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## THE IMPACT OF SOCIAL COMMUNICATION ON PERCEIVED HPV VACCINE EFFECTIVENESS IN A LOW-INCOME, MINORITY POPULATION

**Objectives:** Perceived vaccine effectiveness is linked to vaccine-uptake. This study aims to determine if hearing about the HPV vaccine from family/friends (social source) or discussing the vaccine with family/friends (social discussion) is associated with perceived HPV vaccine effectiveness among female ethnic-minority, medical-decision-makers of vaccine-eligible girls.

**Methods:** Data come from a cross-sectional HPV vaccine telephone-survey administered by the Los Angeles County Office of Women's Health (OWH) hotline operators between January–November 2009. Among survey participants who reported awareness of the HPV vaccine ( $n=294$ ), two logistic regression models of perceived HPV vaccine effectiveness were conducted; a source of information model with social source as the main predictor, and a discussion model with social discussion as the main predictor. These were adjusted for medical source and medical discussion, and covariates affecting interaction with the health care system.

**Results:** Women who heard about the HPV vaccine from a social source were more likely to perceive the vaccine as effective compared to those who did not report a social source of information (adjusted OR 4.78, 95% CI 1.76–12.98). Medical source of information was also associated with perceived vaccine effectiveness (adjusted OR 2.07, 95% CI 1.06–4.05). Those who reported social discussion, but not those who discussed the vaccine with a medical provider, had increased odds of perceived vaccine effectiveness (adjusted OR 1.98, 95% CI 1.04–3.78).

**Conclusions:** Social source of information and social discussion were associated with perceived HPV vaccine effectiveness; this highlights the value of social communication among low-income minority women, and the need for vaccine-messaging interventions that utilize a social network approach. (*Ethn Dis*. 2011;21(4):495–501)

**Key Words:** HPV Vaccine, Vaccine Communication, Perceived Vaccine Effectiveness, Social Network

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### INTRODUCTION

Cervical cancer remains the leading cause of gynecologic-related deaths worldwide.<sup>1</sup> The American Cancer Society estimates that 12,200 cases of invasive cervical cancer were diagnosed in the United States in 2010, with 4,210 women dying from this preventable disease.<sup>2</sup> Compared to rates in White women, age-adjusted cervical cancer incidence rates are 35% higher among African Americans and 80% higher among Latinas.<sup>3</sup> Low socioeconomic status, lack of insurance, and other social problems commonly faced by these groups reduce access to cervical cancer screening and timely follow-up/treatment.<sup>3–5</sup> Because minority populations are disproportionately affected by cervical cancer, the Department of Health and Human Services has identified reducing racial and ethnic disparities in cervical cancer as a priority area.

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In 2006, the Food and Drug Administration (FDA) approved the use of a prophylactic, quadrivalent human papillomavirus (HPV) vaccine that protects against the HPV types that cause 70% of cervical cancers and 90% of genital warts.<sup>6</sup> Vaccination is one of the most successful and least costly of all public health interventions. However, widespread adoption of the vaccine, particularly among the highest risk groups, will be critical for realizing the full potential of the vaccine in reducing cervical cancer burden. Previous research has found that parents and adult women generally have positive views of the HPV vaccine. Correlates of vaccine uptake and vaccine intent in these studies include perceived susceptibility to HPV infection and cervical cancer, physician recommendation for vaccination, and in particular, perceived HPV vaccine effectiveness.<sup>7–11</sup>

Since perceived vaccine effectiveness has been linked to vaccine decision-making, perceived HPV vaccine effectiveness offers a modifiable target for future interventions that aim to increase HPV vaccine initiation, especially in groups at higher risk for cervical cancer. A review of 28 studies examining HPV vaccine acceptability from 1995–2007, found that perceived effectiveness was consistently associated with HPV vaccination intentions for eligible women and parents of adolescent girls.<sup>7</sup> In one study, parents rated vaccine effectiveness as the most important attribute of an acceptable sexually transmitted infection vaccine.<sup>8</sup> In one of the few studies examining parents' health beliefs and HPV vaccine uptake in adolescent

