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The Power of a Story: How Emotions and Numeracy Affect Parental Decisions About the Human Papillomavirus Vaccine

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THE POWER OF A STORY: HOW EMOTIONS AND NUMERACY AFFECT PARENTAL DECISIONS ABOUT THE HUMAN PAPILLOMAVIRUS VACCINE

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Abstract

The Human Papillomavirus (HPV) is the most common sexually transmitted infection (CDC, 2021). There are two strains of HPV known for causing cervical, penile, anal, vaginal, and oropharynx (throat) cancers (CDC, 2020). A vaccine is available to prevent these cancer-causing strains of HPV for individuals between the ages of 9-45. Unfortunately, vaccination uptake and completion rates are below the recommended rates to achieve herd immunity. A primary barrier to vaccination is concern about potential adverse events following vaccination. The purpose of the present study is to examine the influence of anecdotal versus statistical information on parents' intentions to vaccinate their children against HPV. Participants (N = 206) were randomly assigned to one of three conditions: 1) read only statistical information about the likelihood of an adverse event after vaccination, 2) statistical information and mostly negative anecdotes about adverse events, or 3) statistical information and mostly positive anecdotes about the benefits of vaccination. The primary outcome measure was behavioral intentions to vaccinate. In addition, risk as feelings were assessed as mediators of association and numeracy was assessed as a moderator of associations. Results indicated that individuals who read negative anecdotes along with statistical information reported less likelihood to vaccinate their child, less reassurance about the benefits of the vaccine, and more worry and uncertainty about the vaccine side effects. Mediation models were tested to examine the possible impact of feelings (i.e., worry, uncertainty, reassurance, and regret) on behavioral intentions. Worry had a mediating effect on the relationship between type of information and behavioral intentions to vaccinate. Overall, the results of this study indicate that negative anecdotes weigh more heavily in decision-making on the HPV vaccine than supported by statistical evidence, and these anecdotes elicit negative feelings (i.e., worry) which are impacting intentions to vaccinate.

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1.1 OVERVIEW

About 13 million men and women contract the Human Papillomavirus (HPV) each year, greatly increasing their chances of developing cervical cancer, anal cancer, oropharynx (throat) cancer, as well as genital warts (CDC, 2021). Several vaccines have been developed to address this growing public health problem. Despite the safety of these vaccines, only 16% of adolescents in the United States are fully vaccinated against HPV before the age of thirteen (Bednarczyk, Ellginson, & Omer, 2019). Parents who have unvaccinated children for whom the vaccine is recommended often cite fear of adverse effects following vaccination including serious adverse outcomes such as seizures or death as reasons for not vaccinating. Fears of adverse events are often derived from exposure to anecdotes describing personal adverse reactions to the HPV vaccines. The current study examines one factor that influences perceived risk of adverse events of the HPV vaccine: the type of information received. In particular, the proposed study examines the relative importance of anecdotal information (e.g., personal web-postings) and statistical information (e.g., base rates of adverse events) when evaluating the risk of adverse events following vaccination. The study attempts to answer the following question: "What is the influence of exposure to anecdotes describing adverse side effects of the HPV vaccine on how individuals perceive the risk of receiving the vaccine, compared to base rate information that states that the risk of having an adverse side effect of the HPV vaccine is minimal?"

This paper includes a review of several topics that may affect an individual's perception of risk and behavioral intentions regarding the HPV vaccine. A brief background on the Human Papillomavirus and the HPV vaccine is provided. The accessibility and availability of HPV

vaccine information online is also discussed. In order to better understand how individuals process health information, an understanding in risk communication, media influence, and numeracy is needed. This paper addresses these topics and reviews prior research that has examined anecdotal versus statistical evidence in communicating health topics.

Findings of the proposed study can shed light on the influence anecdotal information has on a parent's decision to vaccinate their child against HPV and help inform information communication campaigns to promote HPV vaccination. Effective promotion of the HPV vaccination should lead to vaccination uptake in adolescents and may ultimately lower the rates of cancer associated with HPV. Providing information about the HPV vaccine that confronts bias and utilizes the powerful effects of anecdotes can have a lasting impact on health outcomes for future generations.

1.2 HUMAN PAPILLOMAVIRUS

The Human Papillomavirus (HPV) is the most common sexually transmitted infection (STI). Sexually active individuals are highly likely to be infected with HPV virus during their lifetime (CDC, 2021). There are more than 200 strains associated with HPV that can be categorized as either low-risk or high-risk (National Cancer Institute, 2021). The low-risk strains of HPV do not lead to disease or other serious complications. Genital warts may develop on individuals with low-risk versions of HPV. High-risk strains of HPV can be cancer-causing. There are fourteen strains of HPV that are considered high-risk, and of these, two of the strains (HPV-16 and HPV-18) are known for producing most forms of HPV-related cancers (National Cancer Institute, 2021).

An examination of cancer tissue in population-based data revealed that approximately 34,800 diagnoses of cancer attributable to HPV occur each year (CDC, 2020). Cancers that can be attributed to HPV include over 90% of anal and cervical cancers, approximately 70% of vaginal cancers, and over 60% of penile cancers. Approximately 70% of oropharynx (throat) cancers are related to HPV (CDC, 2020).

The annual direct medical cost of treating and preventing HPV in 2010 was an estimated eight billion dollars (Chessona, Ekwueme, Saraiya, Watson, Lowy, & Markowitz, 2012). The burden of treating HPV is costly because several strains of HPV are associated with cancer. The burden caused by HPV associated cancer is most notable in women. In the United States, cervical cancer is the fourth most common cancer for women between 15-44 years old (ICO/IARC Information Center on HPV and Cancer, 2021). Latina and black women are disproportionately impacted from cervical cancer incidence compared to white women. Increased rates of cancer also occur in particular groups of men. For example, men who have sex with other men are seventeen times more likely to be diagnosed with anal cancer (CDC, 2014).

1.3 HUMAN PAPILLOMAVIRUS VACCINE

A vaccine is available to prevent the main cancer-causing strains of HPV. The Federal Drug Administration (FDA) approved three vaccines: Gardasil, Gardasil-9, and Cervarix. These vaccines prevent the high-risk strains of HPV that cause the majority of cervical cancers. Additionally, Gardasil and Gardasil-9 further protect against an even higher percentage of other HPV-associated cancers including throat cancer. Gardasil-9 is the only vaccine that prevents HPV strains that cause up to 90% of genital warts. The Advisory Committee on Immunization Practices (ACIP) recommends that the vaccine be administered in two doses, 6-12 months apart,

to individuals between 9 to 14 years old. For individuals who are aged 15-45 or who are considered immunocompromised, three doses of the vaccine are administered. The second dose is given 1-2 months after the first dose. The third dose is given 6 months after the first dose (CDC, 2020). The CDC (2021) recommends administering the HPV vaccine to children before they become sexually active. By vaccinating at an early age, the chance of becoming infected with high-risk HPV decreases substantially. As age increases, the likelihood of individuals receiving the HPV vaccine decreases (Fontenot, Fantasia, Charyk, & Sutherland, 2014).

The Centers for Disease Control and Prevention (CDC) recommend that all females and males aged 9-26 receive the vaccine. Currently, only four jurisdictions (District of Columbia, Puerto Rico, Rhode Island, and Virginia) have passed legislation that mandates that children be vaccinated (National Conference of State Legislatures, 2020). Because the vaccine is recommended for children as young as 9, parents are the primary decision makers. The safety of the HPV vaccine is monitored by both the FDA and CDC through three safety systems. One safety system is the Vaccine Adverse Event Reporting System (VAERS) (CDC, 2020). Adverse reactions or symptoms related to vaccines are reported to VAERS by vaccine manufacturers (37%), health care providers (36%), state immunization programs (10%), vaccine recipients or their guardians (7%), and other sources (10%; VAERS, 2017), and these reports provide early warnings of potential issues with safety. The second safety system is the Vaccine Safety Datalink (VSD). This safety system gathers electronic health data related to vaccinations (e.g., dosage, illnesses, and emergency room visits) from nine health care organizations across the United States (U.S.). Studies are conducted using this information to further explore vaccination safety and address concerns reported via the first safety system, VAERS (CDC, 2020). The third safety system is the Clinical Immunization Safety Assessment (CISA) Project. The CISA conducts

clinical research on the risks associated with the HPV vaccine in various groups of individuals in a partnership between the CDC and medical centers throughout the U.S.

The CDC has published several reports using data provided by the three safety systems. According to reports, the HPV vaccine is a well-tolerated and safe vaccination (CDC, 2021). A study was conducted from December 2014 to December 2017 in which 28 million doses of the HPV vaccine were administered (Shimabukuro et al., 2019). Of those individuals who were administered the vaccine, 186 participants reported adverse reactions such as Guillain-Barre syndrome, appendicitis, or stroke up to two years after receiving the HPV vaccine. According to this study, about 7 adverse reactions were documented per one million doses given (i.e., 0.0007%) of the HPV vaccine. The CDC also reported that no deaths had been linked to the HPV vaccine. Based on these reports and the anticipated benefits of the vaccination, a strong case for vaccinating all children and young adults can be made.

1.4 BARRIERS TO HPV VACCINATION

It is recommended that the Human Papillomavirus (HPV) vaccine be administered before an individual becomes sexually active (CDC, 2022). By the age of 15 years old, approximately 20% of males and females have had sexual intercourse. This percentage increases to 50% by the time adolescents turn 17 (Martinez & Abma, 2020). Although adolescents may be choosing to engage in sexual activity, the decision to be vaccinated against HPV is left to their parents or guardians. A number of factors have been identified that may influence a parent's decision to vaccinate their child.

The socio-economic status, education level, knowledge of the virus/vaccine, social influence, access to healthcare, and attitudes/beliefs/exposure/experience with sex, HPV, and

vaccines can all impact a parent's decision to vaccinate. Individuals who are male, black, older, or from rural communities are less likely to initiate vaccination (Kurani et. al, 2022). Men are less likely to receive the HPV vaccine than women. Men who have not seen a health care provider within the last year are less likely to receive the HPV vaccine (Thompson, Rosen, & Maness, 2019). Women whose highest level of education is a high school degree or equivalent are less likely to be vaccinated compared to women with some college education. In addition, women who are fluent in English have nearly three times the odds of being vaccinated against HPV compared to women who reported not being fluent in English (Thompson et. al, 2019).

Other factors operating at individual and structural level influence vaccination decisions including attitudes and beliefs toward healthcare, religious beliefs, and influence of important individuals and the media. Three of the top reported reasons why parents do not vaccinate their children against HPV are perceived lack of necessity, lack of knowledge about HPV and the vaccine, and lack of healthcare provider recommendation. Although the proportion of non-Latino white parents do not believe the HPV vaccine will promote sexual activity (less than 2%), approximately 21% of non-Latino white parents with female children and 24% of parents with male children report they do not think the HPV vaccine was necessary for their child in 2010 (Beavis et. al, 2018). In addition, parental perception that their child is not sexually active was also reported as a reason for not vaccinating their child. Research is undergoing to understand whether the lack of perceived necessity and/or the lack of awareness of their child's sexual activity are factors driven by a lack of communication with their child or a lack of knowledge about HPV, HPV-related cancer, and the HPV vaccine.

