

HPV VACCINATION HESITANCY AMONG LATINA IMMIGRANT MOTHERS DESPITE PHYSICIAN RECOMMENDATION

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Purpose: Human papillomavirus (HPV) vaccination uptake continues to be low in the United States. While a recommendation from a health care provider (HCP) has been shown to be associated with vaccine acceptability among parents, little is known about factors associated with hesitancy despite HCP recommendation. We examined factors associated with HPV vaccine hesitancy, despite a physician recommendation, among Latina immigrant mothers of daughters aged 9-12 years.

Methods: As part of a group randomized trial to promote HPV vaccination between 2013 and 2016, we conducted a baseline interviewer-administered survey of mothers to assess sociodemographics, knowledge and perceived risk of cervical cancer/HPV infection, self-efficacy, and intention to vaccinate their unvaccinated daughters. Hesitancy was defined as “don’t know/not sure” (DK/NS) in response to the question: “If your daughter’s doctor recommended that she gets the HPV vaccine, would you let her get it?”

Results: Of the 317 participants, 35.3% indicated hesitancy to vaccinate their daughters if their physician recommended it. Although a number of variables were associated with HPV vaccine hesitancy in the univariate model, five remained significant in the final multivariable model: daughter’s health insurance status; HPV awareness; perceived risk of HPV infection for their daughters; perceived self-risk of cervical cancer; and a self-efficacy score of ability to complete the HPV vaccination series.

Conclusions: A recommendation by a health care provider may be not enough to motivate Latina immigrant mothers to vaccinate their daughters. Further efforts should focus on increasing awareness regarding HPV and cervical cancer, heighten-

INTRODUCTION

HPV-related cancers have been on the rise with more than 38,000 cancers diagnosed yearly in the United States.¹ For cervical cancer, the most common HPV-related cancer among women, incidence and mortality data reveal racial/ethnic disparities.² While African American women exhibit the highest cervical cancer mortality rate compared with women of other races/ethnicity, Latinas have the highest HPV-associated cervical cancer incidence in the United States with a rate of 9.1/100,000.³ A number of reasons have been suggested for this disparity among Latinas, most notably lack of cervical cancer screening.⁴⁻⁶

Vaccination against HPV is rec-

ommended as a primary prevention of cervical cancer for adolescents.⁷ Despite its availability over the past decade, up to 51% of teenagers between aged 13 to 17 years are currently not up-to-date with their HPV vaccination.⁸ If age-appropriate vaccination uptake is high, there is the expectation that the incidence of cervical cancer among disparate populations may decrease. Although multiple studies have found that Latinas are generally pro-vaccination, HPV vaccination rates among Latina adolescents of immigrant parents are affected by a lack of awareness of HPV, a lack of knowledge of the availability of an HPV vaccine, and vaccine cost.^{9,10}

Studies have shown that typically, mothers are primarily responsible

ing perceived risk of HPV infection among daughters and boosting self-efficacy to get their children vaccinated against HPV. *Ethn Dis.* 2020; 30(4):661-670; doi:10.18865/ed.30.4.661

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for ensuring that their children are vaccinated, especially in Latina culture.^{11,12} Reasons that contributed to a non-favorable attitude for the HPV vaccine included but were not limited to: finances; not enough information about the vaccine; and believing their children were not at risk for HPV.¹³ In one study that analyzed different reasons for parents who reported low or unknown intention to vaccinate

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their teens, the second most common reason was that the vaccine was "not recommended."¹⁴ Provider recommendation has consistently been shown as the strongest variable associated with HPV vaccination acceptability among parents.^{13,15-18} However, previous studies have examined mothers' hesitancy and a provider's recommendation separately. To our knowledge, no studies have examined factors associated with mothers' hesitancy despite a physician's or HCP's recommendation. The purpose of

this study, which took place in Alabama, was to examine factors associated with Latina immigrant mothers' hesitancy of HPV vaccination for their daughters aged between 9-12 years, even if the daughter's physician had recommended the vaccine.

