

Effects of Information Framing on Human Papillomavirus Vaccination

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Abstract

Background: In June 2006, the first vaccine to prevent human papillomavirus (HPV) transmission was approved for use in females in the United States. Because the vaccine was approved for females as young as 9, its success depends on parents' and individuals' willingness to accept vaccination. Little is known about how attitudes toward this vaccine will be influenced by the way the vaccine is portrayed in the media or in public debate.

Methods: To assess the effects of information framing on intentions to vaccinate self or female children, if appropriate, 635 adults read one of three short descriptive paragraphs about the vaccine, each of which emphasized a different aspect of the vaccine. Participants were then asked about their intentions to vaccinate under cost or no-cost conditions.

Results: Women who read that the vaccine protects only against cervical cancer had significantly higher intentions to vaccinate themselves when the vaccine was available at little or no cost compared with women who read alternate versions of the descriptive paragraph, $F(2,325) = 5.74, p = 0.004$.

Conclusions: How the HPV vaccine is framed may affect vaccination intentions under certain conditions. Women may be more receptive to the vaccine if it is framed as a cervical cancer prevention tool rather than a sexually transmitted infection (STI) prevention tool.

Introduction

RECENT APPROVAL BY THE Food and Drug Administration (FDA) of a prophylactic vaccine against human papillomavirus (HPV) is expected to have a significant impact on the public's health. HPV is the most common sexually transmitted infection (STI) in the United States, infecting more than six million Americans each year.¹ Most HPV infections are asymptomatic and resolve on their own.² In some individuals, low-risk HPV strains can lead to genital warts, and a small number of high-risk strains will lead to cancer in both males and females. The newly approved vaccine protects against four major types of HPV (types 6,11,16, and 18) that are responsible for 70% of cervical cancer cases and 90% of genital warts.³ In this country, cervical cancer was expected to be diagnosed in roughly 11,000 women and claim the lives of more than 3,800 women in 2008.⁴

Despite the high prevalence of HPV infection among the American population, numerous surveys have documented relatively low levels of knowledge about the virus or its con-

sequences. A survey in 2004 found that 70% of women had never heard of HPV and almost 90% have never discussed HPV with a healthcare provider.⁵ A survey of college students, a particularly high-risk population, found that only 27% correctly identified HPV as the most common STI.⁶ More recent data show that awareness of HPV is increasing, although the majority of Americans remain unaware of HPV or its strong ties to cervical cancer.^{7,8} A review by Zimet et al.⁹ confirmed poor levels of knowledge about HPV, Pap testing, and cervical cancer among U.S. women. However, it is expected that knowledge and awareness will increase with time as the media and industry marketing continue to bring attention to HPV and the vaccine.

Because medical interventions, such as vaccination, for children younger than 18 generally require parental consent, decisions to vaccinate adolescents will most likely be made by a parent.¹⁰ The review by Zimet et al.⁹ found that across 10 studies, parents expressed moderate to strong interest in vaccinating their adolescent daughter against HPV. Opposition to vaccination was associated with concerns about vac-

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cine safety and efficacy, poor understanding of HPV, cost of the vaccine, and viewing one's child as being at low risk of an STI.^{11–15}

Research shows that female adolescents, like their parents, are also in favor of HPV vaccination. Numerous studies about adolescent attitudes toward vaccination, recently summarized by Zimet et al.,⁹ conclude that the majority of adolescent females are in favor of vaccination. Correlates of vaccination include parent and physician recommendation, a belief in vaccine efficacy, greater sexual risk taking, and greater knowledge about HPV.

The Advisory Committee on Immunization Practices (ACIP) recommends the vaccine for girls aged 11 and 12 but it is approved for use in females aged 9–26.¹⁶ This decision could be considered controversial, as many conservatives cited fears that vaccinating adolescents could send a message condoning sexual activity before marriage.^{17,18} More recently, these groups have refined their positions to be in favor of vaccination, as long as it is not mandatory.¹⁹

Message framing

Frames offer a particular way to understand an issue, through definition, diagnosis of a cause, or prescribing a remedy.^{20,21} As such, frames can help create and shape individuals' thoughts and opinions on particular issues. Kinder and Sanders²² note that frames, typically created by elite discourse, are used by the general public to make sense of the issues in everyday life. Frames help to give meaning and order to current public policy topics, which can often be overwhelming and confusing.

