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Parental predictors of HPV vaccine initiation among low-income Hispanic females aged 11–17 years

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Abstract

Purpose: Hispanic women experience a disproportionate burden of cervical cancer morbidity and mortality compared to non-Hispanic women. Increasing HPV vaccination among Hispanic adolescents can help alleviate disparities. This study aimed to identify parental psychosocial predictors associated with HPV vaccine initiation and correlates of parental intentions to obtain the vaccine for their Hispanic adolescent daughters aged 11–17 years.

Methods: This study is part of a larger three-arm randomized controlled trial testing the effectiveness of interventions to increase HPV vaccination. Parents of adolescent females were recruited in community clinics where we conducted baseline surveys. We obtained electronic medical records six months after baseline to assess vaccination status. Multilevel logistic regression was used to identify correlates of parental intentions to vaccinate and predictors of HPV vaccine initiation. Analyses with initiation as the outcome also controlled for intervention study arm. The Integrated Behavioral Model guided selection of psychosocial and outcome variables.

Results: Our sample ($n = 765$) consisted mostly of mothers with less than a high school education born outside of the U.S. Forty-one percent had a household income less than \$15,000. Most daughters had public or private insurance. Twenty-one percent initiated the HPV vaccine series. Correlates of intention to vaccinate included subjective norms related to daughter's doctor (AOR = 1.04; 95% CI 1.01–1.07), belief that the vaccine is safe (AOR = 1.38; 95% CI 1.06–1.78), self-efficacy to obtain the vaccine for their daughter (AOR = 2.39; 95% CI 1.52–3.77), and parental concern about vaccine side effects (AOR = 0.73; 95% CI 0.60–0.89). Intentions predicted initiation (AOR = 2.01; 95% CI 1.10–5.26); concern about sexual

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Conflict of interest

Authors declare no conflicts of interest.

disinhibition decreased the odds of having a vaccinated daughter at follow-up (AOR = 0.66; 95% CI 0.47–0.92).

Discussion: Parental intention and concerns about sexual disinhibition predict vaccine initiation. Further research is needed to explore the role of intention as a potential mediator between psychosocial variables and vaccination status.

Keywords

HPV vaccine; Health disparities; Predictors; Adolescents

1. Background

The human papillomavirus (HPV) is the most common sexually transmitted infection among sexually active individuals [1]. Persistent infection with high-risk HPV genotypes can lead to a number of malignancies including cervical, anal, vulvar, vaginal, and oropharyngeal cancers [2]. Cervical cancer is the most commonly diagnosed HPV-related cancer in women in the United States with a rate of 7.4 cases per 100,000 females, and almost all cervical cancers are attributable to HPV [3].

Disparities exist in HPV infection prevalence, cervical cancer screening, and cervical cancer morbidity and mortality rates. High-risk types of HPV are more prevalent among women with less than a high school education (38%) compared to those with a high school diploma or more (33% and 27% respectively) and among women living below poverty (40%) compared to those at or above the poverty line (27%) [4]. High-risk types are also most prevalent among non-Hispanic black women (40%), followed by Mexican American (31%), as compared to other race/ethnicities (28%), and non-Hispanic white women (27%) [4]. Hispanic women are significantly less likely than non-Hispanic women to obtain cervical cancer screening [5], and Hispanic women experience a significantly disproportionate rate of cervical cancer (9.7 per 100,000) compared to non-Hispanic women (7.1 per 100,000) [3]. Cervical cancer mortality rates for Hispanic women are second only to rates for Black women and are higher compared to White, Asian/Pacific Islander, and American Indian/Alaska Native women [6].

These disparities highlight the importance of preventing initial HPV infection. HPV vaccines, available for 9–26 year olds, protect against certain virus types that can lead to HPV-related cancers including cervical cancer. The HPV vaccine series includes 2 doses six to twelve months apart for adolescents under 14 years old and 3 doses for adolescents and young adults at 0, 1–2, and 6 months [7]. The CDC Advisory Committee on Immunization Practices (ACIP) recommends the vaccine series be administered to adolescents ages 11–12 years alongside other routine adolescent vaccines [8]. Healthy People 2020 sets the goal that 80% of adolescents ages 13–15 years complete the HPV vaccine series [9], but national vaccination coverage falls below this goal. In 2016, 65% of females ages 13–17 years initiated the HPV vaccine series and only 43% completed the series [10].

