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HPV Knowledge and Vaccine Uptake among Mexican-born Farmworkers in North Carolina

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Human papilloma virus (HPV) is the most common sexually transmitted infection (Centers for Disease Control and Prevention [CDC], 2013). HPV causes approximately 26,600 new cases of cancer annually in the United States (US) (Holman et al., 2014), including cervical, vaginal, and vulvar cancers in women; penile cancer in men; and anal and oropharyngeal cancers in both men and women (Chaturvedi, 2010). An HPV vaccine became available in the US in 2006 (CDC, 2011). The CDC (2016) recommends that all 11 to 12 year olds receive the HPV vaccine. Despite the vaccine being 97% effective at preventing the strains of virus that cause cancer, HPV vaccination rates are lower than those of other childhood vaccines (Holman et al., 2014; National Institutes of Health, 2016). Less than 40% of eligible adolescents have completed the full HPV vaccine series (Walker et al., 2017).

The National Cancer Institute (NCI) estimates that 12,820 new cervical cancer cases and 4,210 cervical cancer deaths will occur in the US in 2017 (NCI, 2017). Cervical cancer disproportionately burdens the Latino population in the US. Latina women have the highest cervical cancer incidence rate (9.9 new cases each year per 100,000 persons), compared to African-American and non-Hispanic white women (Galbraith et al., 2016). Latina women also have a higher cervical cancer mortality rate (2.7 deaths each year per 100,000 persons) than non-Hispanic white women (Galbraith et al., 2016), making cervical cancer the third most common cause of death for Latina women in the US (Yeganeh, Curtis, & Kuo, 2010). Although Latino men also have higher incidence rates of penile cancer compared to men of other races (Galbraith, 2016), this study focuses on HPV as it relates to cervical cancer. Research is needed to inform efforts to increase vaccine uptake and improve health equity.

Background

The general Latino population in the US has higher than average HPV vaccine initiation (Walker et al., 2017). However, Latino migrant and seasonal farmworkers are an underserved subset of this population who typically have limited access to healthcare and preventive measures, such as vaccines and cancer screenings (Dodge, Mills, & Riordan, 2007; Luque,

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Mason, Reyes-Garcia, Hinojosa, & Meade, 2011). Children of farmworkers have variable access to healthcare depending on their citizenship status, their parents' citizenship status, and whether they migrate with their parents (Quandt, 2009). These factors may result in the under-utilization of well-child visits and reduced continuity of care, both of which hinder vaccine initiation and completion (Lee, McDermott, & Elliott, 1990; Quandt, 2009). Based on research conducted with the broader Latino immigrant population, several other influences, including cost, perception of vaccine safety, and provider recommendation, may also contribute to HPV vaccine acceptance and uptake for farmworkers (Gerend, Weibley, & Bland, 2009; Luque, Castaneda, Tyson, Vargas, & Meade, 2012; Wentzell, Flores, Salmeron, & Bastani, 2016). In 2011, Mexico implemented a nationwide school-based HPV vaccination program for all girls in the fifth grade (CDC, 2011); as a result, children who remain in Mexico while their parents work in the US may have better access to the HPV vaccine compared to their US-resident counterparts. Evidence is mixed as to whether US acculturation increases HPV vaccine uptake among immigrants (Galbraith et al., 2016; Gerend, Zapata, & Reyes, 2013; Kepka, Ulrich, & Coronado, 2012). Therefore, several characteristics of farmworkers may uniquely affect their vaccine behaviors.

Knowledge of HPV, the vaccine, and related diseases is another factor that may affect vaccine behavior, although findings on the strength and direction of this association vary (Galbraith et al., 2016). Little research has focused on knowledge of HPV among farmworkers in the US. In a qualitative study of Latina farmworkers in Georgia, Luque et al. (2012) found low HPV vaccine awareness. Farmworkers and healthcare providers identified lack of knowledge as a barrier to vaccine initiation (Luque et al., 2012). Therefore, it is important to understand farmworkers' knowledge of HPV in order to develop interventions that will increase vaccine uptake and mitigate health disparities. Previous research has also documented low levels of HPV knowledge among other Latino communities in the US (Galbraith et al., 2016; Gerend, 2013; Kepka et al., 2012; Kepka, Warner, Kinney, Spigarelli, & Mooney, 2015; Luque et al., 2010; Luque et al., 2015; Molokwu, Fernandez, & Martin, 2014; Reimer, Schommer, Houlihan, & Gerrard, 2014). Several studies have found that knowledge of HPV among parents in Mexico is also low (Lazcano-Ponce et al., 2001; Moraros et al., 2006; Wentzell et al., 2016).

