.62, 95% CI 2.55–5.15), single marital status (adjusted OR=1.75, 95% CI 1.23–2.49), less than high school education (adjusted OR=1.87, 95% CI 1.06–3.28), hearing of a vaccine to prevent cancer (adjusted OR=1.43, 95% CI 1.01–2.03), and those would get the vaccine if recommended by a physician (adjusted OR=10.36, 95% CI 3.67–29.29) proved to be significant predictors when included in this model together.

Given that the target population for the vaccine is 18–26 years, we analyzed this age group separately in Table 2. Among this group of women, marital status (single women) and

physician recommendation to receive the vaccine were significantly associated with a desire for the vaccine. This holds true to some degree in a multivariable model adjusting for marital status and education. Single women (OR=1.66, 95% CI 0.99–2.79) and those who report a doctor recommended the vaccine (OR=8.44, 95% CI 2.44–29.14) had higher odds of a desire for the vaccine adjusted for marital status and education..

Reasons that women reported for accepting or declining the HPV vaccination for themselves or a daughter by age group are listed in Table 3. We examined closer the issue of reported recommendation from a doctor for the vaccine on intention to get the vaccine. We found younger (18–26 vs. over 27, OR=3.62, 95% CI 2.55–5.15), single women (OR=1.23, 95% CI 1.23–2.49) who had not heard of the vaccine to prevent cancer (OR=1.43, 95% CI 1.01–2.03) had higher odds of expressing a desire to get the vaccine.

With respect to giving the HPV vaccine to a daughter ages 9–12 years, participants responded “yes” 445 (55%); “not sure” 163 (20%); or “no” 185 (23%). In Table 3, the reasons for accepting or declining the HPV vaccination for a daughter age 9–12 years are listed. If a doctor recommended their daughter age 9–12 years get the HPV vaccine, 709 (90.3% of the 785 participants who answered this question) would have their daughter get the vaccine. For respondents who actually had daughters age 9–12 years, a similar percent said they would have their daughter get the vaccine (94%, 95% CI (84%–99%). Comparisons between participants desiring the HPV vaccine and those who would not be sure or who would decline the vaccine for a daughter age 9–12 years are in Table 4. Again, when taken together in a multivariable model, adjusted relationships (not shown in Table 4) remained strong between the desire for a daughter to get the vaccine and variables such as having a daughter age 9–12 years old (OR=2.12, 95% CI: 1.11–4.06), a current abnormal Pap (OR=1.38, 95% CI: 0.97–1.96), previous abnormal Pap result (OR=1.38, 95% CI: 1.00–1.86), and current smokers (vs. never smokers OR=1.40, 95% CI: 1.00–2.00).

Discussion

About half of Appalachian Ohio women who participated in this study were aware of the HPV vaccine to prevent cervical cancer, thus disproving our first hypothesis. Given the amount of media coverage about the HPV vaccine, this is remarkable given the recent release of the vaccine relative to the data collection. Women who were younger, who had more poverty, who had less education or who did not self-identify as Appalachian, were less aware of the HPV vaccine. Unfortunately, they may also be at greatest risk for exposure to HPV, based upon our experiences with this population [33, 34].

With just the information that the vaccine can prevent HPV, the virus that causes cervical cancer, most participants did not identify girls ages 9–12 years as individuals who should receive the vaccine. The majority identified young women age 13–26 years, older women, and individuals with risky health behaviors as those groups who should get the vaccine. This is consistent with previous studies that documented parents and doctors are more likely to provide HPV vaccination to older girls who are more likely to be sexually active [11, 14, 35].

Only 31% of all women respondents would get the vaccine, but of the women eligible to get it by age group (18–26 years) 55% indicated that they would get the vaccine. Our second hypothesis of non-acceptance of the vaccine was disproven. There was almost universal agreement among the women about reasons to get the HPV vaccine for themselves for age 18–26 years and age 27 years and older. Top reasons reported were: “to be healthy,” “sexually active,” “it will prevent cervical cancer,” “shots necessary to prevent disease,” and “HPV shot safe to get.” There was a similar trend in the reasons to get the HPV vaccine for