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daughters, parents who perceived higher levels of vaccine effectiveness or received a doctor's recommendation for the HPV vaccine, were more likely to report vaccine initiation.<sup>12</sup> Among low-income, primarily Latina mothers, Yeganeh et al found that those who believed the vaccine was safe and effective were more likely to have vaccinated their daughters than mothers who did not share these beliefs.<sup>13</sup> Perceived vaccine effectiveness has been correlated with HPV vaccine uptake and intentions among underserved women specifically,<sup>14</sup> and even among gay and bisexual men.<sup>15</sup>

Although this evidence exists, the decision-making process about the vaccine is not well characterized in minority groups. The known findings among ethnic minorities are mixed, but some work demonstrates that African American, Latina and Asian American respondents have different awareness, knowledge, beliefs and perception about effectiveness related to the vaccine, versus non-Hispanic Whites. Studies suggest that valued sources of information and recommendation may differ for these groups, with a strong emphasis on social networks.<sup>7,16</sup> If there is a belief that social sources of information/discussion in the community are needed for HPV vaccine credibility,<sup>16,17</sup> communication based in these social networks may be important in achieving perceived vaccine effectiveness among minority women and can therefore impact vaccination among vulnerable communities.

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*We hypothesized that a social source of information and social discussion, would each positively predict perceived HPV vaccine effectiveness.*

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The purpose of our study was to examine the influence of two aspects of social communication on perceived HPV vaccine effectiveness, an important modifiable predictor of vaccine uptake. In a sample of low-income, minority women in Los Angeles County, who were aware of the HPV vaccine and medical decision-makers for HPV-vaccine-eligible girls, our objectives were to examine whether 1) hearing about the vaccine from a family member and/or friend (social source of information), and 2) reported discussion with a family member and/or friend (social discussion), were associated with perceived HPV vaccine effectiveness. We hypothesized that a social source of information and social discussion, would each positively predict perceived HPV vaccine effectiveness. We focused on communication and perceived vaccine effectiveness in order to inform tailored strategies for HPV vaccine messaging interventions among low-income, minority women.

## METHODS

### Study Design and Setting

We obtained data from a sample of women who called the Los Angeles County Department of Public Health Office of Women's Health (OWH) hotline during the study's time period. Low-income, minority women generally call this hotline for health information and medical service referrals. The OWH hotline was established in 2002 to focus on cervical cancer education but has expanded to include other cancers and cardiovascular risk reduction. Eight hotline operators conduct calls in Spanish, Mandarin, Cantonese, Korean, Vietnamese, Armenian, and English. The hotline is free, and advertised through OWH partnerships with over 300 community-based organizations as well as through ethnic media in Los Angeles.

The OWH and researchers from the NCI/CDC-funded Cancer Prevention and Control Research Network at the UCLA School of Public Health used the hotline to conduct a 20–30 minute telephone-survey with these women on the following topics: HPV infection knowledge, HPV vaccine awareness, HPV vaccine perceptions, sources of information about the vaccine, discussion about the vaccine, and decisions about HPV vaccination for daughters. Findings from the main study have been presented previously.<sup>18</sup> The present cross-sectional analysis focuses on social source of information, social discussion and perceived HPV vaccine effectiveness among women who reported to be aware of the HPV vaccine. This project received approval from the UCLA institutional review board.

### Study Sample

Between January and November 2009, OWH hotline operators invited and screened all callers to determine eligibility. In addition, operators recontacted women who used the hotline in the past 12 months. The eligibility criteria were: 1) aged 18–65 years, and 2) medical decision-maker for at least one girl who was age-eligible for the HPV vaccine (9–18 years). Overall 2133 women were invited to be screened and 25% were eligible for the study. Ninety-three percent of the eligible women participated; 490 enrolled women completed the phone survey.

The goal of this study was to investigate how social source of information and social discussion impact perceived HPV vaccine effectiveness. Because questions about sources of information and discussion types were only asked of women who reported being aware of the HPV vaccine, our analyses were limited to women who stated they had heard about the HPV vaccine or Gardasil® (the study was conducted prior to the FDA approval of Cervarix®). Out of the 490 initially

surveyed, 294 women responded yes to the question, "Before today, have you ever heard of the cervical cancer vaccine, also called the HPV vaccine or Gardasil®?"

