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Message Framing, Perceived Susceptibility, and Intentions to Vaccinate Children against HPV among African American Parents

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Abstract

This research examines the interaction effect of message framing (gain vs. loss) and perceived susceptibility (i.e., perceived likelihood that one's child is at risk of contracting HPV) on African American parents' intentions to vaccinate their children against HPV. Results of an experiment ($N = 193$), in which parents were exposed to either a gain-framed or loss-framed message about HPV vaccination, revealed a significant interaction between message framing and perceived susceptibility when parents were required to pay for the vaccine. The specific pattern of interaction suggested that parents who perceived their children to be at high risk of contracting HPV were more persuaded by the gain-framed message, whereas those who believed their children to be at low risk of contracting HPV were more persuaded by the loss-framed message. Implications of the findings for HPV vaccination messaging are discussed.

Keywords

message framing; HPV vaccine; perceived susceptibility

Genital human papillomavirus (HPV) is the most common sexually transmitted disease in the United States (Centers for Disease Control and Prevention [CDC], 2014). The CDC estimates that at least 50% of sexually active individuals will have genital HPV at some

point in their lives (CDC, 2014). HPV infections are the primary cause for genital warts and cervical cancer, as well as other types of cancers such as anal, penile, and oropharyngeal cancer (CDC, 2014). Two vaccines are currently available to combat HPV infections. One of the vaccines (Gardasil®) has been licensed for males and females ages 9 through 26 and the other (Cervarix®) licensed for females ages 9 through 26 (CDC, 2012). It is recommended that females ages 11 through 26 and males ages 11 through 21 be vaccinated against HPV (CDC, 2012). Parental consent is needed for vaccinating children under the age of 18.

Because vaccinating minors against HPV requires parental consent, it is important to understand how parents make decisions with regard to their children's vaccinations and how communication materials can be better crafted to enhance parents' intentions to vaccinate their children against HPV. To that end, this research seeks to examine the influence of message framing (i.e., whether the message is gain-framed or loss-framed) on parental acceptance of the HPV vaccine, and the role of perceived susceptibility (i.e., the extent to which parents perceive their children to be at risk of contracting HPV) in moderating message framing effects.

This study in particular focuses on the African American population, which is disproportionately affected by cervical cancer, a serious disease preventable by the HPV vaccine. African American women, compared to non-Hispanic White women, are over 30% more likely to develop cervical cancer and at least twice as likely to die from cervical cancer (Ries et al., 2008). As such, this research addresses not only a theoretical issue of importance for health communicators (i.e., message framing) but also an area of significant cancer-related health disparity.

Conceptual Background

Message Framing

In health messages, the possible outcomes of behavioral decisions may be presented in terms of gains or losses (Rothman & Salovey, 1997). Gain-framed messages highlight the advantages of complying with an advocated action (e.g., "If you have regular mammograms, you will increase your chances of detecting breast cancer at an early, more treatable stage."). In contrast, loss-framed messages emphasize the consequences of failing to comply with an advocated action (e.g., "If you don't have regular mammograms, you will reduce your chances of detecting breast cancer at an early, more treatable stage."). Scholars have argued that the subtle variation in the presentation of gain- vs. loss-framed messages can lead individuals to prefer different courses of action (Rothman & Salovey, 1997; Rothman, Bartels, Wlaschin, & Salovey, 2006).

The hypothesis, that the simple shifting of information can influence people's behavioral decisions, is motivated by the framing postulate of prospect theory (Tversky & Kahneman, 1981). Prospect theory posits that people seek risk or prefer a riskier option when presented with dilemmas framed as losses, but are risk-averse or prefer a less risky alternative when encountering dilemmas framed as gains (Tversky & Kahneman, 1981). From the tenets of prospect theory, researchers developed a heuristic to guide message framing research (Rothman & Salovey, 1997). Specifically, it has been suggested that loss-framed messages

are more persuasive when promoting detection behaviors as they may be perceived as risky given the potential of discovering some unpleasant health problems, and gain-framed messages are more persuasive when advocating prevention behaviors as they are mostly of low risk or safe (Rothman & Salovey, 1997; Rothman et al., 2006).

