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HPV Vaccine Misperceptions Among Hispanics/Latinos in Southern California

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Abstract

Background Cervical and other vaccine-preventable HPV-associated cancers disproportionately impact Hispanic/Latinos in the USA. HPV vaccine uptake may be impacted by community agreement with common HPV vaccine misperceptions. It is unknown whether Hispanics/Latinos have a greater agreement with these misperceptions relative to non-Hispanic whites.

Methods HPV vaccine misperceptions were assessed through a 12-item Likert scale included in a population health assessment mailed to households in the southwest United States. Linear regression models assessed the association between identifying as Hispanic/Latino and summed misperception score.

Results Among the 407 individuals in the analytic sample, 111 (27.3%) were Hispanic/Latino and 296 (72.7%) were non-Hispanic white. On average, Hispanics/Latinos had a 3.03-point higher HPV vaccine misperception sum score relative to non-Hispanic whites, indicating greater agreement with misperceptions (95% confidence interval: 1.16–4.88; $p < 0.01$).

Discussion Culturally relevant interventions are needed to address HPV vaccine misperceptions among Hispanics/Latinos as part of efforts toward HPV-associated cancer health equity.

Keywords HPV · HPV vaccine · Misperceptions · Hispanic · Latino

Introduction

Human Papillomavirus (HPV) is a common virus transmitted through skin-to-skin contact [1]. Approximately 15 of the ~40 HPV types transmitted through mucosal skin-to-skin contact (common in sexual activity) are classified as high-risk types that can cause cancer [1, 2]. These high-risk types, particularly HPV-16 and HPV-18, have been linked to > 90% of cervical and anal cancer cases and the majority of vaginal,

oropharyngeal, vulvar, and penile cancers (60–80%) in the USA [3].

While the prevalence of high-risk HPV genital infection is similar for Hispanic and non-Hispanic white men and women in the USA [4], there are disparities in both incidence and mortality by race/ethnicity for HPV-associated cancers. In 2019, cervical cancer incidence was higher among Hispanic women (9.7/100,000) than non-Hispanic white women (7.3/100,000) [5]. In that same year, mortality was slightly higher among Hispanic women (2.4/100,000) compared to non-Hispanic white women (2.1/100,000) [5]. Higher rates of penile cancer have also been observed in Hispanic men (1.3/100,000) compared to non-Hispanic white men (0.7/100,000) [6].

HPV vaccines were first approved for use in the USA in 2006 [7]; presently, a nonavalent vaccine offering protection for seven common high-risk and two common low-risk HPV types is available [8]. The 3-dose series is approved for use in 9–26-year-olds, with those initiating the series prior to age 15 requiring only two doses [9]. Data from a 2020 report suggest that approximately 75% of US adolescents had initiated the HPV vaccine series, however, fewer than 60% had

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completed the series [10]. While HPV vaccine initiation and completion rates have been improving over the years, they remain low in comparison to other vaccines indicated for the same age groups [10]. Despite the year-over-year improvements, recent reports show that the COVID-19 pandemic has resulted in significantly reduced adolescent HPV vaccine uptake [10].

Research has consistently shown that HPV vaccine uptake varies by ethnicity [11–13]. Although teen uptake appears to be higher among Hispanics [12], coverage among adult Hispanics, the population at risk for cervical cancer, remains low with only 35% receiving one or more doses [11]. Furthermore, HPV vaccine uptake in Hispanics (for adults and their children) depends on their knowledge of, attitudes toward, and beliefs about the HPV vaccine, which tend to differ from non-Hispanic whites [14, 15]. It is possible that community-held misperceptions and norms may impact vaccine uptake. Differences in HPV vaccine misperceptions between Hispanics and non-Hispanic whites are not well-described, particularly in recent years. The purpose of this study was to examine whether common misperceptions of HPV vaccines differed between Hispanics and non-Hispanic whites, which could inform the creation and dissemination of tailored health interventions to reduce HPV-associated cancer disparities.