a daughter age 9–12 years. The number one reason for not getting the HPV vaccine for themselves was that women were older than the recommended age for the vaccine among the older women. Among the women age 18–26 years, the number one reason for not getting the vaccine was “HPV shot not safe.” This finding was not unexpected since we told them the recommended age range, but it highlights that the participants understood the message given during the survey process. Given the overwhelming acceptance of the vaccine if their doctor recommends it, the second reason for not wanting the vaccine (doctor not recommending it) could be easily eliminated. However, some caution must be used when interpreting the data on doctor recommendation. We found that women who had not heard of the vaccine were more likely to intend to get the vaccine if a doctor recommended it. We hypothesize that women who are not aware about the vaccine do not have an opinion and adopt the opinion of the expert physician more easily. While women aware of the vaccine (most likely through the media), may often think negatively about the vaccine. We hypothesize that this group may not be as likely to follow a doctor’s recommendation. We strongly encourage all health care workers to recommend and promote the HPV vaccine for eligible patients.

At first glance, it seems difficult to interpret the response of “*I saw an ad about it.*” The lay press and the Internet have many negative accounts related to the HPV vaccine, which could be interpreted as an advertisement and negatively affect perceptions. In addition, the typical promotional ads include a list of possible adverse events, which can be overwhelming to the general public. The results suggest that ads are interpreted by more respondents as supporting the choice for the vaccine than as a reason not to get the vaccine.

Slightly over half of the women would accept the vaccine for a daughter age 9–12 years, also disproving our hypothesis of non-acceptance for daughters. The frequently cited reasons for not wanting the vaccine were: “not sexually active,” “HPV shot NOT safe,” “Doctor didn’t recommend it,” and “Do not need.” The concern about vaccine safety and “I saw an ad about it” may be tapping into the same issue of numerous stories about safety issues. There was a subset of women (19%) concerned about the vaccine promoting sexual activity, which has been noted in other studies [13, 14, 36]. Again, the response to a doctor recommending a daughter to get the vaccine was near uniform acceptance. Our findings are consistent with a recent systematic review which found that the published vaccination acceptability was higher when people believed the vaccine was effective, a physician recommended it, and HPV infection was likely (i.e., older teens) [35]. Many of the doctors serving this area are not from Appalachia and many are international graduates. Given the lack of trust of outsiders by the Appalachian population, we had hypothesized that women would not be receptive of a doctor’s recommendation for the vaccine. However, our hypothesis related to Appalachian women not accepting their doctor’s recommendation for the HPV vaccine was disproven.

Significant predictors of accepting HPV vaccination for a daughter were: having a daughter age 9–12 years old, current or previous abnormal Pap smear, and current smoking status. The association between HPV vaccine acceptance with a history of abnormal Pap smear is consistent with another study reporting intentions to vaccinate their daughters against human papillomavirus as highest among women who had cervical cancer, women who had hysterectomies, and women who were treated for precancerous lesions [37]. Bringing up mother’s personal experiences with cervical cancer screening in discussion with mothers about HPV vaccination may be a useful strategy for clinicians.

With respect to HPV vaccine acceptance, Appalachian self-identity may represent a segment of the population that has unique characteristics, which can be leveraged to promote the use of this intervention. Self-identification as Appalachian is a unique construct that was created

for the CARE project in an attempt to describe individuals who identify with the distinctive cultural attributes of individuals living in this region of the U.S. As previously reported [19], we found Appalachian self-identity associated most strongly among women who have lived in the Appalachian region for a long period of time, lived in a rural county, had parents who lived in Appalachia, and who had a religious association. The prevalent Appalachian stereotypes of poverty and lack of education were not significantly associated with Appalachian self-identity. In this study, Appalachian self-identity was only related to awareness of HPV vaccine. This construct needs further study to determine if it represents a unique ethnic or regional identity. This study has limitations. First, the participants were recruited from doctor's offices and health department clinical sites. Thus, they have access to medical care. There was a nonresponse rate of 30% of eligible women. Therefore, the participants may not be representative of all women over 18 years of age residing in Appalachia Ohio. All of the participants had received the results of their Pap smear at the time of the survey. The women with an abnormal Pap smear may have looked for information that changed their awareness and knowledge about cervical cancer, HPV, and HPV vaccine compared to women with normal Pap smears. Second, the availability of the HPV vaccine varied among the clinics at the time of the study. Third, the responses are a reflection of what the women might do versus actual behavior. Fourth, we did not probe on issues related to the HPV vaccine and older daughters or boys because of participant burden. The data were collected shortly after the vaccine was released. Knowledge, attitudes, and acceptance may have changed over time. Recent research supports that many of our findings continue to be issues that can be grouped into areas of harms/ineffectiveness, barriers, and social norms [38]. Others have recently reported that older women are more accepting of the vaccine, most parents do not think the HPV vaccine would actually encourage sexual activity in their children [17, 39, 40], and higher acceptance of the vaccine in minority populations [41]. Finally, we did not explore the cost of the vaccine as a potential barrier.