Message framing research relying on the detection-prevention dichotomy to predict the influence of gain vs. loss-framed messages has received empirical support in several studies (e.g., Banks, Salovey, Greener, Rothman, & Moyer et al., 1995; Cox & Cox, 2001; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999). However, meta-analyses by O’Keefe and Jensen (2006, 2007, 2009) provide limited support for the predictions.

It has been argued that the lack of support for the detection-prevention framing hypotheses might be due to researchers’ assumptions that people find detection behaviors to be risky and prevention behaviors to be rather safe (Bartels, Kelly, & Rothman, 2010; Gallagher, Updegraff, Rothman, & Sims, 2011). It has been suggested that people’s unique construals of the riskiness of behaviors should be considered in predicting framing effects (Bartels et al., 2010). Indeed, Rothman and colleagues have noted that the original conception of the detection-prevention dichotomy considered individual perceptions (Rothman & Salovey, 1997), and have stated that variability in how a given behavior is construed should alter the relative influence of gain- and loss-framed messages (Rothman & Updegraff, 2010). Several studies have taken unique individual perceptions into consideration, and results supported the conclusion that individual assessments of risk are key to predicting the influence of gain- vs. loss-framed messages (Gallagher et al., 2011; Rivers, Pizarro, Schneider, Pizarro, & Salovey, 2005; Rothman et al., 1999). More specifically, research has demonstrated that risk perceptions of detection and prevention behaviors vary and may depend on perceptions of susceptibility to a disease, anticipated outcome of a behavior, as well as perceived effectiveness of a recommended action (Bartels et al., 2010; Gallagher et al., 2011; Nan, Xie, & Madden, 2012).

Message Framing and Vaccination Behaviors

The influence of message framing in the context of vaccination has received only modest attention (O’Keefe & Nan, 2012). Early research hypothesized that vaccination is seen as a preventive measure, undertaken to avert the effects of an illness, and thus should be perceived as a less risky behavior. Following prospect theory, scholars predicted that gain-framed messages would be more effective when attempting to persuade people to get vaccinated (McCaul, Johnson, & Rothman, 2002). However, several recent studies indicate that loss-framed messages are more persuasive in the context of vaccination whenever a framing effect is detected (Abhyankar, O’Connor, & Lawton, 2008; Ferguson & Gallagher, 2007; Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008; Nan, 2012). Additional studies (Fahy & Desmond, 2010; Gerend & Shepherd, 2012; Lechuga, Swain, & Weinhardt, 2011a), along with a recent meta-analysis (O’Keefe & Nan, 2012), found loss-framed and gain-framed messages to be equally persuasive when attempting to persuade people to get vaccinated.

In the context of HPV vaccination, research has revealed that loss-framed messages tend to lead to greater intentions to get vaccinated, but results also indicate that the persuasive

advantage of loss-framed messages holds only under certain conditions (Gerend, Shepherd, & Monday, 2008; Nan, 2012). For example, when people were told that the vaccine involves a single dose, loss-frames were more persuasive, but gain- and loss-framed messages were equally influential when people believed that multiple doses are required (Gerend et al., 2008). Moreover, Hispanic and African American parents are more likely to intend to vaccinate their children following loss-framed messages (Lechuga et al., 2011a), however, gain and loss-framed messages seem to be equally persuasive for non-Hispanic white parents.