## Measures

### *Perceived HPV Vaccine Effectiveness*

Perceived HPV vaccine effectiveness for preventing cervical cancer was the main outcome in this analysis. Women were asked "How effective do you think the vaccine is in preventing cervical cancer?" Response options included somewhat effective, very effective, not effective, and don't know. We combined responses for somewhat effective and very effective and grouped not effective and don't know and thus examined any perception of HPV vaccine effectiveness (somewhat/very effective) versus not having perceived effectiveness (not effective/don't know).

### *Sources of Information Regarding HPV Vaccine*

Women were asked, "Where did you hear about the HPV vaccine?" and were given the choices of: family/friends, doctor/nurse/health professional, newspaper/magazine, TV commercial, TV news, Internet, radio, other place, and don't know. These categories were not mutually exclusive. We were primarily interested in examining perceived HPV vaccine effectiveness among women who had selected family/friends as a source of information (a social source- the primary predictor) compared to those who did not, even if these women indicated other sources of information.

### *Discussion Regarding HPV Vaccine*

Women were asked, "Have you ever discussed the HPV vaccine for your daughter with others such as your friends or family members?" The primary predictor for the discussion model was social discussion about the HPV vaccine, defined as having discussed the

HPV vaccine with family and/or friends. We compared perceived HPV vaccine effectiveness among women who had responded "yes" to those who had not discussed the HPV vaccine with family and/or friends.

## Statistical Analyses

Our secondary data analysis examined the relationship between: 1) social source of information and perceived HPV vaccine effectiveness, and 2) social discussion and perceived HPV vaccine effectiveness.

We first obtained descriptive statistics of the study sample. For the source of information model, we conducted unadjusted analyses examining perceived HPV vaccine effectiveness in relation to all possible sources of information listed. Looking at unadjusted logistic regressions of perceived HPV vaccine effectiveness, family/friends and doctor/nurse/health professional were the only sources significantly associated with having a perception of HPV vaccine effectiveness ( $P \leq .05$ ). Because some women in our sample (12%) reported hearing about the vaccine from both family/friends and doctor/nurse/health professional, we included the latter source (medical source variable) in the multivariate source of information model. This was done in order to examine the effect of the women's social source of information, while controlling for the contributing effect of the medical source of information. We included an interaction term for the social source and medical source variables in the adjusted model to test for any evidence of difference among women who heard about the vaccine from the two sources.

In the discussion model, the main predictor was whether or not the respondent had discussed the HPV vaccine with a family member and/or friend (social discussion). Because we know that physician recommendation is one of the most significant predictors of vaccine acceptability from the back-

ground literature, we controlled for physician discussion in this model (women were also asked "Have you ever discussed the vaccine with your daughter's doctor?"), while examining the effect of social discussion. Since 35% of the women reported discussing the vaccine with family and/or friends and a physician, we included a formal test for interaction in the adjusted model as well.

Factors affecting interaction with the health care system were selected as control variables for the two multivariate logistic regression models. These were: age, perceived health, insurance, education, family income, number of daughters, language of interview (English vs non-English), and race/ethnicity of respondents. We also controlled for age, insurance status and usual source of care for the girl who the respondent answered questions about.

Out of the 294 women who were aware of the HPV vaccine, 83% had complete responses for the study variables. Income and education were the variables with the highest missing rate (6.4% and 3.4% respectively). The patterns of missing variables were randomly distributed among the observations, thus we proceeded with list-wise deletion of observations with missing data. The analysis retained 254 observations in the social source of information model and 250 observations in the social discussion model. We used Stata version 11 for our analyses. Results are presented as odds ratios with 95% confidence intervals. Significant results are at  $P \leq .05$ .