The existing literature on HPV knowledge and vaccine initiation has several limitations. The instruments used to measure knowledge are inconsistent, so it is difficult to compare study findings. Most studies focus only on parents or women. Men account for 35% of new HPV-related cancer cases each year and contribute to decisions as to whether to vaccinate children (Osazuwa-Peters et al., 2017), so it is important to assess their knowledge of HPV as well. Finally, we are aware of only one study that has assessed knowledge of HPV among farmworkers, specifically (Luque et al., 2012).

This paper describes the knowledge of HPV and the HPV vaccine among men and women Mexican-born farmworkers. It also describes their sources of HPV vaccine knowledge and HPV vaccine initiation among their children. Finally, it compares HPV knowledge, vaccine knowledge source, and children's vaccine initiation of Mexican-born farmworkers and nonfarmworkers. We aim to provide a deeper understanding of factors influencing vaccine behaviors in order to inform programs and policies serving this population.

Methods

The North Carolina (NC) Farmworkers Project (Benson, NC), El Buen Pastor Latino Community Services (Winston-Salem, NC), and Wake Forest School of Medicine (Winston-Salem, NC) collaborated to collect data for this pilot study in June-August of 2015 as part of an ongoing community-based participatory research project. The Wake Forest School of Medicine Institutional Review Board approved the study protocol.

Participants

We recruited 200 adults, 100 farmworkers and 100 non-farmworkers, for this study. Sample size was determined to meet the needs of our community partners for the larger survey of which this study was a component. Inclusion criteria were being aged 18 and older, having been born in Mexico, self-identifying as Latino or Hispanic, being a native Spanish-speaker, and being a farmworker living in Johnston County, NC or a non-farmworker living in Forsyth County (Winston-Salem), NC. The population of Forsyth County is about twice that of rural Johnston County. However, these counties have similar poverty rates and similar percentages of their populations are Latino or Hispanic (US Census Bureau, n.d.). We considered anyone currently employed in agriculture and co-resident family members of people currently employed in agriculture to be farmworkers.

The NC Farmworkers Project facilitated recruitment of farmworkers in Johnston County, NC. The sample included 80 men and 20 women. Project data collectors recruited male farmworkers by visiting camps during non-work hours, describing the study, and asking for volunteers. Camps are grower-provided barracks, individual houses, trailers, or apartments where migrant farmworkers reside. To reduce the effect of clustering, data collectors recruited no more than five participants from each camp. NC Farmworkers Project collaborated with local service organizations to identify and recruit female farmworkers. El Buen Pastor Latino Community Services facilitated recruitment of non-farmworker participants, 50 men and 50 women, in Forsyth County, NC. Staff identified potential participants among their clients and those of other organizations serving the Latino population in Forsyth County. In both locations, data collectors screened potential participants for eligibility, described the study, answered their questions, and obtained informed consent. Participants received a \$20 cash incentive for completing the interviewer-administered questionnaire.

Data Collection

Trained Spanish-speaking interviewers administered questionnaires verbally. Interviewers recorded responses on tablet computers with Research Electronic Data Capture (REDCap) software hosted at Wake Forest School of Medicine (Harris et al., 2009). Due to difficulties with the tablet, interviewers conducted 12 of the questionnaires in paper format. Average interview time was about 30 minutes. The interviews included questions about personal demographics and HPV and HPV vaccine knowledge.