The data collection methods included telephone interviews, mailed self-administered questionnaires, and medical record review. These multiple methods were used to get maximum response rates from the study participants. The questions were ordered to probe issues prior to giving information in either telephone interview or paper questionnaire. This allowed us to determine if they had heard of a vaccine to prevent cancer and which cancer, and their perception of the target group for the vaccine. So there is likely some difference in responses by data collection method, but none that we could detect or measure. The possible reasons for accepting or declining the HPV vaccine appear to have addressed all of the possible issues women may have about the vaccine given that only six unique participants responded "none of these reasons" were relevant to their opinion for themselves or their daughter.

The study findings suggest that there remains a need to provide HPV vaccine information to women living in Appalachia. Since individuals who live in Appalachia have distinctive cultural characteristics, possibly tapping into that self-identification construct will be important when developing strategies to promote the HPV vaccine in this geographical region. As with many other cancer prevention and control issues, doctor recommendation is reported to be a significant reason for women to accept the HPV vaccine for themselves or for their daughters. Developing effective HPV vaccine messages and the best way to persuade doctors and other healthcare providers serving this population to recommend the HPV vaccine is yet to be determined.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Appalachian women have high rates of cervical cancer
- Survey of Appalachian women on acceptance of HPV vaccine
- If their doctor recommended the vaccine most would get it
- Just of half wanted the vaccine for a daughter ages 9–12 years
- If their doctor recommended the vaccine for a daughter most would have it done

Figure 1.
Flow of participants in the CARE case-control study from sampling to analysis

Table 1

Demographic characteristics of Appalachian Ohio participants in CARE case-control study, 2006–2008 (n=807^a)

		Current Abnormal Pap Status	
		No (Control)	Yes (Case)
Number of Participants (%)		610 (76)	197 (24)
Age (by group)	18–26	212 (68)	101 (32)
	>=27	396 (81)	96 (20)
Race	White	581 (76)	184 (24)
	Other	25 (68)	12 (32)
Socioeconomic Status:			
Education	Less than HS	64 (74)	23 (26)
	High school graduate/GED	212 (74)	75 (26)
	Some college/college graduate	334 (77)	99 (23)
Employment Status	Full-time/part-time	342 (75)	114 (25)
	Unemployed/disabled	71 (71)	29 (29)
	Other	193 (80)	47 (20)
Income	Less than \$10,000 – \$20,000	237 (73)	88 (27)
	\$20,001 – \$50,000	178 (77)	54 (22)
	\$50,001 – over \$75,000	107 (84)	21 (16)
Poverty Income Ratio^b	Less than 1	64 (70)	28 (30)
	Between 1 and 2	63 (74)	22 (26)
	Between 2 and 3	44 (86)	7 (14)
	Greater than 3	69 (73)	25 (27)
Household Characteristics:			
Marital Status	Never married	165 (67)	81 (33)
	Married/member of a couple	330 (83)	70 (18)
	Divorced/widowed/separated	103 (73)	39 (28)
Children in Household	No	168 (68)	79 (32)
	Yes	440 (79)	118 (21)
Daughter(s) in Household	No	121 (77)	36 (23)
	Yes	318 (80)	82 (21)
Age of Daughters^c		15.5 (12)	13.9 (12)
Health Care Access:			
Type of Insurance	Private	145 (75)	48 (25)
	Other	117 (74)	42 (26)
Previous Abnormal Pap	No/Don't Know/Missing/Never had Pap before now ^d	367 (81)	89 (20)
	Yes	243 (69)	108 (31)

		Current Abnormal Pap Status	
		No (Control)	Yes (Case)
Years Since Last Pap^c		1.7 (4)	1.5 (2)
Health Behaviors:			
Smoking	<i>Current</i>	222 (70)	95 (30)
	<i>Former</i>	104 (81)	24 (29)
	<i>Never</i>	279 (78)	78 (22)
HPV Vaccine Exposure:			
Ages 18–26	<i>No</i>	105 (70)	45 (30)
	<i>Yes</i>	7 (100)	0 (0)
	<i>Not asked/available</i>	100 (64)	56 (36)
Culture			
Self Identification as Appalachian	<i>No/Don't Know</i>	424 (74)	146 (26)
	<i>Yes</i>	179 (79)	49 (22)

^aNumbers may not equal 807 due to missing data

^bPoverty Income Ratio is the annual household income divided by the federal poverty level for the relevant household size.