## RESULTS

### Characteristics of Sample

Among the 294 vaccine-aware women (Table 1), 55% were Latina, 22% were Chinese, 9% were Korean, 9% were African American, and 4% were another race/ethnicity or multiracial. The mean age of the respondent was

**Table 1. Demographics of HPV vaccine-aware women (n=294)**

Characteristic	Mean (SD) or n (%)
Mean age of respondent, years	43.9 (SD .32)
Mean age of respondent's daughter*, years	14.8 (SD 2.8)
Race/ethnicity	
Latina	163 (55.4)
Chinese	64 (21.8)
Korean	27 (9.2)
African American	26 (8.8)
Other	12 (4.1)
Education	
Highest education- no school	3 (1.1)
Highest education- grade school	89 (31.7)
Highest education- high school	113 (40.2)
Highest education- college	79 (28.1)
Income <\$1,000/month	94 (34.2)
Respondent's daughter* has a usual source of care	217 (74.1)
Perceived health status of respondent	
Excellent, very good, or good	194 (66.44)
Fair or poor	98 (33.6)
Respondent has insurance	81 (27.9)
Respondent's daughter* has insurance	230 (78.8)
Language of interview other than English	227 (77.2)
Number of girls in eligible age group that respondent made health decisions for - one; two; three	226 (76.9); 63 (21.4); 5 (1.7)

\* Or other girl that respondent may be medically responsible for.

43.9 years while the mean age of the girl in question was 14.8 years. Only 23% completed the survey in English. The respondents were less insured than the girls they cared for; 28% of these women reported having personal medical insurance while 79% reported that

the girls they cared for had medical insurance.

For the outcome of interest (Table 2), 72% reported perceiving that the HPV vaccine was somewhat or very effective. In terms of HPV vaccine sources of information (re-

**Table 2. Perceived HPV vaccine effectiveness and communication variables (n=294)**

Variable of interest	n (%)
Perceived HPV vaccine effectiveness	
Somewhat or very effective	210 (72.41)
Not effective or don't know	80 (27.59)
HPV vaccine source of information	
Social (family and/or friends)	61 (20.75)
Medical	192 (65.3)
TV commercial	90 (30.61)
TV news	87 (29.59)
Newspaper	46 (15.65)
Radio	18 (6.12)
Internet	8 (2.72)
Other source	19 (6.46)
HPV vaccine discussions	
Social (family and/or friends)	153 (52.40)
Medical	155 (53.45)

spondents could select more than one source), 21% reported hearing about the HPV vaccine from family and/or friends (social), 65% reported hearing about the HPV vaccine from a doctor/nurse/health professional, 31% from a television commercial, 30% from television news, 16% from the newspaper, 6% from the radio, 3% from the Internet and 6% from another source. For reported discussions, 52% of these women stated that they had discussed the vaccine with family and/or friends (social) while 53% stated that they had discussed the vaccine with a doctor.

### Social Source of Information Predicts Perceived HPV Vaccine Effectiveness

Women who stated that they had heard about the HPV vaccine from a social source were more likely to perceive the HPV vaccine as somewhat or very effective than those without a reported social source of information (OR 2.21, 95% CI, 1.02–4.75). Respondents who stated that they had heard about the HPV vaccine from a medical source were also more likely to perceive the HPV vaccine as somewhat or very effective than those without a reported medical source of information (OR 2.19, 95% CI, 1.20–3.97).

After controlling for covariates, hearing about the HPV vaccine from a social and medical source remained statistically significant. As seen in the adjusted model (Table 3), women with a social source were more likely to perceive the HPV vaccine as somewhat or very effective than those without a reported social source of information (OR 4.78, 95% CI 1.76–12.98). The association between social source of information and perceived HPV vaccine effectiveness was also larger in magnitude compared to the association between medical source and perceived effectiveness. Sensitivity analyses for an interaction between the social source and medical source were not statistically



**Table 3. Adjusted odds ratios in multivariate model of social source of information and perceived HPV vaccine effectiveness**