The importance of the way the media frames an issue is twofold. First, media frames reflect the larger public discourse, and second, when a particular frame dominates discourse, it can influence public opinion. Framing can make certain facets of the issue seem important and prime individuals to more readily access certain thoughts and emotions.²³ In addition, frames can help construct the news by emphasizing a certain interpretation as valid and relevant while discarding competing ideas as irrelevant. News frames can also trigger distinct trains of thought or feelings.

Previous research provides empirical support for the link between message frames and their influence on health behavior and decision making. Message framing has been shown to influence a myriad of health decisions, such as HIV testing, cancer screening, flu shots, sunscreen use, and safe driving.^{24–29} The introduction of a vaccine to prevent HPV, an STI and a common cause of cancer, could be a potential breeding ground for political and moral debate and an opportunity to study the effects of information framing on vaccination decisions. Gerend and Shepherd³⁰ found that women presented with a loss-framed message (emphasizing the costs of not receiving a vaccine) reported higher vaccine acceptance than women presented with a gain-framed message (emphasizing the benefits of vaccination), but only among women who engaged in risky sexual behavior and women with a tendency to avoid negative outcomes.

Study purpose

The purpose of this study was twofold. The first purpose was to provide descriptive data on knowledge, awareness,

and media exposure of HPV and the vaccine in a nationally representative sample of U.S. adults. These data were collected at the time of the FDA's approval of the vaccine in June 2006, so it is likely that knowledge, awareness, and media exposure among Americans were rapidly evolving from previous survey findings. The second purpose was to test the effects of information framing, mirroring what was anticipated to be an active public debate, on vaccination intentions. A content analysis of U.S. news coverage of the HPV vaccine prior to FDA approval found that the vaccine was more often described as a cervical cancer vaccine than an STI vaccine, and 24% of news articles discussed "moral or political concerns" about the vaccine.³¹ It is hypothesized that discussions among the public about the vaccine, particularly descriptions about HPV as an STI or a discussion about the vaccine leading to increased sexual activity, might positively or negatively influence decision making about vaccination.

Materials and Methods

In June 2006, 635 people completed an online survey embedded in a larger, continuous monthly survey of health communication topics. Survey participants were part of a previously established web-enabled research panel assembled by an independent research firm; the panel was designed to be representative of the U.S. population. Composition of the research panel is based on a sampling frame that includes both listed and unlisted phone numbers and is not limited to current web users or computer owners. Further description of the sampling methodology is described elsewhere.³² Sampling weights and poststratification adjustment to the Current Population Survey were used to reduce biases resulting from sampling and nonsampling error. The survey and methodology were approved by the Institutional Review Board at the University of Pennsylvania. The panel recruitment response rate was 31%, and the survey completion rate of those in the panel was 74%. Previous work has verified that there are no significant differences between panel responders and nonresponders.³³

The survey consisted of two parts. The first part assessed awareness of HPV, the vaccine, and exposure to news or health ads about HPV or the vaccine in the media. Next, participants were randomly assigned to read one of three framing paragraphs (FP), each of which emphasized a different aspect of the vaccine: the vaccine protects against cervical cancer; the vaccine protects against cervical cancer and an STI; the vaccine protects against cervical cancer and an STI and may or may not lead to increased sexual promiscuity among the vaccinated. All three FPs included general information on disease prevalence and symptoms, as well as vaccine dosage frequency, cost, and potential side effects. The average length of the three FPs was 160 words and the readability was at a 9th grade level. The Appendix presents the complete texts of the three FPs.

Females were asked about their intentions to vaccinate under two conditions: if they had to pay for the vaccine and if the vaccine were provided at little or no cost. Participants, both male and female, were asked if they had at least one daughter in particular age groups (0–8 years old, 9–14 years old, 15–17 years old, and 18–26 years old). If respondents in-

dictated that they had one or more daughters in a particular age group, they were asked about their intentions to vaccinate or recommend vaccination to their daughter. Main effects of each age group were assessed by one-way ANOVA.