METHODS

This study is part of a larger randomized trial to examine the efficacy of a theory-based, culturally relevant intervention delivered by peer health educators to promote HPV vaccination among Latina immigrants' daughters aged between 9 and 12 years in Alabama between 2013 and 2016.¹⁹ In this study, we used data from the baseline questionnaire before 317 mothers were placed into the intervention arm (education about HPV, HPV vaccine, and cervical cancer) or the control arm (education about nutrition).¹⁹

Participants

Participants were Latina immigrants and their daughters, aged between 9 and 12 years. Inclusion criteria were: a) Latina immigrant woman; b) resident of Alabama; c) having at least one daughter aged between 9 and 12 years; d) none of the eligible daughters were vaccinated against HPV; e) access to a working phone; f) no personal history of cervical cancer; and g) willingness to participate in a group randomized trial to promote HPV vaccination.

Procedure

Given the power of word-of-mouth among Latina immigrants,

the unit of randomization was apartment complexes, trailer parks, and/or neighborhoods with a large percentage of Latina residents.²⁰⁻²³ Our research team maintains an updated map of these locations. Locations where we already had previous cancer prevention and control efforts were not eligible for the current study.

To assure that there were sufficient eligible participants in these locations, staff conducted a door-to-door "census" that covered basic demographic variables and willingness to participate in a health-related study in the future. As sites became eligible (two at a time), they were randomized to intervention and control conditions. Staff determined eligibility and willingness to participate in the study and proceeded with enrollment, consenting procedures, and completion of interviewer-administered questionnaires. Interviews were conducted in-person within the participants' homes. Parent consent and child assent were also obtained for the daughters to participate in the study. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study. All procedures for this study were reviewed and approved by the University of Alabama at Birmingham institutional review board.

Measures

Assessment measures were developed or adapted through extensive formative assessments used in

previous studies with Latina immigrants.²⁴⁻²⁶ The framework of the study was based on previous use of the PEN3 and Health Belief Model (HBM).²⁵ Questions focused on perceptions of cervical cancer and HPV, a tenet under the “educational diagnosis of a health behavior” in the PEN3 model.²⁵ Given low literacy rates found in our previous studies, baseline questionnaires were administered in Spanish using a face-to-face interviewing format by staff not involved in intervention delivery.^{20-22,24}

The outcome variable was mothers’ intent or hesitancy to vaccinate their daughters, aged 9 to 12 years, if the HPV vaccination had been recommended by the daughters’ physicians. Answers to this question were “yes,” “no,” and “don’t know/not sure (DK/NS).” HPV vaccination hesitancy was defined as “DK/NS” in answer to the hypothetical question: “If your daughter’s doctor recommended that she gets the HPV vaccine, would you let her get it?” None of the mothers indicated “no”; therefore, answers were classified into “DK/NS” (hesitant mothers) and “yes” (non-hesitant mothers).

Independent variables included sociodemographic characteristics: age, time lived in the United States, education level completed, employment status, and monthly household income. Mother’s and daughter’s health insurance status and place where they received medical care were also collected. Questions that assessed the knowledge, awareness, worry, and perceived risks for cervical cancer and HPV that the mother interpreted for herself and her daughter were analyzed.

HPV knowledge consisted of 11 responses to statements about HPV. Correct answers received one point, while incorrect answers or “DK” were recorded as zero points. Points from each question were combined to create an HPV score with the maximum of 11 and minimum of zero points. A reliability analysis was conducted for this set of 11 questions; reliability was moderate with assessment via Cronbach’s alpha ($\alpha=.660$). Self-efficacy questions were scored with an answer of “sure” as three points, “more or less sure” as two points, and “I don’t know, not sure” (DK/NS) as one point. A Cronbach’s alpha analysis indicated strong reliability of the questions ($\alpha=.805$). Therefore, the three questions were combined to create a self-efficacy score with the maximum of nine and minimum of three points.

Analysis

Sociodemographic characteristics and perceived risk about HPV and cervical cancer among the two groups of mothers were evaluated through sample means and variances reported as a mean (SD) for continuous variables and sample proportions for categorical variables. Continuous variables were analyzed through an independent t-test; a Chi-squared test was employed with categorical variables. All statistical analyses were conducted with SPSS version 25 and variables set with a Type I error rate $<.05$ were included in the unadjusted logistic regression model; one variable (HPV Knowledge Score) was excluded due to its limited sample size ($n=169$). Multivariable logistic

regression estimated the potential relationship between variables on the outcome variable. The final model was determined through a forward selection step-wise function. Estimates derived from the regression model used “yes” as the reference group for the outcome. Covariates of the independent variables used “yes” as the reference groups, except for daughter’s health insurance where “no” was the reference group.