Identifying predictors of vaccination can inform interventions for priority groups. Although Hispanic mothers are more accepting of HPV vaccination compared to non-Hispanic White

mothers, specific beliefs can negatively influence the decision to vaccinate their daughters [11]. These include sexuality-related concerns, safety concerns, and low perceived risk that daughter will acquire HPV [11]. Studies of Hispanic populations that have examined parental HPV vaccine knowledge [12–16], parental beliefs and attitudes toward the vaccine [17–22], and barriers to vaccination [23–25], often use cross-sectional or qualitative methods. Few have looked at vaccine series initiation and completion using longitudinal studies to assess predictors of vaccination instead of only correlates [11]. Longitudinal studies to identify psychosocial predictors of vaccination among Hispanics are needed because measuring both psychosocial predictors and vaccination status simultaneously obscures the direction of the association.

This study aimed to identify parental psychosocial predictors of HPV vaccine initiation among low-income Hispanic girls aged 11–17 years. Based on the Integrated Behavioral Model, we also aimed to identify associations between parental psychosocial factors and intentions to obtain the HPV vaccine for their daughters.

2. Methods

This study used data from *Por Nuestras Hijas* (PNH) (*For Our Daughters*; Cancer Prevention & Research Institute of Texas RP130459), a group randomized controlled trial that tested the effectiveness of two parent-education interventions (a tailored interactive multimedia intervention and print *fotonovela*) [26] to increase HPV vaccination among Hispanic adolescent females in Houston, TX. Data are restricted to females only as the interventions were developed prior to HPV vaccine recommendations for males. The interventions have since been adapted for males [26] and data collection with Hispanic parents of males is ongoing. The University of Texas Health Science Center at Houston and the Harris Health System Institutional Review Boards approved this research.

2.1. Setting and participants

Data collection occurred between November 2012 and January 2015. Participants were recruited from within 29 participating community health clinics. These clinics included Harris Health System (HHS) clinics (n = 10) and Federally Qualified Health Centers and other unaffiliated community clinics (n = 19). Harris Health System is a large safety net system serving Harris County, Texas. To be eligible to participate, clinics had to serve predominantly Hispanic patients and participate in the Vaccines for Children (VFC) Program. VFC offers vaccines at no cost for patients who are otherwise unable to pay [27]. Participant eligibility criteria for the original study included: (1) have a daughter aged 11–17 years, (2) have a daughter who had not initiated the HPV vaccine series, and (3) self-identify as Hispanic or Latina/o. If a participant had more than one daughter who met eligibility criteria, we restricted questions to the daughter with the most recent birthday.

Trained, bilingual data collectors recruited parents in clinic waiting rooms, assessed eligibility, and obtained informed consent. Informed consent included consent to access daughters' medical records to assess HPV vaccination status, including information on vaccine doses and dates. Once parents consented, data collectors administered a computer-assisted in-person baseline survey which captured parent and daughter sociodemographic

characteristics and measured psychosocial variables corresponding to constructs of the Integrated Behavioral Model. Parents received a \$20 gift card for completing the baseline survey.

2.2. Theoretical framework

The Integrated Behavioral Model (IBM), an extension of the Theory of Reasoned Action and the Theory of Planned Behavior [28], provided the theoretical framework for this study. Specifically, the IBM and empirical literature guided the selection of psychosocial variables assessed (knowledge, awareness, beliefs, perceived norms, subjective norms, and self-efficacy) and outcomes (intention and vaccination initiation) measured. According to the IBM, these psychosocial variables should predict intention which in turn should predict behavior (vaccination initiation).

2.3. Variables and data sources

2.3.1. Primary outcome variable—Vaccination status was measured at 6 months after baseline as a dichotomous variable (at least one dose of HPV vaccine versus none). We obtained the series dose and date of vaccination for daughters directly from Epic electronic medical records in HHS clinics and submitted written requests to other community clinics. For cases where clinics reported that daughters were not patients or if no records were found in Epic, we obtained information from parents about alternative clinics their daughters attended and sought data from these sources.

2.3.2. Secondary outcome variable—Parental intention was measured at baseline using a 5-point Likert scale modeled on stages of change [29]. We dichotomized the scale to obtain a binary outcome with “no thought of getting her the vaccine,” “think I need to consider getting her the vaccine,” and “think I should get her the vaccine, but I am not quite ready” categorized as no intention to obtain the vaccine. We categorized “think I will probably get her the vaccine” and “I am committed to getting her the vaccine” as intention to obtain the vaccine for daughter.