Measures

HPV awareness. Participants responded to two items: "Have you ever heard anything about a vaccine that prevents cervical cancer?" and "Have you ever heard of the human papillomavirus?" Response options were 'yes' or 'no'.

Media exposure. Those who reported that they had heard of HPV were asked the following question: "In the past 30 days, how often have you seen or heard any news or ads about HPV?" Response categories were 1 (not at all in the past month), 2 (about once in the past month), 3 (about once per week), 4 (more than once per week), and 5 (almost every day).

Discussion of HPV. Those who reported that they had heard of HPV were asked: "Has a healthcare provider ever told you that you have HPV?" "Have you ever talked to a healthcare provider about HPV?" "Have you ever talked to someone other than a healthcare provider about HPV?" Response options were 'yes' or 'no'.

Intention to vaccinate. Female participants were asked about their intentions to get the HPV vaccine: If the HPV vaccine were available to women your age, how likely are you to get the vaccine: (a) if you or your family has to pay for it? and (b) if it is available at little or not cost? Response categories ranged from 1 (very unlikely) to 5 (very likely).

Participants, both male and female, were asked if they had at least one daughter in particular age groups (0–8 years old, 9–14 years old, 15–17 years old, and 18–26 years old). If respondents indicated that they had one or more daughters in a particular age group, they were then asked: How likely are you to get the HPV vaccine for your daughter [age group]: (a) if your family has to pay for it? and (b) if it is available at little or not cost? Response categories ranged from 1 (very unlikely) to 5 (very likely).

Recall. All participants were asked to recall information they may or may not have been exposed to in the FP they read by answering the following: An HPV vaccine . . . (a) could reduce the number of women dying from cervical cancer; (b) could reduce the number of people getting a sexually transmitted infection; (c) might lead some people to be more sexually active. Response categories were 1 (yes, the paragraph said this), 2 (no, the paragraph did not say this), and 3 (I don't know if the paragraph said this). Responses to this item were recoded as correct or incorrect depending on the assigned experimental condition and the content of the FP. If a participant responded that the assigned paragraph contained the text from the item and the text was in fact contained in the paragraph, the response was coded as correct. If a participant responded that the assigned paragraph contained text from the item but the text was actually not present in the paragraph, the response was coded as incorrect. Responses of "I don't know" were coded as incorrect.

Vaccination policy. Participants responded to items assessing their agreement toward public policies about vaccination, such as mandatory vaccination for school enrollment, coverage of the vaccine by insurance companies, and parental consent for vaccination. The results of these items are not presented in this paper.

Results

The survey was completed by 635 adults (51.4% female). Participants ranged in age from 18 to 93 (mean age 47.6, SD 15.6). Three quarters of the sample identified themselves as non-Hispanic white, 11.4% identified themselves as non-Hispanic black, and 9.0% identified themselves as Hispanic. More than half (55.7%) reported having some form of education beyond high school, and slightly less than half (43.6%) reported having an annual household income >\$50,000. Of females, <3% (2.7%) indicated that they had been told by a healthcare provider that they had HPV. Ten percent of adult women would be eligible for vaccination under current ACIP guidelines.

The results of HPV awareness and media exposure are presented in Table 1. Overall, the majority of participants (58.0%) had not heard about a new vaccine to prevent cervical cancer. Forty-five percent of females and 39% of males reported they had heard about the vaccine. Roughly one third of participants aged ≥ 45 had heard about the vaccine, whereas only 16% of those aged 18–29 and 21% of those 30–44 had heard about the vaccine. Non-Hispanic white participants were significantly more likely to have heard of the vaccine than any other racial or ethnic group ($\chi^2 = 32.2, df = 3, p < 0.001$), as were those with at least a college degree ($\chi^2 = 36.6, df = 3, p < 0.001$). Almost twice as many participants with a college degree or higher (42.9%) had heard of the vaccine as those with just a high school diploma (27.1%). Participants whose annual household income was >\$75,000 were most likely to have heard of the vaccine, whereas those with incomes <\$25,000 were least likely to have heard of the vaccine ($\chi^2 = 14.5, df = 3, p = 0.002$). Parents of children <age 18 were less likely to have heard about the vaccine than nonparents ($\chi^2 = 6.7, df = , p = <0.010$).