Approximately 23% of parents with female children report concerns about the vaccine's safety and side effects as a major factor for not vaccinating their daughter (Beavis et. al, 2018).

However, parents often wait for their healthcare provider to recommend the vaccine before beginning the conversation about its safety. About 17% of parents reported the lack of physician recommendation as a reason for not vaccinating their child (Beavis et. al, 2018).

A vast majority of past research has been informed by two health behavior change frameworks that indicate that beliefs about the attributes of the vaccine, vaccination barriers, and the opinion of important others are factors that are associated with the likelihood that an individual will enact a health behavior (Kirscht, 1974; Ajzen, 1991). The health belief model (HBM) and the theory of planned behavior (TPB) are the most commonly used theoretical models in parental vaccination acceptance research. Research suggests that HPV vaccine interventions that are based on these theoretical frameworks have better odds of motivating vaccine uptake and completion (Cotache-Condor, Peterson, & Asare, 2022). According to a recent systematic review, the following constructs of the HBM are significant predictors of HPV vaccine decisions: perceived vaccination barriers, perceived benefits of vaccination such as perceived effectiveness, perceived severity of contracting cancer, perceived knowledge of HPV and the HPV vaccine, and cues to action such as a provider's recommendation (Sacca, Doumat, Rihan, Maroun, & Ejezie, 2023). In addition, perceived susceptibility of being diagnosed with cancer and self-efficacy to vaccinate are related to vaccine uptake. A systematic review comparing the constructs of these prominent theories indicates that the TPB is better suited to inform health messaging interventions aimed at promoting the HPV vaccine. Subjective norms in the form of perceptions of what important others think about the HPV vaccine, self-efficacy to vaccinate, and vaccine cost are primary predictors of vaccine behavior (Sacca et al., 2023). The inclusion of the HBM and TPB in the present study is meant to support and expand on prior research.

1.5 ONLINE ACCESS TO HPV INFORMATION

An increase in the number of news reports about the Human Papillomavirus (HPV) and the HPV vaccine has led to greater awareness about the disease among adults. However, health researchers have expressed concerns about how HPV and the HPV vaccine are being presented by the media (Kelly, Leader, Mittermaier, Hornik, & Cappella, 2009). Negative information about the safety of the HPV vaccine was more likely to be found in political blogs (16%) or blogs posted by news outlets (12.5%) than in blogs created in health websites (5.3%) or in blogs associated with science websites (5.3%; Daily, Nan, & Briones, 2015). Additionally, the majority of news stories regarding HPV leave out important information such as that women should continue getting cervical exams after receiving the HPV vaccine (Kelly et al., 2009). Despite the low likelihood of experiencing serious reactions to the HPV vaccine and the high likelihood of preventing multiple cancers, many individuals choose not to be vaccinated or chose not to vaccinate their children (Beavis et. al, 2018). One explanation for this vaccination hesitancy is the seemingly contradictory safety information that is available online regarding the HPV vaccine (Ortiz, Smith, & Coyne-Beasley, 2019).

Health information is now easily accessed by individuals online. Many websites provide health related information such as websites with self-diagnostic tools or symptom checkers (e.g., WebMD, Mayo Clinic), websites with health information provided by the government (e.g., the Food and Drug Administration), websites created by health agencies to promote knowledge on health topics (e.g., National Institute of Health), and websites with forums where the discussion of health related issues takes place (e.g., ehealthforum.com). The increase in information may lead to greater awareness of health issues, but the available information may not increase individuals' understanding of the information.

A national phone survey of 3,001 adults revealed that 80% of participants look for health information online (Pew Research Center, 2011). The availability of health information has increased because public access to the internet has increased. WebMD, a public website that publishes health information globally, recorded about 127 million unique users on its site during the first quarter of 2020 (Similarweb, 2021). The increased access and use of online health information make it difficult for individuals to identify what they deem to be relevant when analyzing the costs and benefits associated with a health behavior.

Approximately 71% of young adults begin their search for health information with an online search engine (i.e., Google, Bing, or Yahoo; Stankova, Mihova, Andonov, & Datchev, 2020), and 72% of the health information seekers visit two or more websites during their search (Pew Research Center, 2006). Approximately 25% of health information seekers reported feeling overwhelmed by the amount of information found online (Pew Research Center, 2006). Despite feeling overwhelmed, 53% of adults stated that the health information they found online impacted their health-related decisions (Pew Research Center, 2006). Importantly, 75% of adults said they do not consistently check the source and date of the information they access (Pew Research Center, 2006). Unverified sources and undetermined publishing dates may lead online health information seekers to rely on outdated, biased, or inaccurate information. The lack of verifiable or reliable information online is increasingly important as online searches for immunization information increase (Osazuwa-Peters, Rohde, & Boakye, 2021).

The internet appears to be the preferred method among lay persons for obtaining information on HPV (Hughes, Cates, Liddon, Smith, Gottlieb, & Brewer, 2009). A study conducted by Madden, Nan, Briones, and Waks (2012) explored the types of websites that publish information about the HPV vaccine. An analysis of 89 websites revealed that information

about the HPV vaccine was found most frequently in websites created by academic or other nonprofit organizations (34.8%). HPV vaccine information was found the second most frequently in government agency websites (24.7%). The remaining websites with HPV vaccine information included pharmaceutical companies (15.7%), news organizations (12.4%), consumer generated (5.6%), encyclopedic medical websites (3.4%), professional organizations (2.2%), and a medical center (1.1%; Madden et al., 2012). The tone of the HPV information for each website was also analyzed. Approximately 53.7% of the information presented on the websites reflected a neutral tone. The information neither supported nor opposed the HPV vaccine (Madden et al., 2012). The websites in the study contained mostly expert information from academic or government sources. However, the use of particular search terms when conducting an online search can drastically change the results obtained (Madden et al., 2012).

1.6 RISK PERCEPTION AND HEALTH DECISION-MAKING

Risk perceptions feature prominently in health behavior change theories. Risk perception is defined as an individual's estimate of the likelihood that he or she will contract a disease. Theories of health behavior posit that an individual's perception of the probability of contracting an illness influences whether the individual will choose to enact a behavior that will protect against contracting that disease (Weinstein, Sandman, and Blalock, 2008). Other types of perceived risks that influence behavior are the perceived negative consequences that engaging or failing to engage in a behavior can bring. For example, health campaigns often educate individuals about the negative health consequences or health risks associated with specific behaviors such as intoxicated driving or failure to get vaccinated against contagious diseases in hopes of influencing behavior.

Information about risk is often communicated to the public in advertisements of the benefits of treatments for various diseases as absolute or relative risk. Absolute risk refers to the probability of contracting an illness (Andrade, 2015). Absolute risk is often conveyed as a percentage or as the number of persons in a population. For example, a patient may be told that women between 20-24 years old have a 19% lifetime chance of becoming infected with at least one of the main cancer causing or genital warts causing types (types 16, 18, 6, or 11) of the Human Papillomavirus (HPV; Markowitz, Liu, Hariri, Steinau, Dunne, & Unger, 2016). Thus, approximately 190 out of 1,000 women would become infected with HPV. Relative risk refers to the risk of contracting an illness when different groups of people are compared. In the case of the HPV vaccine, the absolute risk of contracting HPV is 0.2% Thus if 1,000 women between 20-24 years old received the HPV vaccine, then only about 2 HPV infections would occur (De Vicenzo, Conte, Ricci, Scambia, & Capelli, 2014). In this case, approximately 18.8% fewer women will be infected with high-risk HPV if they receive the vaccine.

Although absolute risk can be an important consideration when making health related decisions, many physicians present treatment outcomes to their patients in terms of relative risk (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). Relative risk compares the likelihood of the adverse outcome occurring in one target population with the likelihood of the adverse outcome occurring in a second target population (Andrade, 2015). For example, a patient may be told that women between 20-24 years old have a 19% lifetime chance of becoming infected with at least one of the main cancer-causing types of the Human Papillomavirus (HPV; Markowitz et al., 2016). The patient can also be told that they are about 95 times (i.e., nineteen percent divided by two-tenths of a percent) more likely to become infected with HPV if they do not receive the vaccine. Research shows that the way risk information is communicated influences risk

perception and in turn health decision-making. Following from the example above, the individual will be more persuaded to receive the vaccine if they were told they are 95 times more likely to become infected with HPV if they do not receive the vaccine compared to being told that their absolute risk of being infected with HPV decreases 18.8% if they receive the vaccine (Malenka et al., 1993). Thus, individuals are susceptible to cognitive biases when interpreting information that conveys risk.

1.7 RISK PERCEPTION AND COGNITIVE BIASES

Research suggests that risk perceptions are subject to several biases which impact how individuals perceive risk. How frequently individuals encounter the risk, whether the risk occurs locally (e.g., flu outbreak in their city or neighborhood) or globally (e.g., flu outbreak in another country), and the severity of the adverse outcomes associated with the risk can affect how risky and therefore relevant the threat is perceived to be (Uzzell, 2000; De Dominicis et al., 2015).

Primary and Secondary Bias. The repeated appearance of risk information may inflate risk perception when minimal risk is present. Individuals often underestimate the frequency of common causes of death but overestimate the frequency of rare causes of death. This bias is known as "primary bias" (Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978). For example, according to statistical data, no deaths have been linked to the Human Papillomavirus (HPV) vaccine (CDC, 2020). If individuals read anecdotal reports claiming the HPV vaccine is responsible for the death of a child, they may perceive a high frequency of deaths being caused by the Human papillomavirus vaccine. Unfortunately, these types of anecdotal reports are often shared by parents across social media as a warning, and these posts often go 'viral' (i.e., widely spread across social media by many individuals). The repeated exposure to anecdotal reports

claiming that HPV is responsible for a few deaths could lead individuals to believe the HPV vaccine is the cause of many fatalities. Regardless of the validity of such claims, a few deaths caused by the HPV vaccine pale in comparison to the number of deaths caused by cervical cancer in women.

Unfortunately, it is also unlikely that individuals will read anecdotes in the media about how HPV can cause cervical cancer. There were about 311,000 confirmed annual deaths worldwide from cervical cancer in 2018 (Arbyn, Weiderpass, Bruni, de Sanjosé, Saraiya, & Ferlay, et al., 2020). Individuals demonstrating a primary bias in the above example may have encountered anecdotal reports describing fatalities from the HPV vaccine but few, if any, reports of individuals dying of cervical cancer (Bruni et al., 2015). Consequently, individuals would likely conclude the HPV vaccine is deadly, but they may not perceive cervical cancer to be nearly as fatal.