^cmean (std deviation)

^d3 patients with no prior Pap

Table 2

Associations among Appalachian Ohio women age 18–26 years who will not* vs. will get the HPV Vaccine for **themselves**, 2006–2008

Vaccine Intent					
	Will not get* (n=155)	Will get (n=158)	Odds Ratio ^a	95% CI	p-value
Age (years)					
18–20	45 (45.5)	54 (54.6)	1.27	0.79–2.05	0.330
21–26	110 (51.4)	104 (48.6)	1.00		
Education					
Less than HS	19 (46.3)	22 (53.7)	1.31	0.66–2.62	0.429
High School graduate/GED	51 (45.5)	61 (54.5)	1.36	0.83–2.21	
Some College/College graduate	85 (53.1)	75 (46.9)	1.00		
Poverty Income Ratio ^b					
Less than 1	16 (36.4)	28 (63.6)	1.00		0.871
Between 1 and 2	11 (33.3)	22 (66.7)	1.14	0.43–3.04	
Greater than 2	15 (39.5)	23 (60.5)	0.88	0.35–2.19	
Marital Status					
Never Married, Divorced, Widowed, Separated	92 (45.1)	112 (54.9)	1.81	1.10–2.97	0.019
Married/couple	58 (59.8)	39 (40.2)	1.00		
Daughter(s) in Household					
None/No Children	115 (52.3)	105 (47.7)	1.00		
Yes	40 (43.0)	53 (57.0)	0.69	0.42–1.13	0.138
Health Insurance:					
No	24 (34.3)	46 (65.7)	1.00		
Yes	28 (41.8)	39 (58.2)	0.73	0.36–1.48	0.377

	Vaccine Intent		Odds Ratio ^a	95% CI	p-value
	Will not get* (n=155)	Will get (n=158)			
Smoking Status					
Current	70 (47.3)	78 (52.7)	1.26	0.78–2.03	0.597
Former	16 (47.1)	18 (52.9)	1.28	0.60–2.73	
Never	68 (53.1)	60 (46.9)	1.00		
Previous Abnormal Pap					
No/Don't Know/Missing	97 (53.0)	86 (47.0)	0.71	0.45–1.13	0.146
Yes	58 (44.6)	72 (55.4)	1.00		
Current Abnormal Pap					
No	112 (52.8)	100 (47.2)	0.66	0.41–1.07	0.093
Yes	43 (42.6)	58 (57.4)	1.00		
Heard of Shot to Prevent Cancer					
No	76 (46.3)	88 (53.7)	1.35	0.86–2.11	0.195
Yes	79 (53.7)	68 (46.3)	1.00		
HPV Vaccine Exposure: Ages 18–26					
No	87 (58.0)	63 (42.0)			
Yes	1 (14.3)	6 (85.7)			
Self Identify as Appalachian					
No/Don't Know	115 (48.3)	123 (51.7)	1.16	0.69–1.97	0.577
Yes	38 (52.1)	35 (48.0)	1.00		
If Doctor Recommended would get vaccine					
No	24 (88.9)	3 (11.1)	27	1.00	<0.001
Yes	131 (46.0)	154 (54.0)	285	9.28	

^d OR adjusted for random effect of clinic site of recruitment.

^b Poverty Income Ratio is the annual household income divided by the federal poverty level for the relevant household size.

^c OR estimate not stable due to small counts in some cells.

* Will not get group includes women who responded not sure if they will get the vaccine for themselves.