Fifty-six percent of participants reported that they had ever heard of HPV. Two thirds of females and 44% of males reported ever hearing of the virus. Middle-aged participants were significantly more likely than younger or older participants to have heard of HPV; 30% of those aged 30–45 and aged 46–60 had heard of HPV, compared with 20.8% of those 18–29 and 18.0% of those ≥ 60 ($\chi^2 = 26.5, df = 6, p < 0.001$), as were participants with higher levels of education ($\chi^2 = 52.3, df = 6, p < 0.001$) and household income ($\chi^2 = 22.6, df = 6, p < 0.001$). Parents were more likely than nonparents to have heard about HPV ($\chi^2 = 8.7, df = 1, p = 0.013$). Of those who had ever heard of HPV, 57.2% reported having seen or heard news or ads about HPV at least once per week or more, and 42.8% reported exposure to HPV news or ads as once per month or less. Significant differences in the frequency of media exposure were only seen by gender (66% of females, compared with 34% of males, reported exposure at least once per week or more ($\chi^2 = 4.24, df = 1, p = 0.040$)). Of females, only 11% indicated that they had talked to someone other than a healthcare provider about HPV.

TABLE 1. PERCENTAGE OF DEMOGRAPHIC GROUPS OF SAMPLE POPULATION; HPV AND HPV VACCINE KNOWLEDGE/MEDIA EXPOSURE

	Ever heard about a vaccine to prevent cervical cancer (%) n = 635				% ever heard of HPV (%) n = 635				% seen or heard news or ads about HPV (%) ^a n = 355									
	Entire sample n = 635		Chi-square (df)		Yes		No		Chi-square (df)		More than once per week		About once in past month		Not at all in past month		Chi-square (df)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	More than once per week	About once in past month	About once in past month	Not at all in past month	Chi-square (df)			
Overall	42.0	58.0	—	—	56.2	43.8	—	—	33.8	23.3	23.7	19.2	—	—	4.5	(3)		
Gender			2.7	(1)	44.7	55.3	32.8***	(2)	28.5	21.9	27.7	21.9	21.9	17.4	15.2	(9)		
Mle	48.6	61.4			66.9	33.1	16.2***	(3)	37.2	24.3	21.1	17.4	17.4	15.2	15.2	(9)		
Female	51.4	54.9																
Age, years																		
18–29	17.4	60.0			67.7	32.3			29.7	29.7	17.6	23.0	23.0	15.2	15.2	(9)		
30–44	27.3	67.6			62.4	37.6			30.6	22.2	24.1	23.1	23.1	15.2	15.2	(9)		
45–59	31.2	58.1			55.1	44.9			42.2	17.4	22.0	18.3	18.3	15.2	15.2	(9)		
60+	24.1	45.8			41.8	58.2			29.7	28.1	32.8	9.4	9.4	15.2	15.2	(9)		
Race/ethnicity																		
White, non-Hispanic	75.2	51.8	32.2***	(3)	59.1	40.9	19.3**	(6)	35.5	23.0	23.4	18.1	18.1	15.2	15.2	(9)		
Black, non-Hispanic	11.4	79.2			37.5	61.1			37.0	18.5	22.2	22.2	22.2	15.2	15.2	(9)		
Other, non-Hispanic	4.4	67.9			50.0	50.0			14.3	7.1	42.9	35.7	35.7	15.2	15.2	(9)		
Hispanic	9.0	78.9			56.1	43.9			25.0	37.5	18.8	18.8	18.8	15.2	15.2	(9)		
Education																		
<High school	12.1	71.4	36.6***	(3)	36.4	63.6	52.3***	(6)	35.7	25.0	17.9	21.4	21.4	15.2	15.2	(9)		
High school diploma	32.2	64.7			44.6	55.4			38.5	27.5	17.6	16.5	16.5	15.2	15.2	(9)		
Some college	25.6	64.2			58.0	42.0			34.0	21.3	24.5	20.2	20.2	15.2	15.2	(9)		
College degree or higher	30.1	40.3			74.3	25.7			30.3	21.8	28.2	19.7	19.7	15.2	15.2	(9)		
Income																		
<\$25,000	25.7	66.9	14.5**	(3)	46.9	53.1	22.7***	(6)	30.3	27.6	23.7	18.4	18.4	15.2	15.2	(9)		
\$25,000–\$50,000	30.8	57.4			49.7	50.3			38.1	22.7	20.6	18.6	18.6	15.2	15.2	(9)		
\$50,000–\$75,000	21.5	61.0			64.7	35.3			36.4	19.3	23.9	20.4	20.4	15.2	15.2	(9)		
>\$75,000	22.1	45.7			67.1	32.9			29.8	24.5	26.6	19.1	19.1	15.2	15.2	(9)		
Parents of child under age 18																		
Yes	30.0	65.8	6.7**	(1)	64.7	35.3	8.7**	(1)	29.3	23.6	22.8	24.4	24.4	15.2	15.2	(9)		
No	70.0	57.4			52.3	47.5			16.4	24.1	23.3	36.2	36.2	15.2	15.2	(9)		