Taking into account individual beliefs that influence risk perceptions, such as beliefs about side effects and effectiveness of vaccination, as well as susceptibility to diseases, may help untangle or illuminate the influence of gain vs. loss-framed messages on intentions to get vaccinated in general and specifically to get vaccinated against HPV (Ferguson & Gallagher, 2007; Nan et al., 2012). Groups and members of the medical community warn about the possible side effects of vaccination, and people have cited concerns about safety as a reason for failing to vaccinate themselves and their children, even though serious adverse side effects due to vaccination are rare (Ball, Evans, & Bostrom, 1998; Freed, Clark, Butchart, Singer, & Davis, 2010). People who perceive vaccines to have dangerous side effects may perceive getting a vaccine to be risky and be more persuaded by loss-framed messages. Indeed, Ferguson and Gallagher (2007) reported that people who perceived vaccines to have dangerous side effects, and thus perceived vaccines as more risky, were more likely to be motivated to receive a flu vaccine when presented with a loss-framed message.

Others have offered that believing a vaccine is ineffective could increase perceived riskiness of receiving the vaccine (Nan et al., 2012). Individuals who fail to see vaccination as a behavior that prevents a disease may be more likely to focus on the potential risks of the behavior. Research has supported this contention. Older adults who perceived the H1N1 vaccine to be less effective were more likely to intend to get the vaccine when exposed to a loss-framed message (Nan et al., 2012).

Perceived susceptibility to vaccine-preventable diseases may also moderate the relative effects of gain- vs. loss-framed messages, although there has been much less research documenting such an influence. Survey research has indicated that parents' decision to vaccinate their child against HPV is in part dependent on perceptions of susceptibility, or the likelihood that their child will contract the virus (Brewer & Fazekas, 2007; Dempsey, Zimmet, Davis, & Koutsky, 2006), particularly for African American parents (Lechuga, Swain, & Weinhardt, 2011b). If parents believe their children are unlikely to contract the virus, they may ignore the benefits of vaccination while focusing on the negative effects of vaccination and perceiving the behavior to be risky. In contrast, if parents believe their children are likely to contract HPV, they may concentrate on the benefits of vaccination, and perceive the behavior to be less risky. Following prospect theory and past research related to risk perceptions, one might then expect perceptions of susceptibility to moderate the influence of gain- and loss-framed messages, such that when perceived susceptibility is low, parents will see vaccination as risky and be more likely to vaccinate their children following exposure to a loss-framed message. In contrast, when perceived susceptibility is high, parents will see vaccination as less risky, leading to a gain frame advantage.

With the above arguments, we propose the following hypotheses regarding the interaction between message framing and perceived susceptibility. We will assess African American parents' intentions to vaccinate their children following exposure to a gain- vs. loss-framed message in a "free of cost" context as well as a "with cost" context as past research has found cost to be a significant factor in parental vaccination decisions (Friedman & Sheppard, 2006; Manhart et al., 2011).

H1: When parents perceive their children to be at low risk of contracting HPV infections, a loss-framed (vs. gain-framed) message will induce greater intentions to vaccinate their children a) *free of cost* and b) *with cost*.

H2: When parents perceive their children to be at high risk of contracting HPV infections, a gain-framed (vs. loss-framed) message will induce greater intentions to vaccinate their children a) *free of cost* and b) *with cost*.

Method

Participants

Participants for this study were at least 18 years of age, identified their racial background as Black or African American, and were custodial parents of at least one child between the ages of 9 and 17 years old who had not yet received the HPV vaccine. A total of 193 eligible adults participated in this study. The sample was 73% female ($n = 141$) and 27% male ($n = 52$). Participants' ages ranged from 22 to 71 years old ($M = 36.20$, $SD = 9.19$). Education levels varied, with 2% having completed some levels of high school, 17% completing high school, 48% having some college courses, 32% completing college, and 11% having post-graduate education. The majority had health care coverage (80%), had heard of HPV (78%), and had heard about the HPV vaccine as a means of preventing cervical cancer (68%).

Procedures and Design

Participants were recruited by trained researchers at community outlets, such as shopping malls and Laundromats, located in the Maryland suburbs outside of Washington, DC. Eligible individuals were told that the purpose of the study was to evaluate educational materials about HPV vaccination and that their participation would be compensated with a \$25 gift card to a drug store. All participants gave informed consent. The study protocol was approved by an institutional review board.