Table 3

Reasons for accepting or declining HPV vaccine for self or daughter by age group

	All women		Women 18–26 years old		Women over 26 years old	
	Yes [n(%)]		Yes [n(%)]		Yes [n(%)]	
	For you (n=446)	For your daughter (n=588)	For you (n=255)	For your daughter (n=229)	For you (n=191)	For your daughter (n=358)
Opinions for getting HPV shot						
<i>To be healthy</i>	382 (85.7)	334 (56.8)	229 (89.8)	126 (55.0)	153 (80.1)	208 (58.1)
<i>Sexually active</i>	328 (73.5)	188 (32.0)	208 (81.6)	70 (30.6)	120 (62.8)	117 (32.7)
<i>Can afford it</i>	153 (34.3)	253 (43.0)	91 (35.7)	102 (44.5)	62 (32.5)	150 (41.9)
<i>Shots necessary to prevent disease</i>	344 (77.1)	444 (75.5)	204 (80.0)	180 (78.6)	140 (73.3)	263 (73.5)
<i>I know where to get it</i>	214 (48.0)	306 (52.0)	128 (50.2)	118 (51.5)	86 (45.0)	188 (52.5)
<i>MD has recommended it</i>	129 (28.9)	308 (52.4)	81 (31.8)	104 (45.4)	48 (25.1)	204 (57.0)
<i>I'm not worried about safety of the shot</i>	140 (31.4)	192 (32.7)	76 (29.8)	65 (28.4)	64 (33.5)	127 (35.5)
<i>HPV shot safe to get</i>	183 (71.8)	NA	183 (71.8)	NA	112 (58.6)	NA
<i>My partner wants me/her to</i>	42 (9.4)	121 (20.6)	20 (7.8)	42 (18.3)	22 (11.5)	79 (22.1)
<i>My family wants me/her to</i>	78 (17.5)	177 (30.1)	51 (20.0)	81 (35.4)	27 (14.1)	96 (26.8)
<i>My friends want me to get it</i>	47 (10.5)	NA	29 (11.4)	NA	18 (9.4)	NA
<i>Her friends are getting it</i>	NA	84 (14.3)	NA	36 (15.7)	NA	48 (13.4)
<i>I know someone who got it</i>	58 (13.0)	NA	36 (14.1)	NA	22 (11.5)	NA
<i>I saw an ad about it</i>	232 (52.0)	298 (50.7)	145 (56.9)	126 (55.0)	87 (45.6)	172 (48.0)
<i>It will prevent cervical cancer</i>	322 (72.2)	442 (75.2)	203 (79.6)	181 (79.0)	119 (62.3)	260 (72.6)
<i>None of these</i>	19 (4.3)	38 (6.5)	5 (2.0)	15 (6.6)	14 (7.3)	23 (6.4)
Opinions for NOT getting HPV shot						
	For you (n=495)	For your daughter (n=328)	For you (n=127)	For your daughter (n=123)	For you (n=366)	For your daughter (n=203)
<i>Do not need</i>	164 (33.1)	77 (23.5)	23 (18.1)	23 (18.7)	140 (38.3)	54 (26.6)
<i>Not sexually active</i>	63 (12.7)	128 (39.0)	5 (3.9)	54 (43.9)	58 (15.9)	74 (36.5)
<i>Not going to get HPV</i>	58 (11.7)	NA	11 (8.9)	NA	47 (12.8)	NA

	All women		Women 18–26 years old		Women over 26 years old	
<i>Older than recommended age</i>	278 (56.2)	NA	16 (12.6)	NA	261 (71.3)	NA
<i>Too expensive</i>	78 (15.8)	23 (7.0)	33 (26.0)	14 (11.4)	45 (12.3)	9 (4.4)
<i>Shots NOT necessary to prevent disease</i>	25 (5.1)	NA	7 (5.5)	NA	18 (4.9)	NA
<i>Don't know where to get it</i>	43 (8.7)	18 (5.5)	13 (10.2)	10 (8.1)	30 (8.2)	8 (3.9)
<i>MD didn't recommend it</i>	167 (33.7)	82 (25.0)	31 (24.4)	29 (23.6)	135 (36.9)	53 (26.1)
<i>HPV shot NOT safe</i>	110 (22.2)	114 (34.8)	41 (32.3)	46 (37.4)	69 (18.9)	68 (33.5)
<i>My partner does NOT want me/her to</i>	9 (1.8)	11 (3.4)	1 (0.8)	4 (3.3)	8 (2.2)	7 (3.5)
<i>My family does NOT want me/her to</i>	10 (2.0)	5 (1.5)	5 (3.9)	1 (0.8)	5 (1.4)	4 (2.0)
<i>I don't think it will work</i>	23 (4.7)	12 (3.7)	8 (6.3)	6 (4.9)	15 (4.1)	6 (3.0)
<i>I worry about what others will think if they found out</i>	6 (1.2)	15 (4.6)	2 (1.6)	9 (7.3)	4 (1.1)	6 (3.0)
<i>I am worried that it might promote sexual activity</i>	NA	62 (18.9)	NA	37 (30.1)	NA	25 (12.3)
<i>I saw an ad about it</i>	61 (12.3)	42 (12.8)	12 (9.5)	19 (15.5)	49 (14.0)	23 (11.3)
<i>None of these</i>	105 (21.2)	56 (17.1)	30 (23.6)	20 (16.3)	74 (20.2)	35 (17.2)