In the above example, individuals may also be subject to a secondary bias: the overestimation of the frequency of deaths that have been sensationalized by the media and underestimation of the frequency of common deaths not widely reported by the media (Lichtenstein et al., 1978). The media tends to focus on potential catastrophic events because 'fear sells' which can increase the likelihood that secondary bias may occur. In the previous example, the media would have reported one rare adverse outcome that seemed to be associated with the HPV vaccine. This may have been reported in an interview with a family member who claims the HPV vaccine caused the death of a loved one. During this report, it's likely the media would have failed to report the frequent deaths associated with cervical cancer; deaths that may have been prevented by the HPV vaccine. Overall, primary and secondary biases occur when the expectations of individuals are influenced by factors such as media coverage of the target risk

which causes them to form biased expectations about the anticipated outcomes of a behavior. The occurrence of these biases underlines the importance of how health information is presented.

1.8 HEURISTICS AND PERCEIVED RISK OF THE HPV VACCINE

Individuals often form judgments about a behavior and its outcomes by relying on heuristics. Heuristics are defined as cognitive shortcuts that individuals rely on when making judgements under uncertainty (Gilovich & Griffin, 2002). As individuals encounter and solve problems during their lifetime, they make connections between similar problems they encounter. These connections strengthen with repeated exposure to similar problems and increase an individual's efficiency to solve the problems. Increased efficiency in problem-solving may lead to greater reliance on cognitive shortcuts, known as heuristics, in order to identify relevant risk information quickly (Koehler, 1996). By relying on heuristics, individuals solve problems or make judgments about a risk more quickly than if they considered each problem-solving step or weighed each cost and benefit associated with the risk before forming their judgment. Heuristics, therefore, can reduce the cognitive energy in making choices that have been successful in the past when faced with similar problems. However, heuristics are susceptible to error. Since individuals make decisions using cognitive shortcuts, they no longer weigh each piece of information when reaching their decisions. Key pieces of risk information may go unnoticed or may be given less importance because individuals are relying on heuristics to make their decision.

Availability Heuristic. One heuristic that may be relied upon to form a judgment is the availability heuristic. The availability heuristic refers to the tendency of individuals to equate the probability of an adverse outcome with easiness of memory retrieval for similar events

(Tversky & Kahneman, 1974). For example, individuals will likely perceive a greater risk of having a heart attack during middle age if they have known individuals who have experienced a heart attack under these circumstances (Tversky & Kahneman, 1974). Prior probabilities, such as those included in a base rate, tend to be ignored when the availability heuristic is relied upon. For the present study, it is important to consider whether an individual or an acquaintance of the individual has received the vaccine and experienced any negative side effects. The exposure to direct or indirect adverse outcomes of the HPV vaccine may indicate the presence of the availability heuristic.

1.9 BASE RATE NEGLECT AND PERCEIVED RISK OF THE HPV VACCINE

The previous discussion suggests that individuals may ignore base rate information when judging the likelihood of a health threatening outcome and instead rely on other less informative and less accurate information when judging the likelihood of a health threatening outcome. This tendency to ignore base rates is known as base rate neglect or the base rate fallacy (Koehler, 1996). The neglect of base rate information has been attributed to individuals' reliance on heuristics, which are susceptible to error. Thus, an error in judgment occurs when heuristics are relied upon and base rates are ignored.

Several investigators have challenged the claim that individuals typically fall prey to base rate neglect. Empirical evidence suggests that base rates are not completely ignored and do impact decision-making (Koehler, 1996). Tversky's and Kahneman's (1974) indicate that base rate information does influence participants' judgments. A review of eight studies, including the two studies by Tversky and Kahneman (1974), partially support this conclusion. Four of the eight studies included in the review indicated that subjects relied on base rates when making decisions (Koehler, 1996). Between-study differences may explain the result of these findings

(Koehler, 1996). The remaining four studies include Tversky's and Kahneman's (1974) two-part study supporting base rate neglect and two other studies that included descriptive information in their decision-making problems (Koehler, 1996). Reliance on base rate information may be reduced when descriptive information is present. Studies that presented descriptive (individuating) information (e.g., gender or ethnicity of an individual) may lead participants to focus on individuating information and, consequently, ignore the base rate information (Koehler, 1996).

Base rates that are calculated based on experimental data are viewed as 'fact.' The assumption is that the base rate conveys the actual truth, with little variation. Outside of a controlled setting, individual experience may not align to the experimental base rate (Koehler, 1996). For example, an individual may not know anyone who has the Human Papillomavirus (HPV), but the experimental base rate suggests one in two people have contracted HPV. This contradiction in experience versus experimental evidence can lead to mistrust or confusion when making decisions about HPV and the HPV vaccine.

1.10 DENOMINATOR NEGLECT AND PERCEIVED RISK OF THE HPV VACCINE

The news media tends to report catastrophic events without including other relevant details. This type of reporting is an extreme version of ratio bias called denominator neglect. Denominator neglect occurs when an individual solely focuses on the numerator of a ratio (Spiegelhalter & Gage, 2015). For example, a news story reports a single death arising from an adverse reaction to the HPV vaccine. The media fails to report the thousands of individuals who did not die from the vaccine nor experience adverse effects from the vaccine. By focusing on the singular, extreme outcome, individuals are not given enough information to make an informed

decision. Those who do seek more information about a death reported by the media will likely do so online (Pew Research Center, 2006).

1.11 IMPACT OF ANECDOTAL AND STATISTICAL INFORMATION

When individuals search the internet for health-related information, they are likely to visit more than one website (Pew Research Center, 2006). Academic websites, government websites, and websites associated with health organizations often provide statistical information about a health outcome. The statistical information is typically presented in the form of a base rate that details the likelihood of adverse outcomes associated with a range of health-related behaviors (e.g., smoking, vaccination). This information is based on the outcomes of scientific studies, involving large samples. An example of a base rate for HPV is as follows: four out of five women will be infected with the Human Papillomavirus (HPV) by the age of fifty (CDC, 2012).

Anecdotal information is another important type of information that individuals may encounter during online searches for health-related information. Anecdotal reports are usually found in the comments section of a website, distributed on social media, posted on blogs, or shared in consumer generated websites. Anecdotal reports regarding the benefits and dangers of vaccines such as the HPV vaccine can be compelling and commonly provide opinions about the safety of the vaccine or describe experiences with particular adverse outcomes. However, each anecdote describes a singular experience from a subjective viewpoint. The reports have not been verified or tested, and they usually involve a 'sample' of one person.

Persuasiveness of Anecdotal and Statistical Information. Studies of the relative persuasiveness of anecdotal information and statistical information have yielded mixed findings:

some studies suggest statistical information is more convincing than anecdotal information, while other studies suggest that anecdotal information is more convincing than statistical information (Hornikx, 2005). Hornikx (2005) reviewed 12 studies examining the relative persuasiveness of anecdotal and statistical information. Six of the studies suggest statistical information is more persuasive than anecdotal information. Five of the studies in Hornikx's (2005) review reported no difference in persuasiveness between anecdotal and statistical information. Only one study in Hornikx's (2005) review found anecdotal information to be more persuasive than statistical information. Based on these results, Hornikx (2005) determined statistical information is likely to be more persuasive than anecdotal information.

A recent meta-analysis by Freling et al. (2020) supports this conclusion. The meta-analysis included 61 studies that examined how evidence type impacted persuasion on a variety of topics (e.g., technology such as refrigerators, sexual risk behavior, global warming, etc.). The results of the meta-analysis revealed a small, significant effect that suggests individuals are more persuaded by statistical evidence than anecdotal evidence when making decisions, overall (Freling et al., 2020). However, Freling and colleagues (2020) discovered that anecdotal evidence is more persuasive than statistical evidence in three types of decisions: the decision is health related, the decision is personally relevant, or the decision may entail serious consequences. Based on the evidence published by Freling et al. (2020), the decision to be vaccinated against HPV would be a prime example of a health related, personal, decision with serious consequences. One would anticipate anecdotal information to be more persuasive than statistical (i.e., base rate) information when making decisions about receiving the HPV vaccine. However, it is unclear if participants in each of the above studies received both types of information simultaneously.

Research on the persuasiveness of anecdotal and statistical information has primarily been conducted using between-subjects designs. Individuals only encounter one type of information (statistical or anecdotal). Yet, in non-lab settings, individuals most likely encounter both types of information when evaluating the risk of health-related procedures, the risk of taking drugs, and the risk of adhering to a health expert's recommendation (e.g., wearing a mask at the gym). Individuals visit two to five websites during online searches, increasing their chance of exposure to multiple types of health information (i.e., statistical and anecdotal; Pew Research Center, 2002). When individuals visit more than one website, they can read both statistical information outlining the risk of a health-related behavior as well as anecdotal information (i.e., web postings) describing opinions of or experiences with the health-related behavior posted by individuals. Therefore, in a real-world context, individuals seeking health information will likely encounter both statistical information and anecdotal information simultaneously.

Contradictory Anecdotal and Statistical Information. Parents and other individuals who seek out safety information regarding the HPV vaccine must weigh both statistical and anecdotal information found online when evaluating the risk of receiving the vaccination and deciding to have themselves or their child vaccinated. However, anecdotal reports and stories regarding the safety of the HPV vaccine often contradict safety estimates derived from empirical research and base rate data regarding a vaccine's safety. Base rate information regarding the occurrence of adverse reactions to the HPV vaccine support claims that the HPV vaccine is safe. However, personal anecdotal web postings typically describe the HPV vaccine as dangerous and describe severe adverse reactions. For example, on its HPV vaccine safety webpage, the CDC (2021) states, "there is no diagnosis that would suggest Gardasil [has] caused [any] deaths." Yet, an article on healthnutnews.com details the death of a 14-year-old boy that was allegedly caused by

the Gardasil vaccine. The article states, “Again, how many more kids need to die… Our hearts go out to all the parents and families who have had loved ones die or who have been seriously harmed by this vaccine, or any other” (Elizabeth, 2016).

Only a few studies have investigated how individuals weigh contradictory statistical and anecdotal information when individuals are presented with both types of information. In one such study, participants were asked to imagine a scenario in which they may need bypass heart surgery (Ubel, Jepson, & Baron, 2001). All participants were provided statistical information indicating that 75% of patients benefit from this surgery. Group 1 received the statistical information as well as three anecdotes from patients who benefited from the surgery and one anecdote from a patient who did not benefit from the surgery. Group 2 received the same statistical information as the other groups and also received one anecdote from a patient describing the benefit of the surgery and one anecdote from a patient who did not benefit from the surgery. The number of positive and negative anecdotes received by Group 1 (i.e., three out of four anecdotes are positive) is congruent to the ratio of the statistical information provided; both information types provided suggested beneficial outcomes for 75% of participants. The ratio of anecdotal information received by Group 2 (i.e., one positive and one negative anecdote) is not proportional to the statistical information and instead suggests a beneficial outcome for 50% of participants. Participants who received anecdotal information that was congruent with the statistical information were more likely to choose bypass surgery (44%) compared to the participants who received anecdotal information that was incongruent with the statistical information (30%; Ubel et al., 2001). Therefore, anecdotal information that was congruent with the base rate may have exaggerated the benefits of receiving bypass heart surgery.