Participants were given a booklet that contained pre- and post-test survey questionnaires and a pamphlet about HPV vaccination that was either gain-framed or loss-framed. The booklets were pre-shuffled so participants received the gain version or the loss version in a random order. After answering a few pre-test or baseline questions about HPV and the HPV vaccine, people proceeded to read one of two promotional bi-fold pamphlets about the HPV vaccine. After reading the pamphlet, participants answered questions about their intentions to vaccinate their children against HPV. After returning the survey, participants were thanked and compensated with the \$25 gift card. On average, the survey took approximately 20 minutes to complete.

Message Stimuli

The pamphlets contained a photographic montage of African American adult-child dyads along with four numbered content sections informing the reader about, in order, HPV, the HPV vaccine, reasons for vaccinating one's child, and contact information for the Centers for Disease Control and Prevention. All information was identical between the gain and loss versions except for in the third section, in which message frame was experimentally manipulated. The text in this section was exclusively bolded and inset in a highlighted border. While the graphics of the pamphlets were developed by the authors, the informational content was adapted from published materials available on the CDC's website. The framing manipulation entailed four bulleted reasons to vaccinate one's child against HPV. All reasons conveyed support for vaccination in a consistent gain- or loss-frame. In the gain-framed message, the advantages of vaccinating one's child against HPV were emphasized, whereas in the loss-framed message, the disadvantages of not vaccinating one's child against HPV were highlighted:¹

- “By *having/not having* your child receive the HPV vaccine, you make it much *less/more* likely for him/her to get genital HPV.
- By *vaccinating/not vaccinating* your daughter against HPV, you make it much *less/more* likely for her to develop cervical cancer, genital warts, and anal cancer.
- By *vaccinating/not vaccinating* your son against HPV, you make it much *less/more* likely for him to develop genital warts and anal cancer.
- By *having/not having* your child receive the HPV vaccine, you may *feel the peace of mind/increase worry* that comes with *doing the best/not doing the best* you can to protect his/her health.”

Measures

All measures were taken on a 1 to 5 scale, unless otherwise noted.

Perceived susceptibility—Prior to reading the pamphlet, people rated their agreement with three Likert items about the degree to which they believed their children were at risk of contracting HPV (e.g., “My child is at risk for getting HPV.”). The scale was reliable ($M = 2.95$, $SD = 0.92$, $\alpha = .72$).

Intentions toward HPV vaccination—Likelihood of vaccinating one's child was measured under two conditions: if the vaccine were to cost \$375 and if the vaccine were to be free of cost. For each condition, participants rated the likelihood of vaccinating their child on three items (e.g., “How likely would you be to have your child vaccinated against HPV sometime soon?”). Items were reliable for both cost ($M = 3.29$, $SD = 1.13$, $\alpha = .87$) and free ($M = 3.78$, $SD = 1.13$, $\alpha = .89$) conditions.

Control variables—Biological sex, age, education, and healthcare coverage served as socio-demographic controls. In addition, several cognitive and attitudinal variables that were

¹The pamphlets used in the experiment are available per request from the first author.

expected to affect vaccine-related decisions were also included as statistical covariates. They were each measured before exposure to the pamphlet. Specifically, *pre-existing attitude toward HPV vaccination* was assessed with three semantic differential items (“In your opinion, vaccinating boys and girls ages 9–17 against HPV would be: *bad* vs. *good*, *harmful* vs. *beneficial*, *foolish* vs. *wise*”) ($M = 3.80$, $SD = 1.09$, $\alpha = .96$). *Perceived severity of cervical cancer* was assessed with three Likert items about the degree to which cervical cancer is hazardous to a person’s health (e.g., “Cervical cancer is a serious health problem.”).² The scale was reliable ($M = 4.19$, $SD = 0.89$, $\alpha = .76$). *Perceived effectiveness of the HPV vaccine* was assessed with three Likert items about the degree to which the HPV vaccine prevents HPV (e.g., “The HPV vaccine works in preventing HPV.”). The scale was reliable ($M = 3.58$, $SD = 0.71$, $\alpha = .72$). *Perceived safety of the HPV vaccine* was assessed with three Likert items about the degree to which the HPV vaccine causes negative outcomes (e.g., “The HPV vaccine may negatively affect my child’s body.”). The scale was reliable ($M = 3.38$, $SD = 0.77$, $\alpha = .80$). Correlations among key variables are presented in Table 1.