NA: appropriate question not asked

Participants were asked to choose all reason for or against the HPV vaccine. The number and percentage reflect how many times this reason was endorsed by the participants. It does not reflect the percent of women who endorsed this reason.

Table 4

Associations among Appalachian Ohio women who will not* vs. will get HPV Vaccine for a daughter 9–12 years of age, 2006–2008

	Vaccine Intent			p-value
	Will not get* (n=363)	Will get (n=445)	Odds Ratio ^a	
Age (years)				0.43
18–26	134 (43)	179 (57)	1.12	0.84–1.50
27	226 (46)	266 (54)	1.00	
Has a daughter age 9–12 years				0.02
No	347 (46)	408 (54)	1.00	
Yes	15 (29)	37 (71)	2.13	1.11–4.00
Education				0.90
Less than HS	40 (46)	47 (54)	0.95	0.60–1.51
High School graduate/GED	126 (44)	161 (56)	1.05	0.78–1.42
Some College/College graduate	196 (45)	237 (55)	1.00	
Poverty Income Ratio^b				0.02
Less than 1	29 (32)	63 (68)	1.00	
Between 1 and 2	25 (29)	60 (71)	1.11	0.58–2.10
Greater than 2	66 (46)	79 (54)	0.55	0.32–0.96
Marital Status				0.08
Never Married, Divorced, Widowed, Separated	160 (41)	228 (59)	1.29	0.97–1.72
Married/couple	191 (48)	209 (52)	1.00	
Daughter(s) in Household				0.07
None/No Children	195 (48)	212 (52)	1.00	
Yes	167 (42)	233 (58)	1.20	0.98–1.72

	Vaccine Intent		Odds Ratio ^d	95% CI	p-value
	Will not get* (n=363)	Will get (n=445)			
Health Insurance					
					0.94
No	47 (37)	81 (63)	1.00		
Yes	84 (36)	147 (64)	1.02	0.65–1.61	
Smoking Status					
					0.02
Current	124 (39)	193 (61)	1.56	1.14–2.12	
Former	57 (45)	71 (55)	1.25	0.83–1.88	
Never	179 (50)	178 (50)	1.00		
Previous Abnormal Pap					
					<0.01
No/Don't Know/Missing	227 (50)	229 (50)	1.00		
Yes	135 (38)	216 (62)	1.59	1.19–2.08	
Current Abnormal Pap					
					0.01
No	289 (47)	321 (53)	1.00		
Yes	73 (37)	124 (63)	1.52	1.09–2.13	
Heard of Shot to Prevent Cancer					
					0.05
No	202 (48)	219 (52)	1.00		
Yes	156 (41)	224 (59)	1.33	1.00–1.75	
HPV Vaccine Exposure: Ages 18–26					
					^c
Missing	59 (38)	97 (62)			
No	74 (49)	76 (51)			
Yes	1 (14)	6 (86)			
Self Identify as Appalachian					
					0.28
No/Don't Know	261 (46)	309 (54)	1.00		

Vaccine Intent				
	Will not get* (n=363)	Will get (n=445)	Odds Ratio ^d	95% CI
Yes	95 (42)	133 (58)	1.19	0.86–1.64

^aOR adjusted for random effect of clinic site of recruitment

^bPoverty Income Ratio is the annual household income divided by the federal poverty level for the relevant household size.

^cOR estimate not stable due to small counts in some cells.

* This group includes women who responded not sure if they will get the vaccine for a daughter.