Bestch et al. (2011) also investigated the impact of anecdotal and statistical information on health-related decision making. Parents in the study were asked to imagine that they were searching for information on an illness that may affect their child. The parents read statistical information that stated there was a 20% likelihood of their child experiencing an adverse reaction to a vaccine for the illness. Group 1 only read this statistical information. Group 2 read the same statistical information as well as one anecdote describing a negative experience after receiving the vaccine and nine positive anecdotes about receiving the vaccine. Group 3 read the statistical information and also received two negative anecdotes and eight positive anecdotes describing experiences after receiving the vaccine. Group 4 read the statistical information in addition to receiving four negative anecdotes and six positive anecdotes about receiving the vaccine.

Participants in Group 2 were provided with anecdotal information conveying a lower ratio (i.e., 1 out of 10 or 10%) of negative reactions to the vaccine than provided in the statistical information (20%). Parents in Group 3 read two negative anecdotes which was consistent (i.e., 2 out of 10 or 20%) with the statistical information (20%). Parents in Group 4 who read four negative anecdotes were provided with anecdotal information conveying a bigger ratio (i.e., 4 out of 10 or 40%) of negative accounts than provided in the statistical information (20%).

All participants then rated the severity of expected side effects following administration of the vaccine using a 7-point scale with seven indicating greater severity. Participants in Group 1 reported an average perceived severity (APS) of 3.89. Participants in Group 2 reported an APS of 4.50. Participants in Group 3 reported an APS of 4.89, and participants in Group 4 reported an APS of 5.37. As the number of negative anecdotes increased, the perceived risk of serious side effects increased, despite being provided the same base rate that stated a 20% likelihood of experiencing an adverse event after receiving the vaccine (Bestch et al., 2011). Similar to Ubel et

al. (2001), the presence of anecdotal information impacted perceived risk and behavioral intentions.

Gutierrez (2015) extended the research of Bestch et al. (2011) by examining the impact of statistical and anecdotal information on the perceived risk of recreational drug use. Gutierrez (2015) studied how the type of information (i.e., anecdotal vs. statistical) impacts an individual's perception of harm if they were to use recreational drugs, Spice (i.e., synthetic marijuana) and Kratom (i.e., a hallucinogenic/sedative). Participants were placed into 12 groups (Guiterrez, 2015). Groups 1-4 received only base rate information stating the likelihood of having an adverse reaction to Spice and to Kratom. Groups 5-8 received base rate information plus four positive anecdotes describing enjoyable experiences using the drugs and one negative anecdote describing a bad experience using the drugs. Groups 9-12 received base rate information plus four negative anecdotes describing bad experiences when using these drugs and one positive anecdote describing an enjoyable experience while using the drug (Guiterrez, 2015).

Within these groups, the base rates varied for the drugs. Groups 1, 4, 5, 8, 9, and 12 received base rate information indicating an 80% likelihood of experiencing an adverse reaction to Spice and a 50% likelihood of having an adverse reaction when using Kratom. Groups 2, 3, 6, 7, 10, and 11 received base rate information with reversed likelihoods for the drugs: a 50% likelihood of experiencing an adverse reaction when using Spice and an 80% likelihood of having an adverse reaction to the use of Kratom (Guiterrez, 2015).

After reading the information, all subjects reported the likelihood of harm that would occur if they were to use Spice and if they were to use Kratom experimentally (i.e., just once or twice; Gutierrez, 2015; Gutierrez & Cohn, 2018). The results of the study suggest that the presence of four negative anecdotes in addition to the base rate information (Groups 5-8)

magnified the perceived likelihood of harm compared to individuals who received only base rate information (Groups 1-4) and compared to individuals who received four positive anecdotes (Groups 8-12). The findings were the same for both Spice and Kratom (Guiterrez, 2015; Gutierrez & Cohn, 2018). No significant differences were found between the groups who received only base rate information and the groups who received the four positive anecdotes (Guiterrez, 2015; Gutierrez & Cohn, 2018). Results from Gutierrez's (2015) study suggest negative anecdotes have a greater impact on health decision making than positive anecdotes do. These findings are consistent with those suggested by Bestch et al.'s (2011) study.

Coffman (2015) conducted a similar study examining the relative impact of anecdotal and statistical information on health-related decisions when both types of information are encountered simultaneously. Participants were assigned to one of four groups. Group I participants were presented with base rate information depicting a 95% chance of experiencing a positive outcome after using a legal but novel recreational drug. Group II participants were presented with the same base rate information as well as five brief anecdotes describing positive reactions to the drug and one additional anecdote describing a negative reaction to the drug. Group III participants were presented with the same base rate information as well as three positive anecdotes and three negative anecdotes. Group IV participants were presented with the same base rate information as well as five negative anecdotes and one positive anecdote. All subjects then estimated the perceived harmfulness of using the novel drug once or twice. Participants also created a twitter post to 'tell their friends about the drug' (Coffman, 2015). Because twitter posts are limited to 140 characters, participants were indirectly forced to include information that each participant deemed most salient about the drug or its potential effects.

Twitter posts were coded for their valence, either positive or negative, using a scale ranging from 1 (very negative) to 5 (very positive). Each Twitter post was coded by two coders.

Participants in Group IV, who read mostly negative personal anecdotes about the effects of the drug, wrote significantly more negatively valenced twitter posts ($M = 1.83$) compared to participants in the remaining three experimental groups. Group III participants, who read an equal number of positive and negative anecdotes, wrote significantly more negatively valenced twitter posts ($M = 2.2$) compared to subjects who read mostly positive anecdotes ($M = 3.31$) and compared to participants who only read positive base rate information ($M = 3.45$). There were no significant differences in valence of twitter posts between participants who read mostly positive anecdotes and participants who only read positive base rate information.

Participants also estimated the harmfulness of using the drug just once or twice. Perceived harm was evaluated using a scale ranging from 0% likelihood of experiencing harm when using the drug to 100% likelihood of experiencing harm when using the drug. Participants who read mostly negative anecdotes about using the drug rated the drug as significantly more harmful ($M = 70.45\%$ likelihood of harm) than did participants in all other conditions, despite all having read base rate information depicting positive drug outcomes. Participants who read an equal number of positive and negative anecdotes rated the drug as significantly more harmful ($M = 50.6\%$ likelihood of harm) than did participants who read mostly positive anecdotes and participants who only read base rate information ($M = 40.2\%$ likelihood of harm). There were no significant differences in perceived harmfulness between participants who read mostly positive anecdotes and who only read the base rate. These findings suggest negative anecdotal evidence weighed more heavily in the assessment of risk than justified by base rate evidence. In contrast, positive anecdotal evidence had no impact on risk assessments.

Overall, the findings of Coffman (2015), Gutierrez (2015), Bestch et al. (2011), and Ubel et al. (2001) suggest anecdotal information impacts the perceived risk of a health-related behavior (e.g., drug use, vaccinations, surgery) even when empirical base rate data contradicts anecdotal information. The impact of anecdotal information on health-related decisions may depend upon the specific health topic or its associated behavior. For example, positive anecdotes may magnify the benefits of surgery despite the high level of risk described in statistical information. However, when deciding whether to use a drug, negative anecdotes may amplify the perceived risk of using the drug despite statistical evidence that suggests the effects are generally positive. Therefore, investigating how individuals weigh positive and negative statistical information against positive and negative anecdotal information should be assessed in a variety of health-related contexts. Obtaining a better understanding of what information individuals center their decisions on may increase the efficacy of health campaigns.

1.12 THEORETICAL FRAMEWORK

The proposed study is informed by three theoretical frameworks: the dual process theory of thinking, the health belief model, and the theory of planned behavior (Epstein, 1994; Kirscht, 1974; Ajzen, 1991). According to the dual process theory, individuals process information about a stimulus in two ways: by engaging in effortful processing, known as System 2, or engaging in processing that is fast and experiential, known as System 1. System 1 relies on gut feelings to form judgements and make decisions. Reliance on system 1 to process information about risk is known as risk as feelings (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978). Research indicates that when individuals feel positive affect, such as reassurance towards a stimulus, the perceived risk of that activity will be judged as low and the benefits as high. Conversely, negative affect, such as worry and uncertainty, towards a stimulus will generate high perceived

risk and low benefit (Finucane, Alhakami, Slovic, & Johnson, 2000). When a stimulus generates a very strong affective response, individuals become insensitive to probability. For example, if an act of terrorism occurs, individuals will believe such acts are highly likely to occur right after the act occurred and neglect the probability that such acts are actually very infrequent overall (Sunstein, 2003). Risk as feelings will be examined in this study in the form of uncertainty about the HPV vaccine's side effects and reassurance about whether the benefits of the HPV vaccine are high.

The health belief model (HBM) was formed based on theory that a person's belief in a personal threat of a health outcome paired with a person's belief in the effectiveness of a health behavior will predict the likelihood that the person will enact the health behavior (Kirscht, 1974). The HBM suggests there are two components of health behavior: (1) that individuals are driven by the perceived threat of a health outcome, and (2) the belief that a certain health behavior will either prevent or treat a health outcome. Health behavior is determined by an individual's perception of benefit versus barriers to enacting the health behavior. There are six constructs of the HBM: perceived susceptibility or risk of disease acquisition, perceived severity of disease acquisition, perceived barriers that may prevent one from engaging in a health behavior, cues to action, and self-efficacy (Kirscht, 1974).

The theory of planned behavior (TPB) is used in the prediction of health behaviors (Ajzen, 1991). Engagement in a health behavior is determined by an individual's intention to engage in the behavior and their perceived ability in executing the behavior. There are six constructs of the TPB: attitudes or positive/negative evaluations of engaging in the behavior in question or about the health behavior itself, behavioral intention to engage in the behavior, subjective norms or the perceived importance significant others assign to engaging in the health behavior, social norms

or the perception of whether significant others have engaged in the behavior, perceived power to engage in the behavior, and perceived behavioral control or perception of whether engaging in the behavior is under personal control (Ajzen, 1991).

1.13 THE PRESENT STUDY

The present study extends prior research by investigating the presentation of anecdotal information versus statistical information in the evaluation of potential harm caused by the Human Papillomavirus (HPV) vaccine and behavioral intentions of parents to vaccinate their children. The HPV vaccine provides protection against many cancers while rarely causing serious adverse side effects. Despite the health benefits of the HPV vaccine and the low risk of adverse reactions, online users continue to post personal accounts of shocking adverse reactions to the HPV vaccine (e.g., chronic migraines, seizures, death). As individuals increasingly rely on the internet for health-related information, understanding how much importance individuals attribute to both anecdotal information and statistical information becomes increasingly important. The current study addresses this issue.

In the current study, all participants were presented with base rate information regarding the likelihood of experiencing adverse side effects following HPV vaccination. In addition, subsets of participants were also presented with three real web postings describing either positive or negative experiences following HPV vaccination. All participants then reported their intentions to vaccinate their child against HPV and the affect experienced (uncertainty and regret). Participants also completed questionnaires to examine risk appraisals. Moreover, numeracy and feelings of risk were examined for moderating effects (see Figures 1 and 2). It was hypothesized that exposure to negative personal web postings would increase anticipated worry due to possible

harm despite simultaneous exposure to base rate information indicating that severe adverse reactions were rare. Model fit was tested to see the relationship between primary, mediating, and moderating factors. Specifically, the hypotheses listed below were proposed.