RESULTS

The total sample size was 317 (64.7%) mothers. Of these mothers, 205 were willing to vaccinate their daughter following a physician recommendation and 112 (35.3%) were hesitant. Table 1 outlines the descriptive statistics of demographics and all variables for the sample. The average age was 35.13 (± 5.8) years and women had lived an average of 12.9 (± 5.4) years in the United States. The average years of education completed was 8.8 (± 3.1) years. Most mothers were married or living with a partner (90%). The average monthly household income per person supported was \$356.40 (\$248.10). More than half of the sample (53.9%) had heard of HPV, but almost half the mothers (45.3%) responded “DK/NS” as to whether they perceived they were exposed to HPV. More than 82% of mothers reported worrying that their daughter would get infected with HPV, but only half (51.1%) of the sample perceived that their daughters were at risk of being infected with HPV in the future.

Table 1. Demographics of sample population based on vaccine intention for daughters following physician recommendation: age, US residency, education, income, household and family information, HPV knowledge, place of medical care

Variable	Total Mothers, N=317 ^a	Intend to Vaccinate Following HCP Recommendation ("Yes"), n=205 ^a	Hesitant to Vaccinate Following HCP Recommendation ("Don't Know/Not Sure"), n=112 ^a	P
Age, years	35.13 (5.81)	35.36 (5.74)	34.71 (5.74)	.35
Time in United States, months	154.50 (64.32)	153.00 (59.16)	157.23 (73.02)	.60
Level of education, years	8.78 (3.10)	8.80 (3.26)	8.75 (2.75)	.88
Average monthly income, \$	1632.98 (835.40)	1660.36 (909.11)	1584.14 (685.73)	.41
Number of people supported	4.95 (1.32)	4.98 (1.36)	4.91 (1.23)	.67
Average household income/people supported, \$	356.40 (248.10)	366.14 (284.38)	339.29 (166.09)	.30
Number of children				
Daughters	2.01 (.92)	2.05 (.94)	1.95 (0.88)	.34
Sons	1.14 (1.01)	1.12 (1.03)	1.19 (0.96)	.55
Self-efficacy score	6.20 (1.69)	6.71 (1.62)	5.25 (1.37)	<.001
HPV knowledge score ^b	6.01 (2.48)	6.35 (2.40)	4.87 (2.42)	.001
Marital status				.12
Single	21 (6.6%)	15 (7.3%)	6 (5.4%)	
Living together, but not married	104 (32.8%)	75 (36.6%)	29 (25.9%)	
Married	181 (57.1%)	110 (53.7%)	71 (63.4%)	
Separated/divorced	11 (3.5%)	5 (2.4%)	6 (5.4%)	
Employment status				.84
Full-time job	63 (19.9%)	42 (20.5%)	21 (18.8%)	
Part-time job	98 (30.9%)	63 (30.7%)	35 (31.3%)	
Unemployed	12 (3.8%)	9 (4.4%)	3 (2.7%)	
Homemaker	144 (45.4%)	91 (44.4%)	53 (47.3%)	
Mother's place of medical care				.84
Private doctor/clinic	53 (16.7%)	37 (18.0%)	16 (14.3%)	
Public Medical clinic	170 (53.6%)	108 (52.7%)	62 (55.4%)	
Federally qualified clinic	45 (14.2%)	28 (13.7%)	17 (15.2%)	
Other	49 (15.5%)	32 (15.6%)	17 (15.2%)	
Daughter's place of medical care				.19
Private doctor/clinic	169 (53.5%)	108 (52.9%)	61 (54.5%)	
Public Medical clinic	100 (31.6%)	71 (34.8%)	29 (25.9%)	
Federally qualified clinic	36 (11.4%)	20 (9.8%)	16 (14.3%)	
Other	11 (3.5%)	5 (2.5%)	6 (5.4%)	

a. Values at mean (SD) or n(%).

b. n=169; only participants who have heard of HPV (HPV awareness) were asked HPV knowledge questions.

Comparing the groups (Tables 1 and 2), there were no significant demographic differences except for their daughter's health insurance status (P=.03). Mothers hesitant about vaccination reported higher rates of health insurance for their daughters (84.8%) compared with those willing to vaccinate their daughters (74.5%). Additional differences be-

tween both groups of mothers included perceived self-risk of cervical cancer (P<.001) and HPV infection (P=.001). In addition, worry about daughters being infected with HPV in the future was different between mothers hesitant to vaccinate and mothers intending to vaccinate their daughters (P=.02). These differences also persisted between the

two groups with the mothers' perceived risk of HPV in their daughters (P<.001) and average HPV knowledge score (P=.001). Finally, the mothers also exhibited differences in self-efficacy scores of completion of HPV vaccination series among their daughters (P<.001).