Measures

Demographic characteristics for adult participants included gender, age, education (grouped into categories 0–6 grade, 7–11 grade, 12+ grade), if a farmworker, and years lived in the US (grouped into the categories 5 years, 6–10 years, 11–15 years, 16–20 years, and 21 + years). We also assessed if participants had H-2A visas, temporary work permits for agricultural workers (Arcury et al., 2015). For migrant farmworkers, years lived in the US referred to the number of years spent working in the US. We also assessed whether or not participants had an adolescent child (11–17 years old). Some participants had multiple adolescent children, so the total number of children was greater than the total number of participants. Demographic characteristics for participants' adolescent children included gender, age (grouped into the categories 11–12, 13–14, and 15–17), and country of residence.

We assessed HPV knowledge and HPV vaccine knowledge using 17 true-false items, 14 items adapted from Gerend et al. (2013) and 3 additional items about recommended vaccine administration. Participants received one point for every correct response and zero points for incorrect or “don't know” responses. To assess vaccine initiation, we asked respondents who reported having an adolescent child, “Has [your daughter/son] received at least one dose of the vaccine for HPV?” To determine HPV vaccine knowledge source we asked, “The HPV vaccine is also known as the cervical cancer vaccine or Gardasil or Cervix. Have you ever heard about the HPV vaccine from [source]?”

Analysis

Descriptive statistics were calculated for demographic characteristics within farmworker groups. Chi-squared tests, t-tests and Wilcoxon rank sum tests were used to compare variables between farmworkers and non-farmworkers as appropriate. Since some parents had multiple children, the generalized estimating equation (GEE) approach was used to compare the adolescent child characteristics between farmworker parents and non-farmworker parents. This model accounted for familial correlation using a sandwich estimator of the variance under exchangeable correlation.

For HPV knowledge items, counts and percentages of participants who provided correct responses were calculated for the full sample and by gender and farmworker status. Chi-squared tests were used to compare correct responses for each item between gender and farmworker status. Total scores were calculated for the HPV knowledge measure by summing the number of correct responses. The means and standard deviations of total scores were also calculated by gender and farmworker status and compared using Wilcoxon rank sum tests. The same procedures were used to analyze HPV vaccine knowledge.

The frequencies of HPV vaccine knowledge source were compared between farmworker groups and reported child vaccination status (no child vaccinated vs. any child vaccinated) using chi-squared tests. To evaluate vaccine initiation, counts and percentages of children vaccinated were calculated for demographic groups based on gender, country of residence, and age. Counts and percentages of children vaccinated were also calculated by farmworker status, gender, education level, and time in US for the parent completing the interview.

Parent characteristics were of interest in this analysis since parents decide whether to vaccinate their children. The GEE approach was used to compare vaccine initiation among children of farmworker parents and non-farmworker parents. For descriptive purpose, p values < 0.05 were considered statistically significant. All analyses were performed using SAS 9.4 (SAS Institute, Cary, NC).

Results

Participants

Participants included 100 farmworkers: 80 men and 20 women, and 100 nonfarmworkers: 50 men and 50 women (Table 1). Farmworker participants had an average age of 37.6 years ($SD = 10.1$) and were slightly younger than non-farmworker participants ($M = 41.1$, $SD = 11.7$, $p = 0.052$). Most participants had low levels of education. A larger percentage of non-farmworker participants (36%) than farmworker participants (11%) had completed 12th grade or above ($p < 0.001$). Most farmworker participants (78%) were H-2A visa holders. Nonfarmworkers had lived in the US for an average of 16.2 years ($SD = 7.5$), while farmworkers had lived in the US for an average of 10.6 years ($SD = 6.9$, $p < 0.001$). Eighty-eight participants, 48 farmworkers and 40 non-farmworkers, had at least one child between the ages of 11 and 17 ($p = 0.255$). Participants had a total of 135 adolescent children, 66 boys and 69 girls. Most children of farmworkers (78%) lived in Mexico, while most children of non-farmworkers (95%) lived in the US ($p = 0.019$).

HPV and HPV Vaccine Knowledge

Total HPV and HPV vaccine knowledge scores did not vary significantly by participant characteristics (farmworker status, gender, education, and years in US). For the 9 HPV knowledge items, farmworkers had an average of 5.4 ($SD = 2.0$) correct responses, while nonfarmworkers had an average of 5.1 ($SD = 2.5$) correct responses ($p = 0.780$). For the 8 HPV vaccine knowledge items, farmworkers had an average of 3.1 ($SD = 1.9$) correct responses, while non-farmworkers had an average of 3.0 ($SD = 2.2$) correct responses ($p = 0.777$).