1.14 HYPOTHESES

(H1): Participants assigned to the negative anecdotes, in addition to base rate information, will report greater uncertainty about the benefits of vaccination, increased anticipated worry of adverse effects of the vaccine if they decide to vaccinate their child, and reduced behavioral intentions to vaccinate children compared to participants who are only exposed to base rate information.

(H2): Participants exposed to positive anecdotes, in addition to base rate information, will report greater anticipated regret at the thought of not vaccinating, increased reassurance about the benefits of vaccination, and increased behavioral intentions to vaccinate their children compared to participants who are only exposed to base rate information.

(H3): Ratings of anticipated worry at the possible thought of vaccinating due to the vaccine's side effects (worry risk appraisal) will mediate the relationship between type of information read (base rate only vs base rate + negative anecdotes) and vaccination intentions. Conversely, ratings of anticipated regret if participants do not vaccinate in light of the cancer prevention benefits of the vaccine (inaction regret risk appraisal) will mediate the relationship between type of information read (base rate only vs base rate + positive anecdotes) and vaccination intentions.

(H4): Numeracy will moderate the effect of the type of information on the risk appraisal experienced. Specifically, the relationship between type of information read and risk appraisal experienced (worry vs regret) will be stronger for participants with lower numeracy. Feelings of risk after reading the conditions that include anecdotes (uncertainty v reassurance) will moderate the relationship between risk appraisal experienced and behavioral intentions.

Chapter 2: Methods

2.1 RECRUITMENT

Participants were recruited using the platform, Prolific. Prolific is an online consumer survey website that hosts surveys from various entities (e.g., educational researchers, marketing teams, etc.). Participants on Prolific must undergo a verification process that includes taking a photo of themselves and of their Identification Card. In addition, participants must complete questionnaires to allow researchers to pre-screen for their studies. Overall, Prolific participants have been shown to be more honest, give questions more attention, and follow instructions better than competing survey platforms such as Amazon Mechanical Turk (MTurk; Rothschild, Peer, Gordon, & Damer, 2020).

Prolific protects their participants from overuse. Researchers are not allowed to screen their participants within their main study, as this may lead to undercompensating those who attempt the survey. In order to fully screen individuals for the current study, two projects were created on the Prolific platform. The first project was used as a formal prescreen. A description of the study was posted online, and registered users of Prolific chose to participate in the study. Participants who enrolled in the project were sent to the survey tool, Qualtrics, via a URL link. Six hundred and eleven participants on Prolific completed the prescreen project and were awarded $1 for their time. Of these participants, 306 met the inclusion criteria for the primary study. See Table 1 for screening requirements.

The participants who met the inclusion criteria were invited to participate in the primary study (i.e., project two) on Prolific. Two hundred and twenty-four adults residing in the United States who have children between the ages of 9 and 16 completed the study via a redirect URL

link to Qualtrics. Every participant who completed the study received $10 in monetary compensation.

2.2 MEASURES

Screening Survey. A three-question survey was used to determine a participant's eligibility for the study (Appendix A). An additional three questions were added to prevent participants from guessing the full purpose of the study and decrease deceptive answers (Appendix A). The participants had to be a parent or guardian of at least one child between the ages of 9-16 that has not received the HPV vaccine. If individuals did not meet these requirements, they were redirected to a thank you and asked to exit the survey (Appendix B). Individuals who met the criteria were invited to the primary study which began with the informed consent (Appendix C).

Attention Checks. Three attention checks were included in the form of reCAPTCHA items to make sure that humans were completing the study. These items were distributed throughout the survey. All participants included in the sample passed all three of the attention check items.

Demographic Survey. A demographic survey was administered to assess each participant's age, sex, gender, ethnicity, English language ability, sexual orientation, marital status, education level, and household income (Appendix D).

HPV Knowledge Questionnaire. Participants completed a 13-item measure of their knowledge about HPV and the HPV vaccine (Appendix E). The 13-item measure consists of true or false questions detailing facts about HPV and the HPV vaccine. The HPV Knowledge Questionnaire measures two factors: general HPV knowledge and perceptions of gender

differences in HPV infection and vaccine recommendations. The measure has strong internal consistency ($\alpha = 0.87$) and good model fit (RMSEA = 0.12, $p < 0.01$; Harrison, et. al, 2021). Sample item: "A person's chances of getting HPV increase with the number of sexual partners they have." Ratios of correct and incorrect responses were calculated for each participant.

Affect Experienced after Experimental Information. After reading each piece of information assigned, participants completed two items assessing their affect in response to the information (Appendix G). After reading the information, participants responded to, "How pleasant or unpleasant did you find the above experience?" Participants chose from six response options ranging from most unpleasant imaginable to most pleasant imaginable. See Table 5.

HPV Vaccine Intentions. Participants completed a 1-item measure assessing their behavioral intentions to vaccinate their child against HPV, if the vaccine were free (Appendix G). Item: "If the vaccine were completely free, how likely would you be to vaccinate your child with the HPV vaccine in the next year?" Likelihood ratings were completed using a 101-point scale ranging from 0% likely to 100% likely.

Risk Appraisals. Two questions were employed to assess two constructs of risk associated with health behavior: anticipated inaction regret and worry (Appendix H; Brewer, DeFrank, & Gilkey, 2016). Anticipated regret was measured with the following item: "Imagine that your child had cervical or penile cancer, but the HPV vaccine might have prevented it. How much would you regret that you did not give your child the HPV vaccine?" One item assessed worry of vaccinating in light of the potential side-effects of the HPV vaccine. Worry was measured with the following item: "The HPV vaccine can cause adverse side effects for both girls and boys. How worried are you about giving the HPV vaccine to your child?" All responses were measured using a 5-point scale ranging from none at all to a great deal.

Feelings of Risk. Two items were used to assess risk as feelings in line with the dual process theory of information processing (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978). The first item assessed reassurance in the benefits of the vaccine. Item: "How reassured do you feel about the benefits of vaccinating your child?" Five response options were possible from 'Extremely reassured' to 'Not at all reassured.' The second item assessed uncertainty about side effects from the vaccine. Item: "How uncertain do you feel that the vaccine may cause serious side-effects to your child if you vaccinate him/her?" Five response options were possible from 'Extremely uncertain' to 'Not at all uncertain.'

Health Belief Model. Sixteen items were used to assess five constructs of the Health Belief Model (Appendix G, K, & L). Perceived severity/susceptibility was assessed with two questions. The first item is perceived severity of HPV-related cancer (Appendix G). Item: "How serious would it be if your child got cervical or penile cancer?" Four response options were possible from 'slightly serious' to 'extremely serious.' One item was used to assess perceived susceptibility of HPV-related cancer. Item: "Without the vaccine, what do you think is the chance that your child will get cervical or penile cancer in the future?" Four response options are possible from 'No chance at all' to 'High chance.' These two items were adapted from Reiter's and colleagues' 2009 study. Cues to action were evaluated with 3 questions. Doctor recommendation, diagnoses of genital warts, and diagnoses of penile or cervical cancer were used from the Health History table (Appendix L). Perceived effectiveness was assessed with two questions (Appendix G). The two items were adapted from the Carolina HPV Immunization Attitudes and Beliefs Scale to assess perceived effectiveness of the HPV vaccine (McRee et. al, 2010). One item assessed the vaccine's effectiveness against genital warts, and one item assessed the vaccine's effectiveness against HPV-related cancers. Sample item: "How effective do you

think the HPV vaccine is in preventing genital warts?" Four response options were possible ranging from 'Not at all effective' to 'Extremely effective.' Perceived potential harms (barriers) was assessed with six questions included in the Barriers to Vaccination section below (Appendix K). Questions include parental agreement with whether the vaccine: will cause short term problems, is being used to make money for drug companies, will cause lasting health problems, will make their child more likely to have sex, is unsafe (in general), is not necessary because their child is too young. Perceived barriers in getting the vaccine (self-efficacy) were evaluated with five questions (Appendix K). The questions concern barriers to: finding a provider they can afford, finding a provider that is easy to get to, finding a provider that has the vaccine available, paying for how much the vaccine costs, and finding an appointment easily with a provider. See Table 8 for specific items and their paired construct.

Theory of Planned Behavior. Thirteen questions were used to assess four constructs of the Theory of Planned Behavior (Appendix G, K, & L). Behavioral intentions were evaluated with the two questions from the HPV Vaccine Intentions section above (Appendix G). Subjective norms were evaluated with 3 questions indicating a participant's level of agreement with talking to others about the HPV vaccination and promoting it (Appendix K). Measure of attitude were examined with a 3-part question on whether "vaccinating your child is… necessary; a good idea; beneficial?" (Appendix K). Perceived behavioral control was assessed with 5 questions. These include whether vaccination is possible (Appendix K), whether vaccination would be easy (Appendix K), whether it is in the parent's control (Appendix K), whether it is the parent's decision (Appendix L), and whether cost is a barrier (Appendix K). See Table 8 for specific items and their paired construct.

The eHealth Literacy Scale. Participants completed an 8-item measure on their perceived ability to navigate the internet and find reliable health information (Appendix I). The eHealth Literacy Scale (eHEALS) has good internal consistency ($\alpha = 0.88$, Norman & Skinner, 2006; $\alpha = 0.8$, Nguyen et. al, 2016). Sample item: "I have the skills I need to **evaluate** the health resources I find on the Internet." The items were answered using a 5-point scale ranging from strongly disagree to strongly agree. Higher average scores indicate greater perceived literacy. An additional two questions were added to this section, as recommended by the scale's authors, to understand eHealth in general (Norman & Skinner, 2006). These two questions assess the usefulness and importance of accessing health information online.

Social Media Use. Two questions were created to assess participants' use of social media (Appendix J). One question was as follows: "How often have you visited Twitter to read or make a post?" A choice between five responses was allowed, including never, once a week, 2-3 times a week, 4-6 times a week, or daily. The second question was as follows: "How believable do you find information posted to social media (i.e., Twitter, Facebook, Blogs, etc.)?" Response options were on a 5-point scale from extremely unbelievable to extremely believable.

Barriers to Health Care and Obtaining the HPV Vaccine. Two questions were created to assess the participant's accessibility to health care for their child (Appendix K). The first question measures accessibility on a 5-point scale from extremely difficult to access to extremely easy to access. The second question measures how comfortable the parent is in seeking healthcare for their child on a 5-point scale from extremely uncomfortable to extremely comfortable. Eighteen items were administered to assess a variety of barriers that participants may have obtaining the HPV vaccine.

Health History. A 12-item measure was created to assess key predictors of HPV vaccination uptake related to the health history of the parent and child (Appendix L). The first 11 questions asked the participant to choose whether they apply to themselves (i.e., the parent), the child, or neither of them. They could select all that apply. The predictors included annual doctor visits, vaccination history, history of Sexually Transmitted Infections, and history of cancer. The last question was as follows: "Who makes most of the health decisions for your family?" Participants chose from a number of choices including themselves, a partner, another family member, or other person.