Methods

Study Population

The San Diego County Assessment to Reach Equal Health Status (SD CARES) was a cross-sectional population health assessment administered to assess cancer-related knowledge, attitudes, and behaviors of San Diego County residents. The county is the fifth largest by population in the USA with > 3.3 million residents and is situated along the westernmost portion of the US-Mexico border. In the spring of 2019, 5,000 study packets were sent via First-Class Mail to a stratified random sample of county addresses. Specifically, 4,000 addresses were randomly selected from a sampling

frame of the entire county and an additional 1,000 addresses were randomly selected from ZIP codes along the US-Mexico border. Study packets included materials in both English and Spanish, including an introductory letter and informed consent, a 12-page survey booklet, a business reply envelope, and a \$2 bill pre-incentive. The exterior of the envelopes was stamped with “Gift Enclosed.” Recipients were instructed that if more than one adult resided at the address, the adult with the next upcoming birthday should complete the survey. A follow-up mailing to all 5,000 addresses was sent a few months later in the summer of 2019 with a reminder to complete the survey. Participants were provided with a phone number to request a replacement of lost surveys and a hyperlink to complete the survey online if preferred. A total of 720 (14.4%) individuals completed and returned the surveys through the mail ($n = 685$) and online ($n = 35$). The dataset was weighted by ICF International (Fairfax, VA) using San Diego County sociodemographic characteristics as the reference [16].

Measures

HPV vaccine misperceptions were assessed through a 12-item scale that had high internal consistency (Cronbach’s $\alpha = 0.90$). Three domains were measured: safety concerns, linkages to sexual activity, and age-related concerns. Item wording and scoring by domain are shown in Fig. 1. Responses were recorded on a 4-point Likert scale from *strongly disagree* to *strongly agree* and were reverse coded as appropriate. Items were summed across all 12 items to create an HPV vaccine misperception score with a possible range of 0–36. Higher sum scores indicated greater agreement with HPV vaccine misperceptions.

Meaningful access to care was defined as an affirmative response to “Is there a place that you usually go to when you are sick or need advice about your health?” and a negative response to “In the past 12 months, was there a time when you needed to see a doctor, but could not?”; otherwise, participants were defined as not having meaningful access to care. Educational level was assessed as the highest reported grade or level of schooling the participant completed (less

Fig. 1 HPV vaccine misperception scale items

1. The HPV vaccine is safe. *
2. The HPV vaccine was not properly tested.
3. The HPV vaccine is effective. *
4. The HPV vaccine encourages promiscuity.
5. The HPV vaccine causes more serious side effects than other vaccines.
6. The HPV vaccine hasn’t been available long enough to know it’s safe.
7. Only sexually active people need the HPV vaccine.
8. Girls ages 11-12 should get vaccinated for HPV. *
9. Boys ages 11-12 should get vaccinated for HPV. *
10. 11-12 year old girls are too young to need the HPV vaccine.
11. 11-12 year old boys are too young to need the HPV vaccine.
12. The HPV vaccine can give you HPV and cause cancer.

than 8 years, 8–11 years, 12 years or completed high school, post-high school training other than college, some college, college graduate, or postgraduate). Participants were also asked to indicate their gender identity (i.e., female, male, intersex, transgender, other, prefer not to answer).

Statistical Analysis

The analytic sample was restricted to participants who identified as either Hispanic (any race) or solely as white (non-Hispanic) ($n = 585$). Those that identified as any other race, regardless of whether it was in addition to white, or if they were missing race information were excluded ($n = 135$). An additional 178 participants that did not respond to one or more of the 12 HPV vaccine misperception questions were excluded.

Linear regression was used to model HPV misperception sum scores as a function of ethnicity (i.e., Hispanic vs. non-Hispanic white). We constructed a directed acyclic graph (DAG) to reflect our assumptions about the data generating mechanism [17] and our hypotheses about the causal interrelationships among Hispanic ethnicity, HPV vaccine misperceptions, and other relevant covariates (Fig. 2) [18–21]. Based on that DAG, there were no non-causal confounding paths that needed to be closed to control for confounding via the inclusion of additional variables in our linear regression model. In exploratory interaction analyses, we examined whether the association between race/ethnicity and HPV vaccine misperception scores varied by gender (female vs male), age (in years), income ($\leq \$74,999$ vs $> \$75,000$; dichotomized based on San Diego’s median household income), education (some college or less vs college degree

or more), and meaningful access to care (meaningful access to care vs no meaningful access to care vs unknown). Interactions were examined through the inclusion of interaction terms between race/ethnicity and each of the hypothesized interaction variables (one at a time) in separate linear regression models. All analyses were conducted in SAS v9.4 (Cary, NC). The SDSU Institutional Review Board reviewed the study and designated it as exempt.