The average score for the full sample for general HPV knowledge was 5.2 ($SD = 2.3$) out of 9. Differences in responses for specific HPV knowledge items between farmworkers and nonfarmworkers were minimal. Participants had a general awareness that HPV is a sexually transmitted infection (66% correct), risk for infection increases with number of sexual partners (81% correct), and condom use can reduce transmission (77% correct, Table 2). About half of participants knew that HPV can cause abnormal Pap smear results (52%) and cervical cancer (56%). Most participants did not know that HPV causes genital warts (41% correct) or that it is a common infection (35% correct).

Vaccine knowledge was lower than general HPV knowledge. The average score for vaccine knowledge items was 3.0 ($SD = 2.0$) out of 8. Only 54% of participants knew that the HPV vaccine helps protect against cervical cancer (Table 2). About half of participants believed that women no longer need Pap smears after getting the HPV vaccine (51% correct). Only 37% of participants knew that the HPV vaccine is recommended for girls and less than one

quarter (24%) knew that it is recommended for boys. Most participants did not know that more than one dose of the HPV vaccine is required (28% correct).

Knowledge Source

The most common source of HPV vaccine knowledge for all participants was an advertisement (54% of farmworkers and 40% of non-farmworkers, $p = 0.047$, Table 3). The second most common source of HPV vaccine knowledge for farmworkers was a news program (52%), while for non-farmworkers it was an educational program (36%). Less than half of participants (49% of farmworkers and 31% of non-farmworkers; $p = 0.009$) reported hearing about the vaccine from a doctor or nurse. More farmworkers than non-farmworkers reported learning about the HPV vaccine from each possible source.

The most common knowledge source for parents who had vaccinated at least one child was a doctor or nurse (70%) (Table 3). The most common knowledge source for parents who reported they did not vaccinate any children was an advertisement (32%). A larger percentage of parents who had vaccinated at least one child, compared to parents who did not vaccinate any children, reported learning about the HPV vaccine from each of the 10 possible sources.

HPV Vaccine Initiation

Parents in this sample reported low levels of HPV vaccine initiation among their children (Table 4). Among the 88 participants who had adolescent children, 23 (26%) had vaccinated at least one child. Of the full sample, 28% of girls and 21% of boys had received at least one dose. Farmworkers and non-farmworkers had similarly low levels of initiation; 25% percent of children with farmworker parents and 24% of children with non-farmworker parents had initiated vaccination. Children living in the US with farmworker parents had significantly higher reported vaccine initiation (65%) compared to children living in the US with non-farmworker parents (25%; $p = 0.038$). A larger percentage of children of female participants (44%) had initiated vaccination compared to children of male participants (11%). There were no statistically significant differences in reported vaccine initiation based on child's gender, child's age, parent's education, or parent's time in the US.

Discussion

This study found low levels of knowledge about HPV and the HPV vaccine among Mexican-born farmworkers and non-farmworkers in North Carolina. Farmworkers and nonfarmworkers have comparable HPV vaccine knowledge, although they learn about the HPV vaccine from different sources. The results show low HPV vaccine initiation among children of farmworkers and non-farmworkers. However, for children living in the US with farmworker parents, vaccine initiation was higher. We need improved educational campaigns and interventions promoting vaccine initiation to prevent HPV-related cancers and improve health equity.

The low knowledge scores in our findings are consistent with results of previous studies of HPV knowledge within various subsets of the Latino population (Bair, Mays, Sturm, & Zimet, 2008; Kepka et al., 2015; Kepka et al., 2012; Molokwu et al., 2014). We found

similar scores compared to the results of the Gerend et al. (2013) study of knowledge among Latina mothers at a Federally Qualified Health Center in Florida. In the Gerend et al. (2013) study, the mean HPV knowledge score was 6.10 out of 9 ($SD = 1.71$) and the mean HPV vaccine knowledge score was 3.32 out of 5 ($SD = 1.12$). According to a recent population-based sample, over 70% of adults knew that HPV could cause cervical cancer (McBride & Singh, 2017). These findings suggest that HPV knowledge in our sample was lower than HPV knowledge among the general US population. We found low HPV knowledge among men and women. Although our focus was on HPV as it relates to cervical cancer, men's awareness is important because they are at risk for HPV-related diseases such as oropharyngeal, anal, and penile cancer (Osazuwa-Peters et al., 2017). Men's HPV knowledge is also important as male vaccination helps protect their female partners and fathers' knowledge may affect their decision to vaccinate their children. These findings underscore the need for HPV and HPV vaccine educational campaigns that are culturally competent and inclusive of the Mexican-born immigrant population.