Prior Vaccination Exposure. Three questions were created to determine if the participant has knowledge or experience of an adverse reaction to the HPV vaccine (Appendix M). The participant was asked to report their relationship with the person who had the experience, how old the person was when they had the experience, and how severe the reaction was to the vaccine.

Subjective Numeracy Scale. Numerical ability was assessed with an 8-item self-reported measure (Fagerlin, Zikmund-Fisher, Ubel, Jankovic, Derry, & Smith, 2007; Appendix N). The Subjective Numeracy Scale (SNS) has good internal consistency ($\alpha = 0.82$, Fagerlin et al., 2007). Sample item: "How good are you at working with fractions?" The items were answered using a 6-point scale ranging from not at all good to extremely good. Higher average scores indicate greater perceived numeracy. Analyses for the current study confirm adequate reliability of this scale ($\alpha = 0.87$).

2.3 SELECTION OF HEALTH INFORMATION

Base Rate Associated with the HPV Vaccine. Participants in Groups I, II, and III read the same base rate information regarding adverse reactions to the HPV vaccine (Appendix F). The

base rate for experiencing adverse reactions was determined using facts reported by the Centers for Disease Control and Prevention (CDC) and existing literature on the HPV vaccine (Shimabukuro et al., 2019). The absolute risk of having a minor, common reaction (e.g., headache) and a serious, adverse reaction (e.g., stroke) to the HPV vaccine were presented as base rates. The base rate for experiencing minor side effects following HPV vaccination was 7,058 out of 28 million vaccinations (i.e., 0.025%; Shimabukuro et al., 2019). The base rate for experiencing a serious adverse reaction to the HPV vaccine was seven out of a million (i.e., 0.0007%; Shimabukuro et al., 2019).

The brief narrative describing the base rate for experiencing adverse reactions to the HPV vaccine contains 235 words. This brief narrative is written at a 9th grade reading level (see Table 3). All additional information regarding the HPV vaccine was also written at or below an eighth grade reading comprehension level. The ease of reading software used to compute these scores also identified a list of words that were considered 'hard' (My Byline Media, n.d.). These words were replaced with more common terms when possible. These anecdotes were used in a previous study (Coffman, 2022).

Anecdotes Regarding the HPV Vaccine. Approximately 30 positive and negative anecdotes (personal web postings) were located during an online search for information about the HPV vaccine. Search terms included "HPV vaccine safety," "HPV vaccine dangerous," and "Benefits of HPV vaccine." Each search term was entered into the following search engines: Google, Yahoo, and Bing. Anecdotes were selected for use in the current study based on three criteria: (1) appropriateness of content about the HPV vaccine (i.e., directly related to the HPV vaccine's effects); (2) length of the anecdote (i.e., the web posting could not be more than one page in length); and (3) affect (i.e., each web posting had to convey a like or dislike for HPV

vaccination). Ten anecdotes were selected for use in the study. Five anecdotes depicted positive experiences with the HPV vaccine, and five anecdotes depicted negative experiences with the HPV vaccine. When necessary, the anecdotes were edited to maintain their positive focus or negative focus. For example, the following statement was removed from a positively focused anecdote: "I had heard the vaccine had side effects."

The anecdotes are 46 to 184 words in length (M = 134.2; Appendix F). The anecdotes were assessed for their ease of reading using free online software (My Byline Media, n.d.). The software allows users to enter text and computes a number of ease of reading scores (i.e. various proportions related to words, sentence structure, syllables, etc.). Reading level scores were determined for anecdotes presented to each group of participants (i.e., Groups II and III). The following scores were computed for each set of narratives and anecdotes presented to participants: the Flesch Reading Ease formula (0-100 scale with higher scores indicating easier reading); the Flesch-Kincaid Grade Level, which estimates the grade level of an average student that can read the text; the Fog Scale, which compares syllables and sentence lengths (higher scores indicating increased difficulty); the SMOG Index, which estimates school grade level; the Colemn-Liau Index, which uses characters per word and sentence length to compute grade level; the Automated Readability Index, which determines the grade level needed to understand text; and Linsear Write Formula, which uses sentence length and number of words with three or more syllables to estimate grade level readability. A readability consensus score was computed for material presented to participants in each of the three groups. The latter score estimated overall grade level, reading level, and reader age. Table 3 provides these scores.

Web postings that were presented to participants in Group II were estimated to be written at the sixth-grade reading level. Web postings that were presented to participants in Group III

were estimated to be written at the seventh-grade reading level. Majority of adults read at the 8th grade level or lower (Safeer & Keenan, 2005). The information for this study meets this readability level. The ease of reading software also provided a list of words that were considered 'hard.' These words were replaced with more common terms when possible.

Emotional Valence of Information. Each set of information was analyzed using the Linguistic Inquiry Word Count to identify how positively and how negatively valenced the information is altogether (LIWC; Pennebaker, 2001). That is, the base rate (given to all groups), set of five positive and one negative anecdotes (given to Group II), and set of five negative and one positive anecdotes (given to Group III) were processed separately. The proportion of positively valenced words and negatively valenced words in each set of information is consistent with the presence of more positive anecdotes or more negative anecdotes in their respective groups (see Table 4).

Participants completed one question after reading each piece of information (base rate or each anecdote) to assess their perceived affect after reading the experimental information (Appendix F). After reading the base rate, participants rated how positive or negative they found the base rate on a six-point scale from extremely negative to extremely positive. After reading an anecdote, participants determined how pleasant or unpleasant they found the anecdotal experience using a six-point scale from most unpleasant imaginable to most pleasant imaginable. See Table 5.

2.4 PROCEDURE

Participants from Prolific first took the screening survey to see if they qualify (Appendix A). All participants completed the study online via Qualtrics. If the participant did not qualify, they received a thank you message and exited the survey (Appendix B). If the participant

qualified, they read and agreed to the Institutional Review Board approved consent form (Appendix C). The participants then completed the demographic survey (Appendix D) and the HPV-Knowledge Questionnaire (Appendix E). Participants were randomly assigned to one of the three experimental groups (Table 2) where they were provided with instructions (Appendix F).

Participants in Group I were only provided with base rate information about HPV vaccine side effects. They completed the Affect Experienced after the Experimental Information (Appendix G) and the Risk Appraisal items (Appendix H) next and continued to the remainder of the protocol (Appendices I - O). Participants in Group II, and Group III read their assigned web postings (see Table 2 and Appendix F), in addition to reading the identical base rate information provided to participants in Group I. Participants then completed the Affect Experienced after the Experimental Information items (Appendix G) and the Risk Appraisal items (Appendix H). All participants then completed the eHEALS (Appendix I), Social Media Use Questionnaire (Appendix J), Barriers to Healthcare Questionnaire (Appendix K), Health History Survey (Appendix L), questions assessing their previous exposure to vaccinated individuals (Appendix M), and the Subjective Numeracy Test (Appendix N). Upon completion of the protocol, participants were presented a debriefing sheet that described their steps for compensation (Appendix O).

2.5 DESIGN

The experiment used a between-subjects design. The information regarding the HPV vaccine provided to the participant varied across three groups (Table 2). Participants were randomly assigned to one of the three groups using a randomization generator via Qualtrics. Participants assigned to Group I only read base rate information regarding HPV and the HPV vaccine's side effects. Participants assigned to Group II read the same base rate information as

well as five web postings (anecdotes) describing positive HPV vaccine side effects and one negative web posting (anecdote) describing HPV vaccine side effects. Participants assigned to Group III read the same base rate information as well as five negative web postings and one positive web posting about the HPV vaccine and its side effects.

Chapter 3: Analyses and Results

3.1 POWER ANALYSIS

A power analysis was conducted by using an estimated population effect size derived from three studies investigating the relative impact of anecdotal and base rate information on health-related decisions. One sample effect size ($d = 0.57$) was calculated for the study by Betsch et al. (2007). Two sample effect sizes ($d_1 = 0.33$; $d_2 = 0.07$) were calculated for the study by Ubel et al. (2001). One additional sample effect size ($d_1 = 1.24$) was calculated from data presented by Coffman (2015). The weighted average of these effect sizes was $d = 0.34$. The latter estimate is based on data derived from 1,548 participants and is considered a small-to-medium effect.

G*Power version 3.1.9.7 was used to determine the sample size required to detect a small-to-medium size effect ($f = 0.17$) at 80% power for each of the planned comparisons, described in the Approach to Analysis section. The required sample size was approximately 200 participants, with 67 participants assigned to each of three groups (Faul et al., 2009).

In addition, a Monte Carlo Simulation was completed using a RStudio power estimation application, Monte Carlo Power Analysis for Indirect Effects (Mooney, 1997; RStudio Team, 2022; Schoemann, Boulton, & Short, 2017). Power was calculated for a model with 67 participants, a single mediator with variance explained, 1,000 replications, 20,000 draws, and at 95% confidence level. Using these determinants, the random seed number was changed, and the estimation repeated five times. All five calculations determined an estimated power of 80% or above. According to the above analyses, the collected sample size of 206 participants for the current study should be sufficient to detect effects, if they exist.

3.2 PARTICIPANTS

A total of 206 participants were included in the present study. Ages of participants ranged from 25 to 72 with over 40% of the participants being between 41-50 years old (M = 48 years). Participants in the sample mostly identified as male (47.6%) and female (51%), and the majority reported being heterosexual (84.5%) and married (63.1%). The majority of participants described themselves as white or Caucasian (79.1%) with some college (23.3%) or a bachelor's degree (37.4%) and a total household income between $25,000-75,000 (42.3%). Most participants reported having one child living in their household (48.5%). Detailed participant characteristics are found in Table 6.

3.3 DESCRIPTIVES

Basic descriptive statistics were computed to characterize the sample. See Tables 6 and 8. Chi-square analyses were conducted on the following variables: sex of participant and exposure to vaccinated individuals. Both factors were evenly dispersed across conditions. Males and females were found in relatively equal numbers across the three conditions, χ^2 (2) = 0.647, p = 0.723. Participants who either experienced or knew of someone who experienced an adverse reaction to the HPV vaccine were found evenly across the three conditions, χ^2 (6) = 3.366, p = 0.762. See Table 7.

Between-subjects ANOVAs were conducted to identify if participant scores on the HPV Knowledge Questionnaire, eHealth Literacy Scale (eHEALS), and Subjective Numeracy Scale differed across conditions. See Table 9. Differences in overall HPV Knowledge, F(2, 205) = 0.492, $p > 0.05$, and Subjective Numeracy, F(2, 200) = 0.506, $p > 0.05$, were not found between groups. However, significant group differences were found on the eHEALS, F(2, 200) = 5.144, $p < 0.05$. Participants in Condition I (base rate only; M = 35.05, SD = 4.27) had significantly

higher eHealth literacy scores than participants in Condition III (base rate plus mostly negative anecdotes; $M = 32.73$, $SD = 4.77$), $t(132) = 2.96$, $p = 0.004$. In addition, participants in Condition II (base rate plus mostly positive anecdotes; $M = 34.54$, $SD = 4.1$) had significantly higher eHealth literacy scores than participants in Condition III (base rate plus mostly negative anecdotes; $M = 32.73$, $SD = 4.77$), $t(132) = 2.35$, $p = 0.02$. See Table 11. It is important to note that individuals completed the eHEALS after the experimental protocol was administered. This may have impacted their subjective reports of how well they seek and find information online.