A logistic regression determined the association among the seven

Table 2. Demographics of sample population based on vaccine intention for daughters following physician recommendation: health insurance, HPV awareness, perceptions, decision-making

Variable	Total Mothers, N=317 ^a	Intend to Vaccinate Following HCP Recommendation ("Yes"), n=205 ^a	Hesitant to Vaccinate Following HCP Recommendation ("Don't Know/Not Sure"), n=112 ^a	P
Mother's health insurance status	33 (10.4%)	20 (9.8%)	13 (11.6%)	.61
Daughter's health insurance status	247 (78.2%)	152 (74.5%)	95 (84.8%)	.03
HPV awareness				<.001
Yes	171 (53.9%)	131 (63.9%)	40 (35.7%)	
No	57 (18.0%)	36 (17.6%)	21 (18.8%)	
Don't know/not sure	89 (28.1%)	38 (18.5%)	51 (45.5%)	
Perceived self-risk of cervical cancer				<.001
Yes	52 (16.6%)	47 (23.3%)	5 (4.5%)	
No	73 (23.2%)	46 (22.8%)	27 (24.1%)	
Don't know/not sure	189 (60.2%)	109 (54.0%)	80 (71.4%)	
Perceived exposure to HPV				.18
Yes	51 (16.1%)	35 (17.1%)	16 (14.4%)	
No	122 (38.6%)	85 (41.5%)	37 (33.3%)	
Don't know/not sure	143 (45.3%)	85 (41.5%)	58 (52.3%)	
Worry about being infected with HPV				.19
Yes	203 (64.4%)	137 (67.2%)	66 (59.5%)	
No	65 (20.6%)	42 (20.6%)	23 (20.7%)	
Don't know/not sure	47 (14.9%)	25 (12.3%)	22 (19.8%)	
Perceived self-risk of HPV infection				.001
Yes	28 (8.9%)	24 (11.7%)	4 (3.6%)	
No	169 (53.7%)	118 (57.6%)	51 (46.4%)	
Don't know/not sure	118 (37.5%)	63 (30.7%)	55 (50.0%)	
Worry- daughter being infected with HPV				.02
Yes	261 (82.3%)	178 (86.8%)	83 (74.1%)	
No	12 (3.8%)	7 (3.4%)	5 (4.5%)	
Don't know/not sure	44 (13.9%)	20 (9.8%)	24 (21.4%)	
Perceived risk of HPV in daughter				<.001
Yes	162 (51.1%)	127 (62.0%)	35 (31.3%)	
No	23 (7.3%)	13 (6.3%)	10 (8.9%)	
Don't know/not sure	132 (41.6%)	65 (31.7%)	67 (59.8%)	
Vaccine decision responsibility				.13
Mother	80 (25.2%)	59 (28.8%)	21 (18.8%)	
Mother and father	203 (64.0%)	124 (60.5%)	79 (70.5%)	
Other	34 (10.7%)	22 (10.7%)	12 (10.7%)	

a. Values at mean (SD) or n(%).

significant variables and HPV vaccination hesitancy. The sample for this analysis was 317 mothers. Five variables were incorporated into the final model and were found to be significant in the presence of each other. These included mothers' perceived self-risk of cervical cancer, mothers' perceived risk of

HPV infection in their daughters, HPV awareness, self-efficacy score, and daughter's health insurance status (Table 3). After controlling for other variables in the model, a non-significant association was observed between hesitancy to vaccinate and answering yes or no with having previously heard of HPV

(P=.28). In contrast, significant results were observed in mothers' hesitancy to vaccinate their daughters with a higher likelihood of hesitancy for mothers responding "DK/NS" (OR 2.79; 95% CI 1.47-5.28, P=.002) as compared with mothers who indicated "yes" to previous HPV awareness. With adjustment

Table 3. Multivariable logistic regression model of factors associated with HPV vaccine hesitancy in Latina immigrant mothers

Variable	OR	95% CI	P
Perceived self-risk of cervical cancer ^a			
No	4.20	1.29-13.70	.02
Don't know/not sure	3.94	1.30-11.94	.02
HPV awareness ^a			
No	1.51	.72-3.21	.28
Don't know/not sure	2.79	1.47-5.28	.002
Perceived risk of HPV in daughter ^a			
No	2.60	.81-8.39	.11
Don't know/not sure	2.54	1.41-4.58	.002
Daughter's health insurance status	3.20	1.48-6.94	.003
Self-efficacy score	.55	.45-.67	<.001

a. Reference group is mothers who answered "yes."