HPV vaccine initiation in our full sample (21%–28%) was much lower than national averages. In the US, 65% of girls and 56% of boys have received at least one dose of the HPV vaccine (Walker et al., 2017). According to the National Immunization Survey-Teen, HPV vaccine initiation is higher than average for Hispanic females (72%) and males (61%) (Walker et al., 2017). However, our findings are consistent with several previous studies that have found lower than average HPV vaccine uptake in underserved subsets of the Latino population (Gerend et al., 2013; Kepka et al., 2012; Yeganeh et al., 2010). The low vaccine initiation among children living in Mexico (13%) could reflect recent trends of decreasing HPV vaccine initiation across Latin America, despite national vaccine programs (Nogueira-Rodrigues et al., 2017)

The unusually low vaccine coverage in our sample could be the result of participants' limited access to healthcare. Cost is a commonly reported barrier to HPV vaccination (Holman et al., 2014). Research suggests that many parents may not be aware that the HPV vaccine is available at no cost through the Vaccines for Children Program (Yeganeh et al., 2010). Public health programs should utilize community resources outside traditional healthcare settings to ensure that parents of adolescents who do not regularly utilize healthcare receive information about HPV and the HPV vaccine.

Fewer than half of participants learned about the vaccine from a doctor or nurse. Since both parents were not interviewed, it is possible that participants' partners received information from a provider about the vaccine. However, this finding may reflect limited access to healthcare or it could indicate that when participants did access healthcare, providers did not recommend the vaccine. HPV vaccine acceptance is generally high among the Latino population, regardless of knowledge level (Bair et al., 2008; Galbraith et al., 2016; Watts et al., 2009). For example, through interviews with Mexican-born women in California, Wentzell et al. (2016) found that participants usually followed provider recommendations even if they felt they did not have enough information about the vaccine. Providers need to be aware that, in contrast to national statistics, many subgroups of the Latino population have low HPV vaccine initiation rates and recommend catch-up vaccination when appropriate.

HPV vaccine initiation for children living in the US with farmworker parents (65%) was higher than initiation for the full sample and closer to the national average. The high percentage of HPV vaccine initiation could reflect the efforts of health outreach programs serving the farmworker communities in our study area. Outreach workers from these programs provide health education, case management, and other enabling services to improve healthcare access and increase utilization of preventive services for farmworkers and their dependents. Our community partner for this study, the NC Farmworkers Project provides such services, which may explain why more farmworkers (45%) than non-farmworkers (28%) reported learning about the HPV vaccine from a community health educator. The NC Office of Rural Health funds the NC Farmworkers Project and several similar programs throughout the state, serving farmworkers in 45 counties (NC Department of Health and Human Services, 2017; NC Farmworker Health Program [NCFHP], 2017). In addition to these state funded programs, there are eleven federally funded Migrant Health Centers in North Carolina (NCFHP, 2017). Our findings suggest that these programs may positively contribute to HPV vaccine initiation.

This study also demonstrates the importance of provider follow-up after vaccine initiation. Half of participants (51%) held the misconception that women do not need Pap smears after receiving the HPV vaccine. Less than one third of participants (28%) knew that more than one dose of the HPV vaccine is required. Therefore, case management is crucial to ensure that patients complete the full vaccine series and continue utilizing recommended cancer screenings.