2.3.3. Psychosocial variables—Psychosocial variables from the IBM included: HPV awareness and knowledge [29,30]; HPV vaccine awareness [29]; behavioral beliefs including concerns related to sexual disinhibition (the belief that HPV vaccination may lead to risky sexual behavior) [31]; normative beliefs including perceived social norms, subjective norms related to family, and subjective norms related to the daughter’s doctor [29]; and self-efficacy to obtain the vaccine for the daughter [32]. Additional variables measured included parental perceived susceptibility of their daughter to HPV [29]; perceived severity of HPV [33]; beliefs about HPV vaccine safety; and concerns about vaccine side effects and cost [34]. Intention, an IBM construct, was included as a psychosocial variable in all analyses with vaccination status as the outcome [29]. See Supplemental Materials for all survey items.

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.vaccine.2018.06.071>.

HPV knowledge was measured through a series of three true/false questions with responses added together to give an overall knowledge score (range 0–3). Based on our previous research, we adapted a validated self-efficacy scale for cervical cancer screening [34,35] and cognitively tested HPV vaccination items [32] to produce a six-item scale assessing parental self-efficacy to obtain the vaccine HPV for daughters ($\alpha = 0.63$). Parental self-efficacy was measured as the mean of the six items. Next, each subjective norms scale consisted of two questions measuring beliefs about whether doctors or family members wanted them to vaccinate and motivation to comply. Responses were multiplied to give an overall subjective norms scale (range 1–25). All other variables consisted of one item each measured on a five-point Likert scale. For example, sexual disinhibition was measured by parental agreement with the statement “If my daughter gets the HPV vaccine, she may think it is okay to have sex.” The five-point Likert scale ranged from strongly disagree to strongly agree.

2.3.4. Covariates—We selected covariates based on bivariate analyses and literature supporting the association of each of these factors with HPV initiation. These included: daughter’s age (continuous), daughter’s health insurance status (uninsured, public, or private, insurance), mother’s age (continuous), and household income (dichotomized as no income to \$14,999 vs. >\$15,000) [25,36,37]. Because data were obtained from a group-randomized control trial testing the impact of an intervention, we dummy coded study arm to include as a covariate in the models with vaccination status as the outcome.

2.4. Data analysis

We computed descriptive statistics for daughter and participant demographic variables and calculated Pearson correlations to assess multicollinearity between psychosocial variables. For both outcomes, we used multilevel logistic regression to account for participant clustering within clinics when computing unadjusted and adjusted odds ratios. Variables significant at the $p < 0.10$ level in bivariate analyses were included in multivariable analyses. We controlled for covariates in multivariable models. We also controlled for study arm in both bivariate and multivariable analyses with vaccination status as the outcome since vaccination status was measured after intervention delivery. Tests were two-tailed with an alpha of 0.05. All analyses were completed using Stata v.14 [38].

3. Results

We obtained vaccination status via electronic medical records for 765 daughters of participants (Table 1). Mean age for daughters was 13 years, and most (76%) had some form of public insurance. Mean parent age was 39 years, and more than half (59%) reported a household income over \$15,000 per year. Most parents were female (98%), reported having less than a 12th grade education (70%), and were born outside of the United States (89%). Most parents (79%) had other daughters who were unvaccinated at follow up.

Parental HPV awareness and HPV vaccine awareness were the most highly correlated independent variables at $r = 0.48$ indicating possible multicollinearity between the variables (Table 2). Similarly, subjective norms related to family and subjective norms related to the doctor were also highly correlated at $r = 0.39$. Each variable remained in subsequent

analyses after careful consideration of the survey items and because of the theoretical basis for each question.

3.1. Correlates of parental intention to vaccinate

3.1.1. Unadjusted analysis—In unadjusted analyses, correlates positively associated with parental intention to vaccinate included subjective norms related to family (OR = 1.03; 95% CI 1.02–1.05), subjective norms related to daughter's doctor (OR = 1.06; 95% CI 1.04–1.08), beliefs about HPV vaccine safety (OR = 1.56; 95% CI 1.34–1.82), and self-efficacy (OR = 3.07; 95% CI 2.28–4.13) (Table 3). Parents with higher scores on subjective norms related to family and daughters' doctors, beliefs about the vaccine's safety, and self-efficacy to obtain the vaccine for their daughters had higher odds of intending to vaccinate their daughters. Correlates negatively associated with intention included concerns about sexual disinhibition (OR = 0.88; 95% CI 0.78–0.99), concerns about side effects (OR = 0.77; 95% CI 0.69–0.86), and concerns about cost (OR = 0.86; 95% CI 0.78–0.95).