^aComprising only those responding yes to ever having heard of HPV.
* $p < 0.05$; ** $p < 0.1$; *** $p < 0.001$.

Women who read that the vaccine protects against cervical cancer (FP 1) had significantly higher intentions to vaccinate themselves when the vaccine was available at little or no cost compared with women who read alternate versions containing information on STIs or the possibility of increased sexual promiscuity, $F(2,325) = 5.74, p = 0.004$. Tukey HSD analysis showed that mean differences were significant between FP 1 and FP 2 and between FP 1 and FP 3. Full results of intentions to vaccinate self or female child are shown in Table 2. Sixty-three percent of women responded that they were very likely or somewhat likely to get the vaccine if it were available to women their age at little or no cost if they read FP 1, compared with 43.0% of women and 43.5% of women who read FP 2 and FP 3, respectively ($\chi^2 = 16.7, df = 8, p < 0.05$). When asked about their intentions to vaccinate if the vaccine were at a cost to them or their family, there were no discernible differences between conditions, $F(2,325) = 1.64$, nonsignificant). Intentions to vaccinate female children at different ages were not significantly different between experimental conditions; however, power calculations for each age group revealed that sample sizes may not have been large enough to detect small effects. For example, for the analysis of daughters aged 9–26, there were roughly 50 participants in each condition. Using $\alpha = 0.05$,

$d = 0.33$, and σ (between group) = 1.391, power (β) was 0.255.

Despite the lack of significant findings among intentions to vaccinate female children, important trends emerged that are worth noting. First, mean scores for intentions to vaccinate females >18 years and daughters aged 9–26 were highest among participants who read FP 1, that the vaccine protects against cervical cancer. When information about STIs was added (FP 2), intentions to vaccinate were reduced. Information about increased sexual promiscuity among the vaccinated had little effect on reducing intentions below the levels seen with FP 2. Additionally, across all three age categories, intentions to vaccinate were significantly higher when the vaccine was presented as being of little or no cost to themselves or their family. For example, 50.7% of females responded that they were very likely or somewhat likely to get the vaccine for themselves if eligible when the vaccine was offered at little or no cost, compared with 25.8% of females when the vaccine would be of cost to themselves or their family.

The recall item revealed only partial success in relaying information to participants and framing the vaccine under specific conditions. All three experimental groups had high percentages correctly responding that the paragraph they