Sensitivity Analysis

An additional analysis was performed to investigate the robustness of the results in light of the exclusions ($n = 178$) due to missing items from the 12-item HPV vaccine misperception scale. A mean score was calculated for every participant missing one to five of the scale items by using their responses to the other scale items they did answer. That mean score was then imputed into the items that were missing and totaled to create a new HPV vaccine misperception sum score. This analysis was then performed in SAS using the previous linear regression model.

Results

After exclusions, 407 individuals remained in the sample; 111 identified as Hispanic (27.3%) and 296 identified as non-Hispanic white (72.7%). As shown in Table 1, age ranged from 18 to 94 years (mean = 54.7 years, std dev = 15.7), and approximately one-third identified as male. Slightly less than half of the respondents reported an annual household income $< \$75,000$ and 41% reported completing some

Fig. 2 Directed acyclic graph depicting hypothesized causal interrelationship among Hispanic/Latino ethnicity, HPV vaccine misperceptions, and relevant covariates

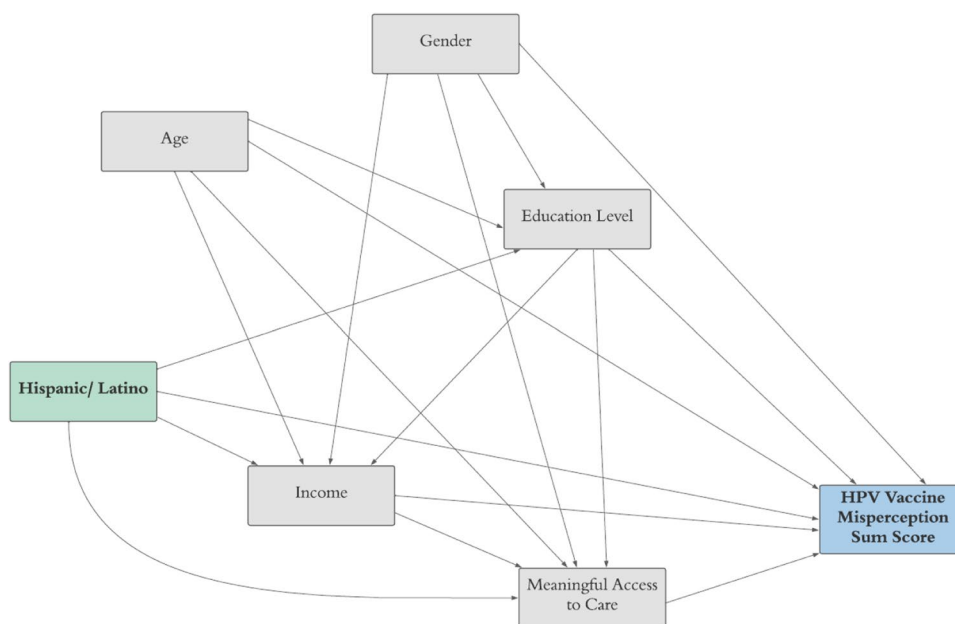


Table 1 Unweighted frequencies of select characteristics among Hispanic/Latinos and non-Hispanic Whites living in San Diego County ($n=407$)^a

Variables	Hispanic/Latino n^b (%)	Non-Hispanic White n^b (%)	Total n^b (%)
HPV vaccine misperception score	13.1 ± 6.8	10.1 ± 6.6	10.9 ± 6.8
Age	50.9 ± 13.7	56.1 ± 16.2	54.7 ± 15.7
Income			
\$ 0–\$ 74,999	59 (56.7%)	121 (42.8%)	180 (46.5%)
\$ 75,000 or more	45 (43.3%)	162 (57.2%)	207 (53.5%)
Education level			
High school or some college	70 (63.6%)	96 (32.7%)	166 (44.5%)
College degree or more	40 (36.4%)	198 (67.3%)	207 (55.5%)
Gender			
Female	75 (68.2%)	199 (67.9%)	274 (68.0%)
Male	35 (31.8%)	94 (32.1%)	129 (32.0%)
Other			
Access to care ^c			
No meaningful access to care	29 (26.6%)	57 (19.2%)	86 (21.2%)
Meaningful access to care	78 (71.6%)	235 (79.4%)	313 (77.3%)
Unknown	2 (1.8%)	4 (1.4%)	6 (1.5%)
Has a daughter between 9 and 26 years old?			
Yes	43 (39.1%)	51 (17.2%)	94 (23.2%)
No	67 (60.9%)	245 (82.8%)	312 (76.8%)
Has a son between 9 and 26 years old?			
Yes	33 (30.8%)	44 (15.1%)	77 (19.3%)
No	74 (69.2%)	248 (84.9%)	322 (80.7%)