3.1.2. Adjusted analysis—In multivariable analysis, variables positively associated with intention to obtain the vaccine included subjective norms related to daughter's doctor (AOR = 1.04; 95% CI 1.01–1.07), beliefs about HPV vaccine safety (AOR = 1.38; 95% CI 1.06–1.78), and self-efficacy (AOR = 2.39; 95% CI 1.52–3.77). Greater concern about side effects (AOR = 0.73; 95% CI 0.60–0.89) was negatively associated with HPV vaccination intention.

3.2. Predictors of HPV vaccination within six months

3.2.1. Unadjusted analyses—In unadjusted analyses, subjective norms related to family (OR = 1.03; 95% CI 1.01–1.05) and subjective norms related to daughter's doctor (OR = 1.03; 95% CI 1.00–1.06) were positively associated with HPV vaccine series initiation within 6 months (Table 4). Additionally, parents with higher scores pertaining to beliefs that the HPV vaccine is safe had 22% higher odds of having a vaccinated daughter at 6 months compared to those with lower scores on beliefs in the vaccine's safety (OR = 1.22; 95% CI 1.01–1.48). Parents with higher scores on self-efficacy to obtain the vaccine had nearly twice the odds of having a vaccinated daughter at 6 months compared to those with lower self-efficacy scores (OR = 1.91; 95% CI 1.33–2.76). Finally, parents who expressed the intention to obtain the HPV vaccine for their daughters had twice the odds of having a daughter vaccinated within 6 months compared to parents that did not express that intention (OR = 2.01; 95% CI 1.39–2.93).

Two variables were negatively associated with HPV vaccine series initiation. Parents who perceived their daughter to be less susceptible to HPV had lower odds of having a vaccinated daughter at 6 months compared to those who thought their daughter had about the same or a higher chance of HPV infection as other girls (OR = 0.65; 95% CI 0.44–0.95). Second, parents more concerned about the vaccine's side effects had lower odds of having a vaccinated daughter at 6 months than those who were less concerned about side effects (OR = 0.86; 95% CI 0.76–0.97).

3.2.2. Adjusted analyses—After adjusting for covariates, parental concern about sexual disinhibition was significantly associated with lower odds of having a vaccinated daughter at 6 months (AOR = 0.66; 95% CI 0.47–0.92) (Table 5). Additionally, parents who intended to vaccinate had nearly two and a half times higher odds of having a vaccinated daughter at 6 months compared to those who did not intend to vaccinate their daughters at baseline (OR = 2.01; 95% CI 1.10–5.26).

4. Discussion

Guided by the Integrated Behavioral Model, we aimed to identify parental predictors of HPV vaccine initiation of low income Hispanic girls ages 11–17 years and to identify correlates of parental intentions to obtain the HPV vaccine for their daughters. Our study found parental intention to vaccinate predicts HPV vaccine series initiation, and greater concerns about sexual disinhibition were negatively associated with initiation. Further, parental subjective norms related to daughter's doctor, beliefs in vaccine safety, and self-efficacy to obtain the vaccine for daughters are correlates of parental intention. Because our self-efficacy scale incorporated six behaviors, further research is needed to understand if self-efficacy for some behaviors versus others (e.g., ability to ask questions vs. ability to make an appointment) are more highly correlated with intention than others.

Overall, the relationship between parental intention to vaccinate and HPV vaccine series initiation is in line with theory and previous studies focused on vaccination of adolescent girls. As suggested by the IBM, parental intention predicted HPV vaccine initiation. Previous studies have found intention correlated with HPV vaccine initiation for adolescent girls [36,39,40]. However, a paucity of studies exist examining the association between parental intentions and vaccination outcomes among Hispanic adolescent females specifically, and few have examined psychosocial correlates of intention to vaccinate among Hispanic parents [41]. Our study contributes to the literature by describing the associations between IBM constructs and vaccination behaviors among this population to inform future intervention development.