3.4 PRIMARY ANALYSES

Three between-subjects ANOVAs were conducted in order to identify the presence of group differences (base rate only, base rate plus positive anecdotes, base rate plus negative anecdotes) on the following dependent variables: (1) intention to vaccinate their child, (2) risk appraisals (inaction regret and worry), and (3) uncertainty/reassurance.

ANOVAs indicated significant differences between experimental conditions for four dependent variables: (1) vaccination intentions, $F(2, 198) = 8.078$, $p < 0.001$; (2) risk appraisal of worry, $F(2, 205) = 3.989$, $p = 0.02$; (3) uncertainty, $F(2, 205) = 3.82$, $p = 0.024$; (4) reassurance, $F(2, 205) = 5.097$, $p = 0.007$. No significant differences were found between conditions for inaction regret (see Table 9).

Follow-up analyses (i.e., *t*-tests using Tukey's HSD) were performed to examine the statistical differences found in the ANOVAs (see Tables 10). It was predicted that participants who read anecdotal information that contradicted base rate information regarding HPV vaccine safety will amplify the perceived harmfulness of receiving the HPV vaccine. The results of this study support this prediction.

Individuals who read base rate safety information plus five negative anecdotes, and one positive anecdote, reported being significantly less likely to have their child receive the HPV vaccine in the next year, if it were completely free, (M = 47% likely) compared to: (1) those who read only the base rate information (M = 72%), $t(131) = 3.97$, $p < 0.001$ and (2) individuals who read the base rate, five positive anecdotes, and one negative anecdote (M = 62%), $t(130) = 2.32$, $p = 0.02$ (see Table 10).

Individuals who read base rate safety information plus five negative anecdotes, and one positive anecdote, reported being significantly more worried about their child experiencing negative side effects after receiving the HPV vaccine (M = 3.25) compared to those who read only the base rate information (M = 2.59), $t(135) = 2.85$, $p = 0.005$ (see Table 10).

Individuals who read base rate safety information plus five negative anecdotes, and one positive anecdote, reported being significantly less reassured about the benefits of their child receiving the HPV vaccine (M = 3.4) compared to those who read only the base rate information (M = 2.65), $t(135) = 3.13$, $p = 0.002$ (see Table 10).

Individuals who read base rate safety information plus five negative anecdotes, and one positive anecdote, reported being significantly more uncertain about their child experiencing negative side effects after receiving the HPV vaccine (M = 3.21) compared to those who read only the base rate information (M = 3.75), $t(135) = 2.79$, $p = 0.006$ (see Table 10).

The Health Belief Model. Between-subjects ANOVAs and Chi-square tests were conducted in order to identify the presence of group differences (base rate only, base rate plus positive anecdotes, base rate plus negative anecdotes) for each of the following constructs of the Health Belief Model (HBM): (1) Seriousness/ susceptibility, (2) effectiveness/ benefits, (3) harms/ barriers, (4) self-efficacy, and (5) cues to action. If significant group differences were

found, a series of *t*-tests using Tukey's HSD were conducted for ANOVAs and post-hoc chi-squares for significant chi-square tests. In order to reduce family-wise comparison error, a Bonferroni approach was used to test significance. As three chi-squares were needed for post-hoc analyses, the significance value (*p*) was set at 0.017.

No significant group differences were found for items related to seriousness/ susceptibility or for items related to effectiveness/ benefits. One item related to self-efficacy differed between conditions. Individuals who read the base rate information only reported the vaccine being too expensive: (1) more than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 90.889, and (2) less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 56.696. Individuals who read the base rate information and mostly positive anecdotes reported the vaccine being too expensive less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 70.618 (see Tables 12-13).

All items related to harms/ barriers indicated significant group differences. For harms/ barriers, individuals who read base rate safety information only reported: (1) being concerned about vaccine side effects less than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 22.407, and less than those who read the base rate and mostly negative anecdotes, $\chi 2$ (1) = 29.681; (2) the vaccine may have long-term side effects less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 14.029; (3) the vaccine being pushed to make money for drug companies more than those who read the base rate and mostly positive anecdotes, $\chi 2$ (1) = 16.124, and more than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 11.102; (4) the HPV vaccine would make their child more likely to have sex less than those who read the base rate and mostly positive anecdotes, $\chi 2$ (1) = 110.431, and less than those who read the base rate and mostly negative anecdotes χ^2 (1) = 114.051; (5) their child is too young to

receive a vaccine for a sexually transmitted infection (STI) less than those who read the base rate and mostly positive anecdotes, $\chi 2$ (1) = 16.941, and less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 35.507 (See Tables 12-13).

In addition, individuals who read the base rate and mostly positive anecdotes reported concerns about vaccine safety less, χ^2 (1) = 22.407, concerns about vaccine side effects less, $\chi 2$ (1) = 40.265, long-term side effects of the vaccine less, $\chi 2$ (1) = 26.471, the vaccine being pushed to make drug companies money less, $\chi 2$ (1) = 15.791, the HPV vaccine making their child more likely to have sex more, χ^2 (1) = 102.382, and their child being too young for a STI vaccine less, $\chi 2$ (1) = 16.941, than those who read base rate information and mostly negative anecdotes. See tables 12-13 for descriptives.

All items related to cues to action indicated significant group differences. For cues to action, individuals who only read base rate safety information reported: (1) themselves being recommended for the HPV vaccine less than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 87.681, and less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 87.681; (2) themselves being diagnosed with HPV-related cancer less than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 134.029; (3) their child being diagnosed with HPV-related cancer less than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 134.029, and less than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 134.029; (4) themselves being diagnosed with genital warts more than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 111.420, and more than those who read the base rate and mostly negative anecdotes, χ^2 (1) = 107.855; (5) their child being diagnosed with genital warts less than those who read the base rate and mostly positive anecdotes, χ^2 (1) = 134.029 (See Tables 12-13).

In addition, individuals who read the base rate and mostly positive anecdotes reported themselves being recommended for the HPV vaccine more, χ^2 (1) = 70.618, their child being recommended for the HPV vaccine more, χ^2 (1) = 8.500, themselves being diagnosed with HPV-related cancer more, χ^2 (1) = 132.029, their child being diagnosed with HPV-related cancer more, χ^2 (1) = 128.118, themselves being diagnosed with genital warts less, χ^2 (1) = 132.059, and their child being diagnosed with genital warts more, χ^2 (1) = 132.029, than those who read base rate information and mostly negative anecdotes. See tables 12-13 for descriptives.

The Theory of Planned Behavior. Between-subjects ANOVAs and Chi-square tests were conducted in order to identify the presence of group differences (base rate only, base rate plus positive anecdotes, base rate plus negative anecdotes) for each of the following constructs of the Theory of Planned Behavior: (1) Behavioral intentions, (2) perceived power/ control, (3) attitudes, and (4) subjective/social norms. If significant group differences were found, a series of *t*-tests using Tukey's HSD were conducted for ANOVAs and post-hoc chi-squares for significant chi-square tests. In order to reduce family-wise comparison error, a Bonferroni approach was used to test significance. As three chi-squares were needed for post-hoc analyses, the significance value (*p*) was set at 0.017.

No significant group differences were found for items related to attitudes. The likelihood of vaccinating their child was the only significant item for behavioral intentions. Please see results in section above or tables 9-10. For perceived power/control, group differences were present in how many individuals considered the vaccine to be expensive. See results in HBM section above. In addition, group differences were present with who individuals reported being in charge of the health decisions for their family. See tables 14-15.

For subjective/ social norms, individuals who read the base rate information only reported they would: (1) recommend the vaccine to family and friends more than those who read the base rate and mostly negative anecdotes, $t(134) = -2.828$, $p = 0.005$, (2) speak to others about the importance of the vaccine more than those who read the base rate and mostly negative anecdotes, $t(133) = -3.020$, $p = 0.005$, and (3) be willing to support the promotion of the vaccine more than those who read the base rate and mostly negative anecdotes, $t(134) = -2.715$, $p = 0.007$ (see Tables 14-15).

3.5 TESTING ASSUMPTIONS IN PRIMARY ANALYSES

Kolmogorov-Smirnov (K-S) tests were conducted to test for normality in the dependent variables. K-S tests reached statistical significance for all dependent measures, indicating violations of normality. Quantile-Quantile (Q-Q) plots were also examined for these violations. Visually, the violations did not appear as obviously.

Levene's tests were conducted to indicate whether violations in the equality of variances occurred between conditions for the dependent variables. No violations in the homogeneity of variances were found for the dependent variables (p's > 0.05).

3.6 ANALYSES OF INDIRECT EFFECTS and MODERATION

An analysis was conducted to determine if significant missing data was present (i.e., over 50% of measures). After data cleaning (see Table 1), it was determined that multiple imputation (MI) was not necessary as missing values were between 0 and 5% for each variable. Missing values were replaced by the single imputation as simulation studies have demonstrated that this procedure produces similar values to regression and expectation maximization techniques when missing values fall below the 5% threshold (Ruben et al., 2007). The P-value was set at .05 and confidence intervals for parameters were estimated. To test the proposed mediation hypotheses,

bivariate correlations were computed to test associations between variables hypothesized to be significantly related for each of the positive and negative moderated mediation anecdote models followed by a path analysis and linear regression. Statistical software MPLUS and SPSS were used. Figures 1 and 2 present the models that were tested. The lines depict the corresponding associations that were tested to yield answers to the proposed hypotheses. Path analyses allowed for the estimation of direct effects to test the association between assignment to the type of information conditions, risk appraisal, and vaccination intentions and indirect effects to test the mediating effect of risk appraisal on the type of information assigned-behavioral intentions link. To test the moderating impact of numeracy on the type of information and risk appraisal link and the impact of reassurance or uncertainty on behavioral intentions, four linear regression equations were computed. Four interaction terms, two for type of information and risk appraisal (worry and regret) and two for reassurance and uncertainty and behavioral intentions were computed. The procedure delineated by Hayes (2018) was followed. Specifically, Hayes (2018) defined a moderation effect (W) as a statistically significant interaction term (X*W), regardless of whether W affects the outcome, Y. Hayes (2018) that a significant interaction should be probed by characterizing the moderating effect using the percentile approach that estimates the effect sizes of X on Y at different values of W. That is, it shows how the effect size of X on Y changes at the 10th, 25th, 50th, 75th, & 90th percentile value of W. Moreover, significant interactions should be probed using the Johnson-Neyman Technique. This technique shows on the continuum of values of a moderating variable where moderation took place (e.g., scores from 75-90th percentile). Through our approach, we allowed for the estimation of regions of statistical significance that provide a deeper level of detail for understanding the specific levels of the moderators that change the relationship. Mediation was tested as the cross-product of the a-path

coefficient (a = effect of X on M) and b-path coefficient (b = effect of M on Y). However, because there is no theoretical sampling distribution for the a*b cross-product, repeated bootstrapped samples yielding 1000 randomly generated estimates of the mediated effects (k=1000) are used to approximate an empirically derived sampling distribution that is then used to create a 95% confidence interval around the a*b effect. We applied a bias correction as the sampling distribution that is derived can be, and often is, skewed (i.e., confidence intervals are often asymmetrical with respect to the upper and lower bound estimates surrounding the mediated effect). All data was analyzed in the SPSS macro titled PROCESS (Hayes, 2012).