^aMissing values for demographic variables are not shown in the table but are listed here in the form variable (number missing): age (5), income (20), education level (3), access to care (2)

^bMean ± SD

^cAccess to care was determined by responses for “Is there a place that you usually go to when you are sick or need advice about your health?” and “In the past 12 months, was there a time when you needed to see a doctor, but could not?”

college or less. Lastly, 21% of respondents lacked meaningful access to care. HPV vaccine misperception sum score ranged from 0 to 36 (mean = 10.9, SD = 6.8).

Table 2 presents HPV vaccine misperception scale item responses by race/ethnicity (i.e., Hispanic vs non-Hispanic white). The 4-point Likert scale was dichotomized to represent whether participants agreed or disagreed with the statements that comprised the HPV vaccine misperception scale. When comparing agreement with misperceptions between Hispanics and non-Hispanic whites, Hispanics had greater agreement with misperceptions regarding age, gender, disease outcomes from the vaccine, and perceptions related to vaccine safety as compared to non-Hispanic whites. No difference in agreement was observed between the groups for the misperception stating that only sexually active individuals need the HPV vaccine.

On average, Hispanics had a 3.03-point higher HPV vaccine misperception sum score than non-Hispanic whites as shown in Table 3 and Fig. 3 (95% confidence interval: 1.16–4.88; $p=0.0015$). Gender, age, income, education, and meaningful access to care were investigated for statistical

interaction; interaction terms were not significant in the linear regression models ($p>0.05$).

A sensitivity analysis was performed that included an additional 178 respondents with imputed means for missing scale items; parameter estimates differed by less than 10% from the original estimate, indicating that our results were robust to the missing data.

Discussion

In this study, we examined the association between identifying as Hispanic relative to non-Hispanic white and HPV vaccine misperceptions among residents of a diverse US-Mexico border region. Those who identified as Hispanic had greater agreement with HPV vaccine misperceptions than their non-Hispanic white counterparts by 8% as measured by a 12-item scale. The most prevalent misperceptions among Hispanic participants were on appropriate age, vaccine safety concerns, and thinking the vaccine could give an individual HPV or cancer.

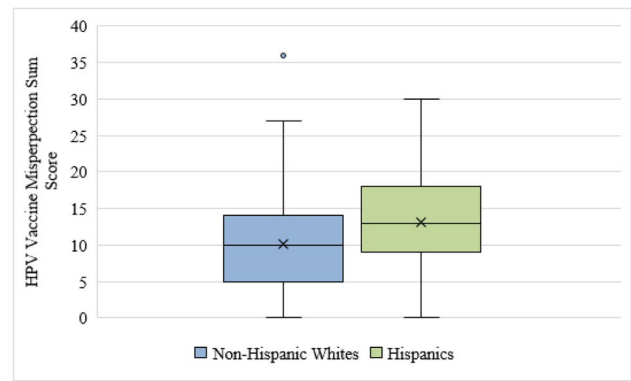
Table 2 Comparison of HPV vaccine misperceptions between Hispanics and Non-Hispanic Whites