Results

Hypothesis Testing

To test the hypotheses,³ two hierarchical multiple regression analyses were conducted, with intentions to vaccinate one’s child under two conditions (*free of cost* and *with cost*) as dependent variables. The regression models had a similar 4-block structure. The first block contained socio-demographic control variables, including sex, age, education, and healthcare coverage. The second block included pre-exposure attitudinal and cognitive control variables, including pre-exposure attitudes toward HPV vaccination, perceived severity of cervical cancer, perceived effectiveness of the HPV vaccine, and perceived safety of the HPV vaccine. The predictors of main interest to this research – message framing and perceived susceptibility to HPV infection – were entered into the third block. The final and fourth block contained a two-way interaction term – the product of framing and perceived susceptibility. To reduce multicollinearity, the component variables were mean-centered and the interaction term was formed based on the centered scores. Diagnostic analysis revealed no multicollinearity problems in the regression models.

Results of the regression analyses are summarized in Table 2. The predictors as a whole explained 32.7% of variance in intentions to vaccinate free of cost and 27.9% of variance in intentions to vaccinate with cost. Several control variables emerged as significant predictors of intentions. Females had stronger intentions to vaccinate their children against HPV than

²Although cervical cancer is a common complication associated with HPV infections, other types of cancer (e.g., anal, penile) have been found to be associated with HPV infections. It may be important for future research to assess perceived severity of the other types of cancer as well, particularly when studying parents who had male children who hadn’t been vaccinated.

³Prior to hypothesis testing, we conducted a randomization check. Independent-samples *t*-tests and Chi-Square tests were conducted. There was no difference between the gain and loss conditions in terms of age ($t = .601$, $p = .549$) and education ($t = .581$, $p = .562$). The two conditions were also similar in terms of the distributions of sex ($\chi^2 = 2.492$, $p = .144$) and healthcare coverage ($\chi^2 = .158$, $p = .720$). No significant differences in perceived susceptibility, perceived severity, perceived effectiveness, and perceived safety were found between the two framing conditions (all $ps > .200$). Pre-exposure attitudes toward HPV vaccination were somewhat more positive in the gain condition ($M = 3.93$, $SD = 1.06$) than the loss condition ($M = 3.67$, $SD = 1.11$), and this difference approached significance ($p = .096$). Including pre-exposure attitudes as a control variable was expected to alleviate this problem.

males, but only when the vaccine was not free ($\beta = .142, p = .031$). More educated parents had greater intentions to vaccinate their children, but only when the vaccine was not free ($\beta = .145, p = .035$). Having healthcare coverage was associated with *less* intention to vaccinate under both cost and no cost conditions (free of cost: $\beta = .161, p = .015$; with cost: $\beta = .142, p = .038$). Among the attitudinal and cognitive control variables, pre-exposure attitudes emerged as a strong predictor of both types of intentions (free of cost: $\beta = .324, p < .001$; with cost: $\beta = .286, p < .001$). Greater perceived effectiveness of the HPV vaccine predicted stronger intentions to vaccinate under both cost and no cost conditions (free of cost: $\beta = .263, p < .001$; with cost: $\beta = .192, p = .009$). Greater concerns about vaccine safety were associated with less intention to vaccinate, particularly when the vaccine was not free (free of cost: $\beta = -.122, p = .062$; with cost: $\beta = -.295, p < .001$).

The predictors of main interest to this research were message framing and perceived susceptibility to HPV infection. Neither variable alone was a significant predictor of intentions to vaccinate. However, the interaction between message framing and perceived susceptibility emerged as a significant predictor of intentions to vaccinate under the cost condition ($\beta = -.183, p = .005$), but not under the no cost condition.