Limitations

These results should be interpreted in the context of the study's limitations. Self-report bias, recall bias, and interview bias are all potential limitations when using interviewer-administered questionnaires. Although we included male participants in our sample, our knowledge measure does not assess awareness of the association between HPV and anogenital, penile, and oropharyngeal cancers. In addition, not all participants were parents of adolescent children, so we had a small sample size from which to calculate vaccine initiation. Due to the small sample size, we were unable to adjust for the effects of potential confounders. We did not collect data on location of child's vaccination. Many participants were not aware of the vaccination status of their children. By treating "don't know" responses as "not vaccinated," we may have underestimated the number of vaccinated children. Since mothers make most decisions concerning children's healthcare (Osazuwa-Peters et al., 2017), female participants may have had more accurate information about their children's HPV vaccine status than male participants. A larger percentage of children whose fathers were interviewed had unknown vaccination status (66%) than children whose mothers were interviewed (35%; $p = 0.083$). The higher reported vaccine initiation for children of female participants (44%) compared to children of male participants (11%) may reflect gendered difference in responsibilities for children's health rather than a true difference in vaccine initiation. Therefore, the gender distribution among farmworker participants (80 male, 20 female) could have artificially lowered vaccine initiation in this sample. Finally, the cross-sectional nature of the study provides a limited snapshot of

vaccine initiation. Many participants still had several years before their children outgrew the recommended age range for HPV vaccination.

Conclusion

Despite these limitations, this study makes important contributions to the literature. This quantitative study evaluates farmworkers' knowledge of HPV, and is one of few studies about HPV knowledge that includes women and men. This research highlights a significant health disparity by identifying groups with little knowledge and utilization of an effective cancer prevention strategy. Community organizations providing health outreach services to farmworkers and other underserved populations are important resources for improving HPV vaccine awareness and initiation. Catch-up vaccines, improved patient-provider communication, and case management services are necessary to increase HPV vaccine coverage and reduce the incidence of HPV-associated cancers.

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Table 1

Demographic Characteristics, Mexican-born Farmworkers and Non-Farmworkers, North Carolina, 2015

Adult participant characteristics	Farmworkers (n=100)	Non-farmworkers (n=100)	P value
	n (%)	n (%)	
Gender			<0.001
Female	20 (20)	50 (50)	
Male	80 (80)	50 (50)	
Education			<0.001
0–6 grade	45 (45)	37 (37)	
7–11 grade	44 (44)	27 (27)	
12+ grade	11 (11)	36 (36)	
Years lived in US			<0.001
< 5	30 (30)	9 (9)	
6–10	19 (19)	11 (11)	
11–15	27 (27)	31 (31)	
16–20	17 (17)	27 (27)	
21+	7 (7)	22 (22)	
Parent of adolescent child			0.255
Yes	48 (48)	40 (40)	
No	52 (52)	60 (60)	
Adolescent child characteristics	Farmworker parent (n=76)	Non-farmworker parent (n=59)	P value
	n (%)	n (%)	
Gender			0.031
Female	45 (59)	24 (41)	
Male	31 (41)	35 (59)	
Age			0.654
11–12	24 (32)	20 (34)	
13–14	19(25)	16 (27)	
15–17	33 (43)	23 (39)	
Country of residence			0.019
US	17 (22)	56 (95)	
Mexico	59 (78)	3 (5)	

Note. Adolescent is defined as aged 11–17 years old. Some participants had more than one adolescent child, so the number of children is greater than the number of parents.

Table 2
Knowledge about HPV and the HPV Vaccine among Mexican-born Farmworkers and Non-Farmworkers