	Hispanic/Latino (n = 111)		Non-Hispanic White (n = 296)	
	n	%	n	%
The HPV vaccine is safe				
Agree	82	73.9%	257	86.8%
Disagree	29	26.1%	39	13.2%
The HPV vaccine was not properly tested				
Agree	27	24.3%	48	16.2%
Disagree	84	75.7%	248	83.8%
The HPV vaccine is effective				
Agree	85	76.6%	258	87.2%
Disagree	26	23.4%	38	12.8%
The HPV vaccine encourages promiscuity				
Agree	23	20.7%	28	9.5%
Disagree	88	79.3%	268	90.5%
The HPV vaccine causes more serious side effects than other vaccines				
Agree	27	24.3%	39	13.2%
Disagree	84	75.7%	257	86.8%
The HPV vaccine has not been available long enough to know it is safe				
Agree	48	43.2%	89	30.1%
Disagree	63	56.8%	207	69.9%
Only sexually active people need the HPV vaccine				
Agree	14	12.6%	36	12.2%
Disagree	97	87.4%	260	87.8%
Girls ages 11–12 should get vaccinated for HPV				
Agree	74	66.7%	240	81.1%
Disagree	37	33.3%	56	18.9%
Boys ages 11–12 should get vaccinated for HPV				
Agree	72	64.9%	234	79.1%
Disagree	39	35.1%	62	21.0%
11- to 12-year-old girls are too young to need the HPV vaccine				
Agree	37	33.3%	53	17.6%
Disagree	74	66.7%	243	82.1%
11- to 12-year-old boys are too young to need the HPV vaccine				
Agree	39	35.1%	52	17.8%
Disagree	72	64.9%	244	82.4%
The HPV vaccine can give you HPV and cause cancer				
Agree	23	20.7%	18	6.1%
Disagree	88	79.3%	278	93.9%

Table 3 Unadjusted linear regression of race/ethnicity on HPV vaccine misperception score

Variable	Parameter estimate	95% CI	p value
Hispanic	3.03	1.16–4.88	0.0015

¹Reference category = non-Hispanic white

**Fig. 3** Box plots reflecting sample variability in HPV vaccine misperception sum scores between Hispanics and non-Hispanic whites

Our findings of greater HPV vaccine misperceptions among Hispanics are in line with past studies demonstrating lower HPV and HPV vaccine knowledge among this group [13, 18–20]. For example, Bodson and colleagues found low HPV-related knowledge among Hispanic/Latino parents in Utah [18]. Escobar and colleagues similarly found low knowledge about HPV-associated cancers across all of their study groups, which included Hispanic (US-born and foreign-born) and non-Hispanic white adults [19]. Reimer and colleagues found that white women demonstrated the highest knowledge of HPV, followed by white men, with Hispanic men and women having the lowest knowledge of HPV [20]. Lastly, Flores and colleagues found that Mexican mothers residing in the USA had less knowledge of and more negative attitudes toward the vaccine compared to Mexican mothers residing in Mexico [21]. Mothers not vaccinating their children reported holding misperceptions such as receiving the vaccine would influence their daughters to think it was okay to have sex, that it could cause future health issues, and that the side effects were a concern [21]; similar to our study, which showed a higher agreement with misperceptions pertaining to the safety of the HPV vaccine. In contrast, Ashing and colleagues found that adult Latinas who exhibited greater HPV vaccine knowledge had more favorable beliefs about, and greater acceptability of, the vaccine [22], indicating that educational interventions to correct misperceptions may lead to improved uptake.

Strengths and Limitations

There were some limitations to this study. We were unable to assess whether misperceptions were associated with vaccination behavior in this population, as this study was focused on community misperceptions among adults and did not collect personal HPV vaccination status. Additionally, despite the pre-incentive, the response rate was relatively low at 14.4%, though data were weighted to the San Diego County

population and similar response rates have been reported in the HPV vaccine literature [23]. Having the data weighted for population demographics was an attempt to ensure representativeness, but ultimately, we were not able to characterize non-responders, which would have been beneficial to determine whether selection bias was present. Lastly, the evaluation and validation of the HPV vaccine misperception scale has been conducted internally but not yet published; as noted, the scale's alpha was 0.90. Despite the limitations, the study benefited from several strengths. These included the utilization of random household selection, anonymous participation, bilingual study materials and staff, inclusion of community input, and direct assessment of misperceptions through a scale. This investigation of HPV vaccine community misperceptions among Hispanics is essential, as sociocultural factors like familismo/familism can influence health behaviors and ideologies [24, 25].

Conclusion

In this study, Hispanics had greater HPV vaccine misperceptions than non-Hispanic whites. Examining individual scale items, Hispanic adults had greater misperceptions around whether boys needed the vaccine, the appropriate age of administration, the safety of the vaccine, and its efficacy for cancer prevention. Future interventions focused on improving HPV vaccine uptake among Hispanics should focus on addressing these misperceptions given the important role that familism plays in influencing health behaviors in this community [24, 25]. Medical providers and community health workers are ideally suited to carry out these interventions, which will ultimately prevent HPV-associated cancers that disproportionately impact the Hispanic population.

Data Availability Data associated with this manuscript are available upon request.

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