Variable	Odds ratio, (95% CI)	P
Social source of information	4.78†, (1.76–12.98)	.002
Medical source of information	2.07*, (1.06–4.04)	.03
Age of respondent	.97, (.92–1.01)	.12
Age of daughter‡	.97, (.86–1.09)	.63
Number of girls respondent cares for	1.74, (.77–3.93)	.18
Korean	2.22, (.36–13.68)	.39
Chinese	.99, (.37–2.64)	.99
African-American	2.48, (.61–10.04)	.61
Other	3.12, (.48–20.26)	.48
Ref. Latina		
Insurance of respondent	.47*, (.22–.97)	.04
Insurance of daughter‡	.83, (.33–2.11)	.70
Excellent/very good/good health status	.97, (.49–1.90)	.92
Ref. fair/poor		
Language of interview in English	.62, (.22–1.74)	.37
Ref. non-English		
Household income less than \$1,000 per month	1.27, (.63–2.57)	.50
Ref. >\$1,000 per month		
No school	.72, (.05–9.81)	.80
High-school	.59, (.27–1.34)	.21
College	1.33, (.42–4.21)	.63
Ref. grade school		
Daughter‡ has usual source of care	.99, (.43–2.32)	.98

\* P≤.05

† P≤.01

‡ Or other girl that respondent may be medically responsible for.

**Table 4. Odds ratios in multivariate model of social discussion and perceived HPV vaccine effectiveness**

Variable	Odds ratio, (95% CI)	P
Social discussion	1.98*, (1.04–3.78)	.037
Medical discussion	1.71, (.86–3.39)	.125
Age of respondent	.97, (.93–1.02)	.21
Age of girl	.97, (.85–1.08)	.51
Number of girls respondent cares for	1.60, (.69–3.70)	.27
Korean	3.71, (.63–21.73)	.15
Chinese	1.81, (.67–4.89)	.24
African-American	2.13, (.53–8.48)	.29
Other	2.16, (.33–14.18)	.42
Ref. Latina		
Insurance of respondent	.47*, (.23–.96)	.04
Insurance of daughter	.66, (.25–1.76)	.41
Excellent/very good/good health status	.95, (.48–1.88)	.88
Ref. Fair/Poor		
Language of interview in English	.85, (.32–2.27)	.74
Ref. non-English		
Household income less than \$1,000 per month	1.23, (.61–2.49)	.56
Ref. >\$1,000 per month		
No school	.76, (.05–12.56)	.85
High-school	.43*, (.19–.996)	.049
College	.67, (.22–2.06)	.48
Ref. Grade school		
Daughter has usual source of care	.997, (.42–2.36)	.99

\* P≤.05.

‡ Or other girl that respondent may be medically responsible for.

significant, and the inclusion of the interaction term in the model did not alter the effect of the main predictor. Lastly, women who had medical insurance had lower odds of perceived vaccine effectiveness compared to those who were uninsured (OR 0.47, 95% CI 0.22–0.97).

### Social Discussion Predicts Perceived HPV Vaccine Effectiveness

Unadjusted analyses between perceived HPV vaccine effectiveness and reported discussions about the vaccine were statistically significant. Social discussion about the vaccine significantly increased the odds of perceiving the vaccine as effective (OR 2.29, 95% CI, 1.35, 3.90). Reported discussion with a doctor also significantly increased the odds for perceived vaccine effectiveness (OR 2.03, 95% CI 1.20–3.43).

Table 4 shows the multivariate model of the relationship between social discussion and perceived vaccine effectiveness, while controlling for medical discussion. Women who reported social discussion had increased odds of perceiving the vaccine as effective compared to those who did not report discussing the vaccine with family and/or friends (OR 1.98, 95% CI 1.04–3.78). After controlling for other factors in the multivariate model, the medical discussion variable was not statistically significant (OR 1.71, 95% CI .86–3.39). Sensitivity analyses of an interaction term between social discussion and medical discussion were not statistically significant in this model.

In terms of covariates, women who reported having medical insurance had decreased odds of perceiving the HPV vaccine as effective (OR 0.47, 95% CI 0.23–0.96). Women who reported having a high school education had decreased odds of perceived vaccine effectiveness compared to women who had a grade school education (OR 0.43 0.19–0.996).