The interaction between message framing and perceived susceptibility was further probed to see if the pattern was as hypothesized. We performed the Johnson-Neyman (J-N) analysis through Hayes and Matthes' (2009) SPSS macro to interpret the interaction. The J-N analysis mathematically derives the point or points along the continuum of the moderator where the effect of the predictor transitions between statistically significant and nonsignificant, thus providing rich information about how the moderator affects the relationship between the predictor variable and the criterion variable. In the current analysis, the predictor variable was message framing. The moderator was perceived susceptibility. The criterion variable was intentions to vaccinate with cost. With all control variables held constant, the J-N analysis revealed two critical points of transition: -1.553 (1.69 *SD* below the mean, $b = .563, p = .05$) and $.370$ ($.40$ *SD* above the mean, $b = -.302, p = .05$). The results suggested that when perceived susceptibility was rather low (1.69 *SD* below the mean), the loss-framed message resulted in significantly greater intentions to vaccinate than the gain-framed message, whereas when perceived susceptibility was high ($.40$ *SD* above the mean), the gain-framed message led to significantly greater intentions to vaccinate than the loss-framed message. See Figure 1 for a visualization of the detected interaction. Overall, H1a and H2a were not supported. H1b and H2b were supported.

Discussion

This research attempted to identify maximally persuasive communication messages promoting the HPV vaccine among African American custodial parents of vaccine-eligible children. Specifically, it examined the interaction effect of message framing (gain vs. loss) and perceived susceptibility (i.e., perceived likelihood that one's child is at risk of contracting HPV) on parents' intentions to vaccinate their children. Focusing on the African American population, which suffers from disproportionately high incidence and mortality rates of cervical cancer, this research also addressed an important area of health disparity.

Results of an experiment, in which African American parents received either a gain-framed or loss-framed pamphlet about the HPV vaccine, suggested that message framing interacted with perceived susceptibility to influence intentions to vaccinate children when parents were to required to pay for the vaccine. Interestingly, the interaction did not hold when the vaccine was offered free of cost.

The specific pattern of interaction in the “with cost” condition indicated that parents who perceived their children to be at high risk of contracting HPV were more persuaded by the gain-framed message, whereas those who believed their children to be at low risk of contracting HPV were more persuaded by the loss-framed message. These results may be understood in light of the framing postulate of prospect theory, which suggests that a loss frame should have a persuasive advantage when the promoted behavior is perceived as risky whereas a gain frame should be more effective when the advocated behavior is perceived as of low risk (Rothman et al., 2006). Whether or not parents believe their children are at risk of contracting HPV may determine how they view or construe HPV vaccination as a health behavior. Specifically, HPV vaccination may be seen as risky given the possible side effects if parents believe their children are unlikely to get HPV and therefore see no benefits in getting the vaccine. On the other hand, HPV vaccination may be seen as relatively harmless if parents believe their children are likely to get HPV and therefore see considerable benefits in getting the vaccine.

Some previous studies (e.g., Gallagher et al., 2011; Maheswaran & Meyers-Levy, 1990) found that loss-framed messages were more effective when perceived susceptibility was high whereas gain-framed messages were more persuasive when perceived susceptibility was low. On the surface, these findings may be seen as inconsistent with our results. It is important to note, however, that both previous studies examined a detection behavior. The risk associated with a detection behavior is mainly the unpleasantness associated with finding a serious health problem (Rothman & Salovey, 1997). Perceived risk of a detection behavior should increase rather than decrease when perceived susceptibility is high, because perceived likelihood of finding some unpleasant health problems should increase as perceived susceptibility increases. Collectively, therefore, the current study and previous research provide support for the predicted role of risk perception in moderating framing effects.