In adjusted models, only intention predicted series initiation. This is in contrast to other longitudinal predictors studies which showed that attitudes and normative beliefs were predictive of vaccination status [40,42]. Overlapping variance between the predictors and intention may explain these findings. Subjective norms related to family and doctor, beliefs about HPV vaccine safety, concerns about side effects, and self-efficacy to obtain the vaccine were significantly correlated with intention, as expected based on the IBM. Pearson's *r* ranged from 0.16 to 0.30. Overlapping variances could have obscured variable relations with the outcome. Nevertheless, since findings showed that subjective norms related to daughter's doctor, beliefs about safety, concerns about side effects and self-efficacy were all significantly and independently associated with intention, and since intention predicts vaccination, these psychosocial variables remain important as potential intervention targets.

This study also found that parents expressing concerns about sexual disinhibition had lower odds of having a vaccinated daughter at 6 months. Findings related to beliefs about the

vaccine leading to sexual disinhibition are mixed in previous research. Hispanic parents have previously expressed concerns that obtaining the vaccine for their daughter could lead their daughters to think it is okay to have premarital sex or to initiate sex early [11,19]. A previous study examining HPV vaccine uptake among Hispanic adolescent girls found parental concerns about sexual disinhibition to be the only psychosocial factor associated with uptake [22]. However, parents also see the vaccine as an opportunity to protect daughters who may be sexually active [43]. Research indicates there is no link between HPV vaccination, early sexual debut, or risky sexual behaviors [44,45]. Because this is a concern for Hispanic parents, interventions targeting Hispanic parents should address sexual disinhibition concerns and highlight research indicating there is no link between vaccination and sexual debut or risky behaviors. Intervening on these concerns can help move the conversation about the HPV vaccine from one relating the vaccine to sex to a conversation that reiterates the vaccine is a safe and effective cancer prevention strategy.

4.1. Strengths and limitations

Study strengths include our longitudinal study design and large sample size ($N = 765$). Data were collected as part of a larger three-arm cluster randomized control trial testing the effectiveness of two parental education interventions. However, we controlled for study arm in analyses, which enabled us to use all available data for participating parents and daughters with available medical records without variance due to intervention effects. While obtaining vaccination statuses posed some limitations as noted below, our outcome measure is also a strength. Medical records provided accurate initiation data while methods such as parent reporting can lead to underestimation, particularly for girls who are non-white race/ethnicity, are older adolescents, have a lower household income, have a mother with a low level of education, and have public insurance [46–48].

This study has some limitations. Our study included only participants whose daughter's vaccination status could be verified at the health clinics where parents were recruited or those that parents reported as alternative clinics. Those who may not regularly access the same clinic or who attend a number of clinics for care were not captured in our sample, and results may not be generalizable to those populations. Another limitation is that our data on vaccination status may not have captured those who were vaccinated at alternative locations such as mobile clinics, community vaccination events, or pharmacy clinics thus potentially underestimating vaccination. Although Texas has an immunization registry (ImmTrak2), we did not verify vaccination records through the registry. ImmTrak2 is an opt-in system, and children are not automatically enrolled in the registry at birth. Therefore it may not include all participants' daughters which could create bias if there are differences in those included versus those not included in the registry. Next, outcome measurement at 6 months is a limitation. We did not capture participants who may have vaccinated after the 6 month cutoff, thus again potentially underestimating vaccination initiation. Finally, we chose to use data from all study arms. Although we controlled for study arm, it is still possible that it could still have altered observed associations.

All predictor variables, including intention, were measured simultaneously at baseline. This limits our ability to assess intention as a mediator between these predictor variables and

vaccination status. Our study found that several of the psychosocial constructs predicted intention and that intention in turn predicted HPV vaccination. This provides some evidence consistent with a mediation hypothesis, and our findings warrant further research using longitudinal measures of intention prior to assessing vaccination and using other analytic methods such as path analysis.

5. Conclusion

Identifying correlates of intention and predictors of series initiation can inform future intervention development to increase HPV vaccination among Hispanic adolescents. Overall, intention and concerns about sexual disinhibition are significant predictors of HPV vaccine initiation among low income, Hispanic girls ages 11–17 years. Additionally, variables associated with parental intentions to vaccinate include subjective norms related to daughter's doctor, beliefs about the safety of the HPV vaccine, and self-efficacy. Interventions that focus on these factors may increase intention and ultimately increase HPV vaccine series initiation in this population. Additionally, interventions addressing concerns about sexual disinhibition are needed. Interventions that increase HPV vaccination among this population can help reduce later cervical cancer morbidity and mortality and reduce cancer-related health disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Daughter and mother demographics.