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*We found that social source of information and social discussion about the vaccine were important determinants of perceived HPV vaccine effectiveness among minority medical-decision makers for HPV-vaccine-eligible girls...*

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## DISCUSSION

We found that social source of information and social discussion about the vaccine were important determinants of perceived HPV vaccine effectiveness among minority medical-decision makers for HPV-vaccine-eligible girls, who had previously heard of the HPV vaccine, even after controlling for whether the woman had heard about the vaccine from a medical source or discussed it with a physician. Furthermore, in the model that examined discussion, we found that medical discussion was not significantly associated with perceived HPV vaccine effectiveness, while social discussion remained significant.

While there is extensive evidence for physician/medical recommendation as a positive predictor for perceived effectiveness and vaccine uptake, qualitative studies examining the acceptability of HPV vaccination among ethnic minority women also show that Latina immigrants prefer information from multiple sources (other than a physician) including the advice of women they trust.<sup>12,16</sup> Motivating factors for other minority women have included objective evidence, cost, and knowing people who got the vaccine.<sup>12</sup> However, no prior study has examined how social communication (information and discussion) and perceived HPV vaccine

effectiveness are linked. This is the first analysis to demonstrate the positive impact of social communication on perceived HPV vaccine effectiveness, a known predictor of vaccine uptake.

Social communication is an avenue of messaging interventions for the HPV vaccine (and other new technologies) that should be explored among low-income, minority populations. It should be stressed that a majority of the women in this sample completed the survey in a non-English language (77%) and most were also foreign-born. This sample of largely immigrant women may be more reliant on social communication to obtain and validate in-language health information. We hypothesize that social networks are a valuable resource in everyday practice, and we urge clinics/providers, especially those who serve limited-English-proficient populations, to integrate the social network component into their interaction with patients. For purposes of improving perceived HPV vaccine effectiveness in the community, it may be important for HPV vaccine providers to ask their patients and their patients' guardians (in pediatric and adolescent cases) whether they have discussed this technology with their family and/or friends. Future interventions could involve asking patients who know about the HPV vaccine to talk about the issue with family and/or friends as a form of vicarious health outreach, similar to a promotora model.

As Jacob et al stated<sup>19</sup> awareness and availability of an HPV vaccine are not sufficient to warrant its use. Even if the vaccine is available, affordable, and accessible, it may be difficult to convince an at-risk population to use this technology, particularly if the population does not perceive the vaccine as effective. We demonstrated that social communication plays a strong influence in whether these women perceive the vaccine as effective. Therefore, policy cannot rely solely on medical communication to recommend this vaccine and disseminate the message. Providers,

clinics and health systems must take a creative social approach in the messaging about the vaccine, particularly in high-risk minority groups for whom the HPV vaccine can be especially helpful.

Certain limitations to this study must be acknowledged. Since recruitment was limited to women who called the OWH hotline, our population was a convenience sample with a modest sample size. The women in this study may be more socially proactive about seeking medical information and more predisposed to perceive the vaccine as effective, thus limiting the generalizability of our findings to other low-income populations. Selection for confounding factors in this analysis was constrained by the information that had been collected by the survey. However, because the hotline has been a successful method of reaching underserved women, this is a unique dataset that can inform culturally-sensitive interventions and targeted educational campaigns about the HPV vaccine for an important subpopulation of women. Women who are aware of the HPV vaccine are possibly more medically knowledgeable and education-seeking, and perhaps more likely to deliver health information and messages back to their communities.

Larger educational campaigns that highlight the role of social contacts and social recommendation for HPV vaccination merit further study, especially in low-income communities that may face barriers to accessing health information. Future work should examine whether modifying communication about the vaccine can modify perceived effectiveness. A tailored educational messaging intervention using social communication as the platform is a key next step in the evaluation of perception-formation of the HPV vaccine. Finally, the relationship between social communication and perceived effectiveness for other medical resources, particularly among ethnic minority groups, should be examined in future studies.

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## AUTHOR CONTRIBUTIONS

*Study concept and design:* Casillas, Singhal, Glenn, Bastani

*Acquisition of data:* Casillas, Singhal, Tsui, Glenn, Bastani

*Data analysis and interpretation:* Casillas, Singhal, Tsui, Glenn, Bastani, Mangione

*Manuscript draft:* Casillas, Singhal, Tsui, Glenn, Mangione

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