Interestingly, the expected interaction between message framing and perceived susceptibility was found when the vaccine cost \$375, but was not found when the vaccine was offered free of cost. Past research has demonstrated that cost is a significant barrier to HPV vaccination (Friedman & Sheppard, 2006; Manhart et al., 2011). It may be that when the vaccine was offered free of cost, parents were much more inclined to choosing vaccinating their children, perhaps leading to some type of ceiling effect. Indeed, our data suggested that intentions to vaccinate under the no cost condition ($M = 3.78$) were significantly higher than intentions under the cost condition ($M = 3.27, p < .001$). In fact, cost has often emerged as a moderator of message effects in studies on HPV vaccination (e.g., Nan, Dahlstrom, Richards, & Rangarajan, in press; Nan, 2012). It should be noted, of course, that most insurance plans will likely cover the cost if the HPV vaccine is given according to national guidelines. However, it is unclear if all plans will cover the cost and, if so, by how much. Therefore,

although costs might not be a significant concern for many parents, some parents could still face making a decision for their children with financial constraints present.

In addition to the above key findings, this study also offered some insights into the role of several socio-demographic and cognitive and attitudinal variables in predicting acceptance of HPV vaccination among the participants. Females and the more educated indicated stronger intentions to vaccinate their children against HPV, although these differences only emerged when parents had to pay for the vaccine. Past studies have found similar connections between gender, education, and HPV vaccination, reporting that females and more educated parents tend to have more knowledge about the HPV vaccine and are more likely to initiate vaccination for their children (Hughes et al., 2009; Reiter, Brewer, Gottlieb, McRee, & Smith, 2009). Surprisingly, having healthcare coverage was associated with less intention to vaccinate under both cost and no cost conditions. It seems likely that those who have healthcare coverage, but still have not vaccinated their children against HPV may harbor other concerns about getting this vaccine.

In terms of attitudinal and cognitive predictors, pre-existing attitudes toward HPV vaccination were a strong, positive predictor of intentions to vaccinate one's child under both cost and no cost conditions. Consistent with previous research (Nan et al., 2012), greater perceived vaccine effectiveness was associated with stronger intentions and greater safety concerns were negatively associated with intentions. It should be noted that the independent effects of the attitudinal and cognitive predictors combined uniquely explained a significant portion of variance in the dependent variables (free of cost: 31.3%; with cost: 24.8%). In comparison, the interaction between perceived susceptibility and framing uniquely explained 3.1% of the variance in one of the dependent variables (with cost). Thus, the importance of the attitudinal and cognitive predictors, especially perceived effectiveness and perceived safety, cannot be understated.

This study had a few limitations that need to be acknowledged. First, although efforts were undertaken to gather a diverse sample of African American parents, a convenience sampling approach was used. While a variety of people presumably visit community outlets such as Laundromats and shopping malls, the sample was not representative of all African American parents. Additionally, participants were only those that consented to participate after being recruited by a researcher. It is possible that some parents declined participation despite meeting eligibility requirements, but these people were not represented in the sample. Second, print materials were used to carry the health messages. It is unclear if the same results would be obtained should communication materials in other modalities (e.g., video) be used. Third, the dependent variable of intentions toward vaccinating one's child against HPV was assessed immediately after exposure to the health message. It is unknown how long-lasting the framing effects might be and whether these results translate into actual vaccination behaviors. Finally, some of the measures we used had relatively low reliability (e.g., perceived susceptibility at .72). Future studies may seek to identify and use relevant scales with greater internal consistency.

Despite the limitations, the results of this study carry some practical implications for messaging related to HPV vaccination, especially when targeting African American parents.