Note: Variables not included in the final step-wise model include perceived self-risk of HPV and worry of their daughter being infected with HPV.

for other variables, a mother's hesitancy to vaccinate and perceived risk of HPV in her daughter differed among mothers responding "DK/NS" (OR 2.54; 95% CI 1.41-4.58; P=.002) as compared with mothers who indicated "yes."

After adjustment for other variables, a non-significant difference regarding hesitancy existed between mothers who did not believe their daughters were at risk for HPV as compared with those who did believe their daughters were at risk for HPV (P=.11). Mothers who did not perceive themselves at risk of cervical cancer (P=.02) or responded "DK/NS" to risk (P=.02) exhibited more vaccine hesitancy than those who believed they were at risk for cervical cancer when adjusting for other variables. With the adjustment of other variables, mothers who indicated lower self-efficacy scores in completing the vaccination series were more hesitant to vaccinate their daughters than mothers who displayed higher self-efficacy scores (OR .55; 95% CI .45-.67; P<.001).

DISCUSSION

This study examined factors associated with Latina immigrant mothers' HPV vaccine hesitancy of their daughters (aged 9 to 12 years), despite a physician recommendation. Several studies have examined the association between HCP recommendation and HPV vaccine acceptability among parents as well as factors associated with HPV vaccine hesitancy. To our knowledge, little is known about HPV vaccine hesitancy in the context of HCP recommendation, particularly in populations, such as Latinas, with cervical cancer disparities. Among our study participants, HPV vaccine hesitancy was associated with perceived self-risk of cervical cancer, HPV awareness, perceived risk of HPV among daughters, perceived self-efficacy score to complete the vaccination series, and daughter's health insurance status.

Perceived risk, both of HPV and cervical cancer, was unknown in most mothers who were hesitant to vaccinate their daughters. The

Health Belief Model (HBM) postulates that individuals must see a risk and that this risk must be heightened in order to be motivated to engage in a particular health behavior, such as screening or vaccination.²⁷ Perceived risk among high-risk populations has been widely investigated in multiple studies, but typically studies have not acknowledged those who report not knowing their risk.^{28,29} These responses, usually excluded or combined with participants who responded "no," can make up more than 5% of the sample size and is a response associated with populations of lower income and educational attainment.²⁹ Waters et al found that those who responded "don't know" (DK) to cancer risk engaged in less physical activity and had lower screening rates as opposed to individuals with a response of "yes" or "no."³⁰ Our research shows differences among mothers whose intent was to vaccinate based on perceived self-risk of cervical cancer compared with a "DK" response to risk. This was also observed in mothers

who responded “DK” to questions about if their daughter was at risk for HPV, and if they had heard of HPV, compared with those mothers who were aware of these risks.

Perceiving oneself susceptible to a disease can provide motivation to engage in early detection behaviors such as screening.^{31,32} In Garces-Palacio et al, an association between uncertainty of perceived risk of cervical cancer and less knowledge about cervical cancer was present among Latina immigrant women in Alabama.²⁰ With the majority of hesitant mothers not knowing their risk to cervical cancer, and not knowing the risk of HPV in their daughters, there is potentially less motivation to complete preventive health behaviors such as getting the HPV vaccine for their daughters. Heightening the risk could make them more willing to engage in preventive behaviors. In Taber et al, not only was perceived risk knowledge investigated, but participants’ confidence in their risk, a concept labeled as conviction was assessed.³³ Awareness of risk and clarity of that knowledge of risk being correct were postulated to both be essential forms of motivation to complete healthy behaviors.³³ It seems that uncertainty played an important role among Latina immigrants in our sample. Interestingly, even when asked if they would vaccinate their daughters if recommended by their physician, none of them indicated “no.” Hence, our focus on “hesitancy” since a large percentage indicated “DK/NS.”

Self-efficacy (the confidence in one’s ability to perform a behavior) is a more recent arm of the HBM.