Variable	n (%) or Mean (SD)
<i>Daughter characteristics</i>	
Age, μ (SD)	13.18 (1.97)
Insurance status	
Uninsured	136 (18.06)
Public insurance	575 (76.36)
Private insurance	42 (5.58)
<i>Participant characteristics</i>	
Sex	
Female	753 (98.43)
Male	12 (1.57)
Age, μ (SD)	38.79 (6.65)
Education level	
None - 11th grade	530 (69.83)
12th grade - >HS	229 (30.17)
Born in United States	
Yes	81 (10.66)
No	679 (89.34)
Household income	
No income - \$14,999	212 (41.25)
\$15,000+	302 (58.75)

Table 2:

Correlation matrix of predictors.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
HPV awareness	1.00															
HPV knowledge	0.09	1.00														
Perceived susceptibility	-0.01	0.06	1.00													
Perceived severity	0.09 [*]	0.02	-0.03	1.00												
HPV vaccine awareness	0.48 ^{**}	0.08	-0.03	0.06	1.00											
Perceived norms	0.06	0.04	0.03	0.05	0.04	1.00										
Subjective Norms (family)	0.04	0.00	-0.03	0.02	0.02	0.31 ^{**}	1.00									
Subjective Norms (doctor)	-0.05	0.03	0.00	0.00	0.05	0.20 ^{**}	0.39 ^{**}	1.00								
Belief - vaccine safety	-0.01	0.07	-0.02	0.08 [*]	0.02	0.14 ^{**}	0.25 ^{**}	0.25 ^{**}	1.00							
Concern – sexual Disinhibition	0.01	-0.01	0.05	0.04	0.03	0.01	0.05	0.01	0.05	1.00						
Concern – side Effects	0.01	-0.03	0.00	0.05	-0.04	0.05	-0.11 ^{**}	-0.15 ^{**}	-0.20 ^{**}	0.08 [*]	1.00					
Concern – cost	-0.02	0.02	0.04	-0.01	-0.09 [*]	0.12 ^{**}	0.06	0.00	-0.05	0.11 ^{**}	0.10 ^{**}	1.00				
Self-efficacy	0.03	0.02	-0.11 ^{**}	0.11	0.06	0.16 ^{**}	0.20 ^{**}	0.26 ^{**}	0.30 ^{**}	-0.01	-0.16 ^{**}	-0.19 ^{**}	1.00			
Attitude – important	0.00	-0.01	-0.06	-0.03	-0.02	0.07	0.02	0.02	0.07	0.00	0.02	0.03	0.04	1.00		
Attitude – afraid	-0.05	0.04	0.08 [*]	0.01	-0.06	0.02	-0.04	-0.02	-0.14 ^{**}	0.04	0.22 ^{**}	0.11 ^{**}	-0.12 ^{**}	-0.12 ^{**}	1.00	
Intention	0.04	0.07	-0.02	0.06	0.07	0.02	0.16 ^{**}	0.23 ^{**}	0.23 ^{**}	-0.08	-0.17 ^{**}	-0.12 ^{**}	0.30 ^{**}	0.03	-0.06	1.00

*
 $p < 0.05$.**
 $p < 0.01$.

Table 3:

Bivariate and multivariable analyses: Psychosocial factors associated with intentions to vaccinate.

Variable	Unadjusted OR ^a	95% CI	p-value	Adjusted OR ^b	95% CI	p-value
HPV awareness						
Yes	1.16	0.86–1.57	0.32			
No	REF					
HPV knowledge	1.24	0.95–1.63	0.12			
Perception of daughter susceptibility to HPV						
Higher or about the same chance as others	REF					
Less chance than others	0.93	0.69–1.25	0.62			
Perceived severity of HPV	1.17	0.98–1.41	0.09	1.13	0.86–1.48	0.39
HPV vaccine awareness						
Yes	1.31	0.98–1.76	0.07	1.05	0.62–1.76	0.87
No	REF			REF		
Perceived norms	1.04	0.92–1.18	0.53			
Subjective norms (family)	1.03	1.02–1.05	<0.01	1.02	0.99–1.05	0.18
Subjective norms (doctor)	1.06	1.04–1.08	<0.01	1.04	1.01–1.07	0.02
Belief in HPV vaccine safety	1.56	1.34–1.82	<0.01	1.38	1.06–1.78	0.02
Concerns						
Sexual disinhibition	0.88	0.78–0.99	0.04	1.02	0.83–1.25	0.89
Side effects	0.77	0.69–0.86	<0.01	0.73	0.60–0.89	<0.01
Cost	0.86	0.78–0.95	<0.01	0.87	0.74–1.04	0.12
Self-efficacy	3.07	2.28–4.13	<0.01	2.39	1.52–3.77	<0.01
General attitudes about vaccines						
Important to receive all	1.12	0.76–1.86	0.45			
Afraid of vaccines daughter receives	0.93	0.85–1.01	0.08	1.00	0.86–1.16	0.98

^aBold indicates variables to be included in multivariable analysis with $p < 0.10$.