Past research has demonstrated that cost is a significant barrier to HPV vaccination (Friedman & Sheppard, 2006; Manhart et al., 2011), and our results show that when parents face incurring the cost of vaccinating their child, the framing of messages may be particularly relevant in their decision-making such that loss-framed messages are likely to be more persuasive for those who perceive their children to be at low risk of contracting HPV, and gain-framed messages are likely to be more persuasive for parents who believe their children to be at high risk of contracting HPV. These results should suggest to health communication professionals that differentially framed messages be created and distributed to parents based on perceptions of susceptibility. This strategy may be particularly important for African American parents, who are more likely to base their decisions on perceptions of susceptibility (Lechuga et al., 2011b). It should be noted, of course, that implementing this strategy in reality may prove challenging. In order to match the level of perceived susceptibility with a specific frame, health professionals would have to first assess parental perceptions of susceptibility either on an individual basis or at a population level. Significant resources may be needed to initially determine perceived susceptibility held by the target audience. With the advance of the Web 2.0 technology, however, one may consider implementing an online screening portal on a larger platform of health information system to collect visitors' initial risk perceptions before presenting them with tailored HPV vaccination information.

Our findings also revealed that African American parents' perceptions of the perceived effectiveness of the vaccine were associated with stronger intentions to vaccinate. Moreover, those who were concerned about the safety of the vaccine were less likely to vaccinate their children. These results indicate that when creating messages related to the HPV vaccine for African American parents, communication professionals should consider increasing perceptions of the effectiveness and safety of the HPV vaccine. Current government communications about HPV vaccination, including the official CDC materials we used as a basis for our experimental message stimuli, often neglect to make a convincing case that the HPV vaccines are safety *and* effective. In contrast, lengthy information about the risks and possible side effects are typically included in these materials, perhaps as a way of facilitating informed decision-making. It seems important, according to the results of our study, to also inform the public that the HPV vaccine is highly effective in preventing HPV infections and do so in an engaging way (e.g., through not only statistics but also personal narratives).

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Figure 1. Interaction effect of message framing and perceived susceptibility on intentions to vaccinate one's child against HPV (with cost)

Table 1

Correlations among key variables

	1	2	3	4	5	6
Pre-existing attitude (1)						
Perceived susceptibility (2)	.265***					
Perceived severity (3)	.237**	.208**				
Perceived effectiveness (4)	.325***	.366***	.346***			
Perceived safety (5)	-.0127	0.125	.239**	0.116		
Intention-cost (6)	.396***	.144*	0.125	.305***	-.248**	
Intention-free (7)	.461***	.282***	.232**	.435***	-.0104	.619***

Note.

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 2

Predictors of intentions to vaccinate one's child against HPV

	Intentions (free of cost)	<i>p</i> -value	Intentions (with cost)	<i>p</i> -value
Sex	.097	.126	.142 *	.031
Age	−.082	.191	.061	.345
Education	.039	.557	.145 *	.035
Healthcare coverage	.161 *	.015	.142 *	.038
<i>R</i> ²	.042 ^	.085	.038	.119
Pre-exposure attitudes	.324 ***	.000	.286 ***	.000
Perceived severity	.115 ^	.095	.043	.549
Perceived effectiveness	.263 ***	.000	.192 **	.009
Perceived safety	−.122 ^	.062	−.295 ***	.000
<i>R</i> ²	.313 ***	.000	.248 ***	.000
Message framing	.009	.886	−.060	.345
Perceived susceptibility	.076	.258	−.005	.938
<i>R</i> ²	.007	.397	.004	.593
Framing X Perceived susceptibility	−.069	.269	−.183 **	.005
<i>R</i> ²	.004	.269	.031 **	.005
Total <i>R</i> ²	.366 ***	.000	.321 ***	.000
Adjusted <i>R</i> ²	.327 ***	.000	.279 ***	.000

Note. Numbers are standardized regression coefficients; Sex: male=1, female=2; Age: higher scores indicate older ages; Education: higher scores indicate higher education; Healthcare coverage: yes=1, no=2; Perceived severity: higher scores indicate higher perceived severity; Perceived effectiveness: higher scores indicate higher perceived effectiveness; Perceived safety: higher scores indicate higher concerns for safety; Framing: gain=1, loss=2; Perceived susceptibility: higher scores indicate higher perceived susceptibility;

^
p < .10,

*
p < .05,

**
p < .01,

p < .001.