Differences occurred between hesitant mothers and mothers intending to vaccinate their daughters regarding their perceived self-efficacy in being able to vaccinate their daughters against HPV. Similar to perceived susceptibility, a lower level of self-efficacy can be associated with less likelihood of health behavior follow-through. Tung et al investigated perceived barriers among Latinas engaging in cervical cancer screening. Women who either had never been screened or had been

Among our study participants, HPV vaccine hesitancy was associated with perceived self-risk of cervical cancer, HPV awareness, perceived risk of HPV among daughters, perceived self-efficacy score to complete the vaccination series, and daughter’s health insurance status.

but were lost to follow up perceived that there were more barriers that prevented them from engaging in cervical cancer screening.³⁴ Grace-Leitch et al found that even though

HPV knowledge was low among young adult men, self-efficacy levels were high and, subsequently, predicted vaccine acceptability.²⁷ Not only do the risks of HPV and cervical cancer need to be heightened in order to increase the perceived risk of these conditions, but targeting methods for improving self-efficacy can decrease vaccine hesitancy.

One way to heighten the perceived risks of HPV infection and cervical cancer is through education and improvement of health literacy. In our study, mothers were asked a series of questions that were combined into an HPV knowledge score. Differences existed between the average HPV knowledge of mothers intending to vaccinate their daughters compared with those hesitant to do so. Among Latina immigrants in California, low health literacy was found to be associated with economic status and English proficiency.^{35,36} Self-efficacy can also be positively impacted by health literacy; Guntzwiller et al found higher levels of health literacy were associated with greater self-efficacy, healthy nutrition, and exercise behaviors.³⁷

Interestingly, daughters who were uninsured were more likely to have mothers who intended to vaccinate them following a physician recommendation compared with those with health insurance. Comparing health insurance status to a daughter’s place of medical care, it was found that 61.8% of daughters with health insurance sought care at a private office, while a large percentage of daughters without health insurance received care at a public clinic (46.4%). We can speculate that re-

ceiving health services in public clinics without insurance could lead to less frequent visits, and, therefore, more support for addressing recommended vaccination while the patient is present. Furthermore, we have considered the idea that health care providers in the public clinic setting could have more exposure interacting with Latina immigrant mothers; ultimately, this could lead to a higher degree of trust in these relationships. Nevertheless, there is limited literature supporting this finding and it should be investigated in future research efforts.

Study Limitations

There were several limitations to this study. As a cross-sectional study, information was collected from these participants at one point in time. First, it is possible that perceptions of HPV and cervical cancer have changed over time. However, previous qualitative work has indicated this uncertainty, therefore leading to quantitative assessment of perceived susceptibility and self-efficacy.³⁸ Second, while we investigated health literacy through participant's knowledge of HPV, further literacy could have been assessed for cervical cancer and other health conditions, as this knowledge could change an individual's perception of their risk. Third, we provided participants with a hypothetical scenario (if a daughter's physician recommended HPV vaccination) rather than asking them directly whether or not the daughter's provider had recommended the vaccine and they did not follow-up. However, an inclusion criterion for the larger study was that the daugh-

ters had not received the HPV vaccination. Finally, we could only partially adjust analyses for HPV knowledge due to the structural limitation of the dataset. Individuals answered the questions used to calculate HPV knowledge only if they had indicated previous knowledge of HPV. If individuals answered "no" or "DK/NS" to previous knowledge of HPV, respondents were instructed to skip the questions used to calculate the HPV Knowledge score. Under these conditions, the missing at random assumption for multiple imputations is violated and using such a technique would be inappropriate.

CONCLUSION

While HCP recommendation has been strongly associated with HPV vaccination acceptability in parents, this might not be enough of a factor in acceptability among Latina immigrant mothers. Factors associated with hesitancy among these mothers include self-efficacy, perceived risk of HPV in their daughters, perceived self-risk of cervical cancer, HPV awareness, and daughter's insurance status. As a population susceptible to higher incidence of cervical cancer, efforts to heighten perceived risk and improve self-efficacy measures should be considered to increase vaccine acceptability.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Scarinci; Acquisition of data: Scarinci; Data analysis and interpretation: Khodadadi, Redden,

Scarinci; Manuscript draft: Khodadadi, Redden, Scarinci; Statistical expertise: Khodadadi, Redden; Acquisition of funding: Scarinci; Administrative: Scarinci; Supervision: Scarinci

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