TABLE 2. MEANS, SDs, AND OVERALL F VALUES FOR INTENTION TO VACCINATE SELF OR CHILD AGAINST HPV: THREE FRAMES

	Framing version	n	Mean	SD	F (df)	Significance
Women/cost	1	118	2.54	1.42	1.64 (2,325)	0.195
	2	107	2.24	1.29		
	3	101	2.27	1.43		
	Total	326	2.36	1.38		
Women/no cost	1	118	3.58	1.42	5.74 (2,325)	0.004
	2	107	2.95	1.59		
	3	101	3.03	1.59		
	Total	326	3.21	1.55		
Daughter aged 0–8/cost	1	27	2.67	1.44	0.85 (2,64)	0.431
	2	20	3.15	1.04		
	3	17	3.06	1.52		
	Total	64	2.92	1.35		
Daughter aged 0–8/no cost	1	27	3.48	1.40	0.026 (2,64)	0.974
	2	21	3.57	1.17		
	3	17	3.53	1.51		
	Total	65	3.52	1.34		
Daughter aged 9–17/cost	1	25	2.72	1.51	1.37 (2,67)	0.260
	2	26	2.31	1.29		
	3	21	2.95	1.24		
	Total	72	2.64	1.37		
Daughter aged 9–17/no cost	1	26	3.77	1.45	1.04 (2,67)	0.360
	2	24	3.21	1.47		
	3	20	3.40	1.23		
	Total	70	3.47	1.40		
Daughter aged 18–26/cost	1	31	3.29	1.40	0.59 (2,92)	0.559
	2	37	3.00	1.47		
	3	27	2.93	1.24		
	Total	95	3.07	1.38		
Daughter aged 18–26/no cost	1	31	3.68	1.38	0.29 (2,92)	0.747
	2	37	3.49	1.47		
	3	27	3.41	1.34		
	Total	95	3.53	1.39		

^aTukey HSD showed significant mean differences between FP 1 and FP 2 and between FP1 and FP 3.

read described that the vaccine could reduce the number of women dying from cervical cancer. However, the majority of participants failed to accurately recall whether or not the paragraph they read contained information about the vaccine preventing an STI. More than half of the total sample (53.0%) failed to accurately recall whether or not their paragraph discussed the possibility of increased sexual promiscuity among the vaccinated. The distribution of responses to the recall items by condition are presented in Table 3.

A continuous variable from 0 to 3 was created for each participant to reflect the number of correct recall items. For analytical simplicity based on distribution, the variable was recoded to a categorical one: 0 if a participant got none or one of the recall items correct, or 1 if a participant got two or three of the recall items correct. There are trends in the data to suggest that those with better recall of the paragraph's content are more likely to be affected by the content under two circumstances. First, the condition of "vaccinating adult women when the vaccine is available at little or no cost" and recall interact to show a nonsignificant trend ($F(2,317) = 2.446, p = 0.088$). Second, in the condition of "vaccinating daughters aged 9–26 when the vaccine is available at little or no cost," a similar trend emerges ($F(2,134) = 2.544, p = 0.082$). In both cases, intentions are higher for those who read FP 1 and had better recall scores but lower for those assigned to FP s 2 or 3 and having better recall scores.

Discussion

During the same month that the FDA approved the first-ever vaccine to prevent HPV, knowledge about the vaccine was still low. More than half of participants responded that they had not heard of a vaccine to prevent cervical cancer, and 43% had never heard of the virus primarily responsible for causing it, HPV. Knowledge of both the vaccine and the virus was tied to similar demographic characteristics. Females, non-Hispanic whites, those with at least a college degree, and those with the highest reportable household income were most likely to have heard of both the vaccine and the virus. Older adults were more likely to have heard of the vaccine, whereas younger adults were more likely to have heard of the virus. The differences in awareness by age could be attributed to media exposure and personal risk. Older Americans generally report higher levels of news consumption and, hence, are more likely to have heard of the recent FDA approval of the vaccine.³⁴ Younger Americans are less tuned in to recent news developments but are more likely to be targeted by health education campaigns about STIs, where they would have been exposed to information about the virus. Racial and ethnic differences could also be due to media exposure differences, whereas gender differences are most likely attributed to personal risk of cervical cancer.