^bControlling for daughter age, daughter insurance status, parent age, household income; bold highlights variables significant at $p < 0.05$.

Table 4:

Bivariate analysis: Psychosocial factors by vaccination status and psychosocial factors associated with HPV vaccine initiation.^a

Variables	Vaccinated (n = 158) n (%) or mean (SD)	Did not vaccinate (n = 607) n (%) or mean (SD)	OR	95% CI	p-value
<i>Psychosocial predictors</i>					
HPV awareness					
Yes	94 (12.63)	374 (28.76)	0.83	0.57–1.21	0.33
No	62 (8.33)	214 (28.76)	REF		
HPV knowledge, μ (SD) ^b					
	2.45 (0.61)	2.41 (0.69)	1.09	0.78–4.71	0.12
Perception of daughter susceptibility to HPV					
Higher or about the same chance as others	80 (11.59)	258 (37.39)	REF		
Less chance than others	60 (8.70)	292 (42.32)	0.65	0.44–0.95	0.03
Perceived severity of HPV, μ (SD)	4.75 (0.83)	4.70 (0.78)	1.09	0.86–1.39	0.47
HPV vaccine awareness					
Yes	96 (12.75)	356 (47.28)	1.03	0.71–1.50	0.88
No	61 (8.10)	240 (31.87)	REF		
Perceived norms, μ (SD)	3.89 (1.17)	3.82 (1.22)	1.03	0.87–1.21	0.75
Subjective norms (family), μ (SD) ^c	13.51 (9.77)	10.95 (9.40)	1.03	1.01–1.05	0.01
Subjective norms (doctor), μ (SD) ^c	18.08 (8.24)	16.29 (8.15)	1.03	1.00–1.06	0.04
Belief - vaccine safety μ (SD)	4.05 (1.02)	3.82 (1.08)	1.22	1.01–1.48	0.04
Concerns					
Sexual disinhibition, μ (SD)	1.51 (1.12)	1.74 (1.29)	0.87	0.74–1.02	0.09
Side effects, μ (SD)	3.85 (1.52)	4.15 (1.34)	0.86	0.76–0.97	0.02
Cost, μ (SD)	1.89 (1.45)	2.11 (1.58)	0.92	0.81–1.04	0.16
Self-efficacy, μ (SD)	4.53 (0.52)	4.33 (0.63)	1.91	1.32–2.76	<0.01
General attitudes about vaccines					
Important to receive all, μ (SD)	4.98 (0.24)	4.96 (0.35)	1.27	0.63–2.55	0.51
Afraid of vaccines daughter receives, μ (SD)	2.00 (1.57)	2.24 (1.71)	0.92	0.82–1.02	0.12
Intention					
Yes	101 (13.41)	291 (38.65)	2.01	1.39–2.93	<0.01
No	55 (7.30)	306 (4.64)	REF		

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^aStudy arm included as covariate in all analyses; bold indicates variable included in multivariable analysis.

^bRange 0–3.

^cRange 1–25.

Table 5:Multivariable analysis: Psychosocial predictors of vaccination status.^a

Variable	AOR	95% CI	p-value
Perceived daughter's susceptibility			
More or about the same chance as others	REF		
Less chance than others	0.96	0.50–1.88	0.91
Subjective norms - family	1.03	0.99–1.06	0.18
Subjective norms - doctor	1.00	0.96–1.05	0.86
Belief - vaccine safely	0.88	0.63–1.23	0.44
Concerns			
Sexual disinhibition	0.66	0.47–0.92	0.02
Side effects	0.94	0.75–1.15	0.49
Self-efficacy	1.47	0.79–2.73	0.23
Intention			
Yes	2.40	1.10–5.26	0.03
No	REF		

^aControlling for daughter age, daughter insurance status, parent age, household income, and study arm; bold highlights variables significant at $p < 0.05$.