HPV knowledge	Number correct (%)	
	Full (n=200)	Non-farmworkers (n=100)
Having many sexual partners increases your risk of getting HPV. (T)	161 (81)	85 (85)
Condoms can prevent the spread of HPV from person to person. (T)	153 (77)	76 (76)
HPV is a sexually transmitted infection. (T)	131 (66)	67 (67) **
Cigarette smoking increases your chances of getting cervical cancer. (T)	119 (60)	59 (59)
People who have been infected with HPV might not have symptoms. (T)	118 (59)	55 (55)
HPV can cause cervical cancer. (T)	111 (56)	63 (63)
HPV infection can cause abnormal Pap smears. (T)	104 (52)	59 (59)
Genital warts are caused by HPV. (T)	82 (41)	53 (53)
HPV infection is rare. (F)	69 (35)	37 (37)
		41 (41)
HPV vaccine knowledge	Number correct (%)	
	Full (n=200)	Non-farmworkers (n=100)
The HPV vaccine helps protect against cervical cancer. (T)	108 (54)	49 (49)
Pap smears are no longer needed after a woman gets the HPV vaccine. (F)	101 (51)	59 (59)
The HPV vaccine is most effective if given before a person becomes sexually active. (T)	94 (47)	60 (60) **
The HPV vaccine helps protect against genital warts. (T)	76 (38)	39 (39) *
The HPV vaccine is recommended for girls. (T) ^a	73 (37)	32 (32)
Only 1 dose of the HPV vaccine is required. (F) ^a	55 (28)	37 (37)
The HPV vaccine is used to treat people who are infected with HPV. (F)	47 (24)	22 (22)
The HPV vaccine is recommended for boys. (T) ^a	47 (24)	29 (29)
		18 (18)

Note. (T) = correct response is true. (F) = correct response is false.

^a Items added to Gerend et al. (2013) measure;

** p < 0.01;

* p < 0.05

Table 3
HPV Vaccine Knowledge Sources among Mexican-born Farmworkers and Non-Farmworkers (n=200)

Knowledge source	Full sample		Parents*		P value
	Farmworkers (n=100)	Non-farmworkers (n=100)	Any child vaccinated (n=23)	No child vaccinated (n=65)	
	n (%)	n (%)	n (%)	n (%)	P value
Advertisement	54 (54)	40 (40)	13 (57)	21 (32)	0.040
News program	52 (52)	32 (32)	15 (65)	16 (25)	0.001
Doctor or nurse	49 (49)	31 (31)	16 (70)	20 (31)	0.001
Community health educator	45 (45)	28 (28)	14 (61)	17 (26)	0.003
Educational program	40 (40)	36 (36)	9 (39)	16 (25)	0.185
Family member	28 (28)	14 (14)	4 (17)	7 (11)	0.409
Teacher	25 (25)	16 (16)	7 (30)	5 (8)	0.006
Friend or co-worker	23 (23)	12 (12)	5 (22)	5 (8)	0.068
Entertainment program	20 (20)	12 (12)	3 (13)	5 (8)	0.443
Other	2 (2)	6 (6)	1 (4)	0 (0)	0.091

Note. Percentages indicate percent of participants in each category who reported learning about the HPV vaccine from each source. Participants could select more than one knowledge source.

* Only includes parents with adolescent children

HPV Vaccination Status of Children of Mexican-born Farmworkers and Non-Farmworkers

Table 4

Child characteristics	Full sample (n = 135)		Farmworker parent (n = 76)		Non-farmworker parent (n = 59)		P value
	Vaccinated n (%)	Not vaccinated n (%)	Vaccinated n (%)	Not vaccinated n (%)	Vaccinated n (%)	Not vaccinated n (%)	
Gender							
Female	19 (28)	50 (72)	11 (24)	34 (76)	8 (33)	16 (67)	0.246
Male	14 (21)	52 (79)	8 (26)	23 (74)	6 (17)	29 (83)	0.267
Farmworker parent	19 (25)	57 (75)	19 (25)	57 (75)			
Non-farmworker parent	14 (24)	45 (76)			14 (24)	45 (76)	
Country of residence							
US	25 (34)	48 (66)	11 (65)	6 (35)	14 (25)	42 (75)	0.038
Mexico	8 (13)	54 (87)	8 (14)	51 (86)	0 (0)	3 (100)	NA
Age							
11–12	10 (23)	34 (77)	5 (21)	19 (79)	5 (25)	15 (75)	0.743
13–14	6 (17)	29 (83)	5 (26)	14 (74)	1 (6)	15 (94)	0.242
15–17	17 (30)	39 (70)	9 (27)	24 (73)	8 (35)	15 (65)	0.328
Parent reporting vaccination status							
Mother	24 (44)	30 (56)	11 (65)	6 (35)	13 (35)	24 (65)	0.296
Father	9 (11)	72 (89)	8 (14)	51 (86)	1 (5)	21 (95)	0.189

Note. 0 children of non-farmworkers lived in Mexico, so there was no statistical comparison calculated for that category.