TABLE 3. PERCENT OF PARTICIPANTS RESPONDING CORRECTLY TO RECALL ITEMS, BY CONDITION

	<i>Cervical cancer</i>	<i>STI</i>	<i>Sexual promiscuity</i>
FP 1	67.5%	36.2%	51.4%
FP 2	63.2%	37.2%	55.3%
FP 3	63.5%	51.4%	30.3%

A key finding from this study is that information framing had limited effects on intentions to vaccinate. Among adult women, framing had a significant effect on intentions to vaccinate themselves when the vaccine was presented as being of little or no cost to their family. When information describing HPV as an STI was not included, intentions to vaccinate were highest. When STI information was included, intentions dropped, although the decrease was not significant. When information about potential public controversy about sexual promiscuity was added to the STI information, intentions remained relatively constant. Our results are similar to those of a study conducted among Southern women that found that vaccination intentions among women were highest when the vaccine was framed as preventing cervical cancer rather than STI infections; however, the same study reported equal intentions to vaccinate daughters against the two disease outcomes.³⁵

The finding that describing HPV as an STI had negative effects on intentions to vaccinate suggests that a social stigma toward STIs may still exist or that most people believe a vaccine against an STI is personally unnecessary. A Centers for Disease Control and Prevention (CDC) study validated both of these arguments when focus group participants believed they were at low risk of contracting an STI and associated words such as "infidelity," "promiscuity," "shame," and "divorce" with an STI.³⁶ Healthcare providers and communication experts must be cautious of the public's perception of HPV so as not to cause stigmatization of cervical cancer, which could be detrimental to the field of cancer prevention and control. Emphasizing the vaccine as a cancer prevention tool may alleviate some of the stigma associated with STIs.

Another key finding of this study is that, for some, cost of the vaccine may be a realistic barrier of intention to vaccinate. Intentions were higher among all age groups when the vaccine was presented as being of no cost to the participant or her family. The HPV vaccine is the most expensive of all currently recommended childhood vaccines.³⁷ Cost might not be a barrier to the youngest of eligible females, however, because many minors are eligible for free or low-cost vaccines through public or private programs. Those who might be most impacted by cost are young women aged 18–26, who are typically not covered by subsidy programs and are most likely to report being uninsured.³⁸ Even women with private insurance may face financial barriers to vaccination, as copayments and deductibles can make vaccination prohibitively expensive. As attitudes against vaccination decrease when cost is not a factor, state legislation mandating affordable insurance coverage or expansion of vaccination programs for the uninsured could bring the vaccine within reach to many who are interested.

This study showed that information about the potential of the vaccine to lead to increased sexual promiscuity among those vaccinated had little or no effect on intentions. Despite a movement from conservative groups to link this message with the vaccine to thwart vaccination efforts and preserve abstinence efforts, it appears that the information has not affected vaccination intentions. Instead, some have suggested that the home environment and peers are most influential on adolescent sexual decision making.³⁹ Data from other vaccination studies support our finding as well. A study about Lyme disease vaccination and the risk compensation hypothesis found that whereas vaccinated respondents tended

to reduce the frequency of protective behaviors after vaccination, their risk behaviors never exceeded those of the unvaccinated.⁴⁰

The findings from this study support previous research that an STI-associated stigma creates barriers to health behavior adoption.^{41,42} This will undoubtedly have implications for communication strategies and vaccination adoption. A report issued by the CDC on communicating HPV information to the public warns public health professionals against focusing primarily on the sexually transmitted nature of HPV, which can distract from the more important health concern of cervical cancer.⁴³ The report is not suggesting that the medical community ignore the STI aspect, which could erode source credibility; rather, it suggests that those who are discussing HPV focus on the commonality of the virus and its serious link to cervical cancer. Our research supports these CDC guidelines and recommendations by providing limited evidence that the framing of health information may have an effect on health behavior intentions.

There are numerous strengths to this study, such as conducting a randomized controlled experiment with a nationally representative sample, but there are a few limitations that might affect the interpretation of results. Foremost, the partial success of the recall item suggests that not all participants were fully aware of the information they were receiving. This may be due to the complexity of the information that was being relayed or that participants' attitudes toward HPV were not influenced by the material. It has been suggested, however, that when the items involve objective recall of information rather than perceived effects, failure of the item to produce anticipated results may not directly jeopardize the findings of the study.⁴⁴ Failure to recall factual information contained in the FPs is not necessarily failure of a manipulation, as the goal of a framing manipulation is to invoke particular emotions or perceptions. Additionally, our measure of vaccine awareness did not include the acronym HPV and might not have fully captured awareness among those who only recognize the vaccine as the HPV vaccine.

As the vaccine was just being launched at the time of our survey and was not yet available to the public for use, we were unable to measure actual vaccination behavior. Whereas theories of health behavior change are premised on the idea that intention is the most immediate and important predictor of behavior⁴⁵ and meta-analyses of intention-behavior relations show significant and strong associations,^{46,47} the findings of this study would be enhanced if actual vaccination behavior could have been measured. Only 10% of females who responded to the vaccination intention items were actually eligible for vaccination, based on current ACIP recommendations. Although it is possible that older women will be eligible for vaccination in the future, this may have compromised the generalizability of our findings.

Finally, this study did not assess baseline attitudes toward nor perceived risk of HPV; participants may have had preconceived notions about vaccination or risk that had greater influence over decision making than did the FPs.

Conclusions

Framing information about the HPV vaccine affected women's intentions to vaccinate themselves when the vaccine was hypothetically available to them at no cost. Addi-

tionally, although not significant, describing HPV as an STI and the vaccine as a method of STI prevention had negative effects on intentions to vaccinate females of all ages. Adding information about the potential of the vaccine to inadvertently lead to increased sexual activity had no effect on the public's intentions to vaccinate. Because knowledge and understanding of HPV and the vaccine are still relatively low among certain groups in the general population, there are tremendous opportunities for health professionals and communicators to educate the public about this common, yet potentially serious, health treat. Future vaccination campaigns should be aware that how the vaccine is framed may influence how receptive the audience is to this new form of cancer prevention and control.

Disclosure Statement

The authors have no conflicts of interest to report.

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APPENDIX A: COMPLETE TEXTS OF FRAMING PARAGRAPHS

Framing paragraph 1

A new vaccine (shot) will be available that makes it much less likely that a woman will get cervical cancer. The vaccine prevents infection from the types of the human papillomavirus (HPV) that are the main causes of cervical cancer. Millions of people get HPV every year, but many do not know that they are infected because they have no signs of illness. Although in most cases, HPV goes away on its own, in some cases, HPV can cause cervical cancer in women.

For now, the vaccine will be available to girls and women between the ages of 9 and 26. The full series of three shots is expected to cost around \$300–\$500. Side effects to the shots are mild and uncommon.

The new vaccine could reduce the number of women dying from cervical cancer by preventing HPV.

Framing paragraph 2

A new vaccine (shot) will be available that makes it much less likely that a woman will get cervical cancer. The vaccine prevents infection from the types of the human papillomavirus (HPV) that are the main causes of cervical cancer. Almost all cases of HPV are transmitted through sex with an infected partner. Both men and women can be infected. Millions of people get HPV every year, but many do not know that they are infected because they have no signs of illness. Although in most cases, HPV goes away on its own, in some cases, HPV can cause cervical cancer in women.

For now, the vaccine will be available to girls and women between the ages of 9 and 26. The full series of shots is expected to cost around \$300–\$500. Side effects to the shots are mild and uncommon.

The new vaccine could reduce the number of women dying from cervical cancer by preventing HPV, a sexually transmitted infection.

Framing paragraph 3

A new vaccine (shot) will be available that makes it much less likely that a woman will get cervical cancer. The vaccine prevents infection from the types of the human papillomavirus (HPV) that are the main causes of cervical cancer. Almost all cases of HPV are transmitted through sex with an infected partner. Both men and women can be infected. Millions of people get HPV every year, but many do not know that they are infected because they have no signs of illness. Although in most cases, HPV goes away on its own, in some cases, HPV can cause cervical cancer in women.

Some groups believe that getting an HPV vaccine might lead teenagers to become more sexually active, but others say that this is very unlikely.

For now, the vaccine will be available to girls and women between the ages of 9 and 26. The full series of shots is expected to cost around \$300–\$500. Side effects to the shots appear to be mild and uncommon.

The new vaccine could reduce the number of women dying from cervical cancer by preventing HPV, a sexually transmitted infection.