Bivariate correlations for experimental condition, emotion, and health belief variables for the sample assigned to the positive anecdote and base rate conditions is presented in Table 16. As Table 16 indicates, assignment of positive vs base rate was not significantly associated with any of the variables. Anticipated regret at imagining a lost opportunity to vaccinate if their child was diagnosed with cervical cancer (inaction regret) was positively related to feelings of reassurance about the benefits of vaccination ($r = 0.31$, $p < 0.01$), perceived effectiveness of the vaccine (HBM perceived benefits) ($r = 0.60$, $p < 0.01$), and numeracy ($r = 0.76$, $p < 0.01$), and vaccination likelihood ($r = 0.34$, $p < 0.01$). Feelings of reassurance about the benefits of vaccination were positively related to perceived risk of their child contracting HPV ($r = 0.34$, $p < 0.01$), perceived severity of their child being diagnosed with cervical cancer ($r = 0.31$, $p < 0.01$), and perceived vaccine effectiveness ($r = 0.56$, $p < 0.01$).

Results of the path analysis conducted to test mediation in the positive moderated mediation model are presented in Table 17. As Table 17 indicates, inaction regret was the only significant variable positively associated with vaccination likelihood ($\beta = 0.63$, $p < 0.001$). Consequently, hypothesis three for the positive mediation model was not corroborated. Table 18

presents the total effects partitioned by direct and indirect of the proposed mediator regret and indicates that regret was not a mediator. Tables 19 and 20 present the results of the moderation analysis for the positive moderated mediation model testing numeracy and reassurance as moderators. As Tables 19 and 20 indicate, interaction terms were not significant. Consequently, hypothesis three regarding the moderating effects of numeracy and reassurance were not corroborated.

Bivariate correlations for experimental condition, emotion, and health belief variables for the sample assigned to the negative anecdote and base rate conditions is in Table 21. As Table 21 indicates, assignment to the negative anecdote condition was positively associated with worry about side effects of the vaccine ($r = 0.20$, $p < 0.05$), uncertainty about potential serious side effects ($r = 0.21$, $p < 0.05$), and negatively associated with vaccination likelihood ($r = -0.28$, $p < 0.01$). Worry and uncertainty were positively related ($r = 0.63$, $p < 0.01$). However, numeracy was not significantly related to any of the variables. Worry about vaccine side effects was negatively related to the HBM constructs of perceived risk of their child contracting HPV ($r = -0.26$, $p < 0.01$) and perceived effectiveness of vaccination (perceived benefits) ($r = -0.61$, $p < 0.01$). Results of the path analysis conducted to test mediation in the negative anecdote moderated mediation model are presented Table 22. As Table 22 indicates, worry about side effects of the vaccine emerged as a significant indirect effect of vaccination likelihood when probed using process ($\beta = -10.3$, 95% CI: -19.02, -1.99) indicating the presence of mediation. Consequently, hypothesis three for the negative mediation model was corroborated. Tables 23 and 24 present the results of the moderation analysis for the negative moderated mediation model testing numeracy and uncertainty as moderators. As Tables 23 and 24 indicate, interaction terms

were not significant. Consequently, hypothesis three regarding the moderating effects was not corroborated.

3.7 POST-HOC ANALYSES

In addition, as a result of the significant mediation results in the negative anecdote mediation model, two post hoc analyses were conducted testing two exploratory models of the associations between the constructs tested in the negative anecdote mediation model and constructs of the health belief model (HBM) and the theory of planned behavior (TPB). The model tested incorporating constructs of the HBM is presented in Figure x and the model incorporating the constructs of the TPB is presented in Figure y. All variables were analyzed as observed variables. Values of <.05 for the Root Mean Square Error of Approximation (RMSEA) and >.95 for the Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI) are considered indices of good model fit (Byrne, 2013). Indices of fit for the negative anecdote mediation model depicting associations with the construct of the TPB were $\chi 2$ (6) = 7.07 $\chi 2/df$ = 1.18, p = .314; CFI =.99; TLI = .98; RMSEA = .036. These indices indicate that the model fit the data well. Direct effects for the model incorporating the constructs of the HBM is presented in Tables 26. As Table 26 indicates, all variables were significantly related with each other with the exception of perceived severity of cancer acquisition which was unrelated to worry about vaccine side effects and vaccination likelihood. Indices of fit for the model were $\chi 2$ (6) = 7.07 $\chi 2/df$ = 28.42, p = .001; CFI =.18; TLI = .20; RMSEA = .75. These indices indicate that the model did not fit the data well. Consequently, a table showing non-significant direct effects is not presented.

Chapter 4: Discussion

The present study contributes to an ongoing investigation into why some individuals may or may not choose to vaccinate their children. Despite the risks associated with an illness, certain factors deter individuals from taking preventative measures (National Cancer Institute, 2021). In the case of the present study, the type of information that individuals receive may impact their decision to vaccinate their child against the Human Papillomavirus (HPV).

The use of the internet has made access to information easy and affordable. When we once had to commute to a library or buy a paper to get the latest information, we can easily receive answers to our questions from an assortment of sources. This convenience has contributed positively in many ways. However, how does one make an informed decision when receiving conflicting information from various sources?

4.1 IMPACT OF ANECDOTAL VERSUS STATISTICAL EVIDENCE

The present study supports prior research regarding the relative impact of anecdotal and statistical information on health-related decision making. The presence of negative anecdotes, in addition to base rate information, does appear to impact an individual's perceived risk and health related intentions (Ubel et al., 2001; Bestch et al., 2011; Gutierrez, 2015; Coffman, 2015, Coffman, 2022). Individuals who received five negative anecdotes along with base rate information regarding HPV vaccine safety reported being less likely to have their child receive HPV vaccination compared to individuals who received only base rate information and as compared to individuals who read five positive anecdotes along with base rate information. Despite the safety of the vaccine outlined in the base rate information which included thousands of data points, individuals who read five negative anecdotal reports (i.e., equivalent of five extra data points) were less willing to vaccinate their child.

In addition, individuals who read mostly negative anecdotes with the base rate information indicated greater worry about vaccine side effects, more uncertainty about the vaccine side effects, and less reassurance about the benefits of the vaccine as compared to individuals who only read base rate information. Notably, there were no statistical differences on these variables between individuals who read mostly positive anecdotes with the base rate between either base rate only or mostly negative anecdotal condition.

Comparisons between experimental condition for constructs related to the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) revealed similar outcomes. For the HBM, individuals who read mostly negative anecdotal information had more concerns about the safety of the vaccine, the possible side effects of the vaccine, the age of the child getting vaccinated against a sexually transmitted infection, and the cost of the vaccine as compared to the base rate only and mostly positive anecdotal conditions. In addition, the mostly negative anecdotal condition reported less cues to action than the other two experimental conditions. For the TPB, individuals in the mostly negative condition reported less perceived control over their child's health and healthcare as compared to both other experimental conditions. In addition, the mostly negative anecdotal condition reported less behavioral intentions to vaccinate their child against HPV and less willingness to support the vaccine within their social network and community as compared to those who only read base rate information.

Tests of mediation indicated that worrying about side effects was mediating the relationship between experimental condition and vaccination likelihood. This is an important contribution to past research on the relative impact of statistical versus anecdotal information. This result may indicate that individuals rely on System 1, risk as feelings, when anecdotal evidence is presented about a health behavior or outcome (Fischhoff, Slovic, Lichtenstein, Read,

& Combs, 1978). In addition, further tests of the relationship between health belief model variables suggest that this worry could possibly dampen perceptions of effectiveness and perceived susceptibility of cancer acquisition. Worry about side effects of the HPV vaccine had direct effects on the likelihood to vaccinate their child, their perceived risk of their child getting cancer if they do not receive the vaccine, and their perceived effectiveness of the vaccine against HPV acquisition, HPV-related cancer, and genital warts.

Interestingly, the TPB variables tested were unrelated to vaccination likelihood and worry. This finding may suggest that perception of vaccine attributes and threat of disease may be the variables more likely to be affected by negative anecdotes about the HPV vaccine. The results indicating that worry did produce a mediating effect on behavioral intentions when individuals read negative anecdotal reports with the base rate information supports our prediction that some emotions account for the effect of anecdotal reports on behavioral intentions.
Our results suggest that positive anecdotes compared to negative anecdotes and base rate did not have a differential effect on likelihood of vaccination. This may suggest that the inclusion of a similar rate of positive anecdotes could counteract the negative effect of negative anecdotes.

However, our results did not suggest a possible mechanism of effect of the positive anecdotes as further tests of mediation suggest no effect on our proposed mechanism of action: Inaction regret (i.e., risk appraisal). Inaction regret did not emerge as a significant mediator. However, inaction regret did have a significant relationship on behavioral intentions. With more research, we may be able to find a means of bridging the relationship between positive anecdotal information and inaction regret so the mediating effect mirrors that of the negative affect model. Notably, numeracy did not contribute to either negative or positive affect model. However, a strong correlation was found between numeracy and inaction regret. There are a number of

statistical considerations for this including other contributing variables or predicted path analysis. One might speculate that because the positive anecdotal evidence was framed on cancer prevention, individuals did not feel they had any extra contributing information about vaccine side effects. Therefore, they were more apt to rely on statistical evidence and their numeracy skills when they formed their perception of risk with feelings. In this case, the perceived regret they would feel if their child did not get vaccinated against HPV and was later diagnosed with cancer or genital warts.

In this study, the type of information influenced an individual's decision-making regarding vaccination intentions. Past similar research on the effect of anecdotal information on likelihood of engaging in other health behaviors also suggests that the type of information influences decision-making. However, it is still an open question whether anecdotal information has the same impact on behaviors that have short versus long-term consequences. This has implications for how these findings can inform health behavior interventions. For example, in the case of recreational drug use, campaigns can highlight the benefits of prevention approach by highlighting the risks of engaging in the behavior such as having a "bad trip". These are short term consequences and may resonate because the side effects of engaging in the risk behavior are immediate. In comparison, vaccination is a proactive behavior and impacts long term outcomes. Although the HPV vaccine may prevent cervical cancer, can anecdotes truly highlight the benefits of vaccination in a way that resonates? Such as preventing HPV related cancer? The development of cancer and what that looks like for each person is an abstract future outcome. There are, however, many anecdotes that describe pain or sickness after receiving the vaccine. It is a different battle for health care providers and researchers, and the impact on decision-making will vary.

4.2 STRENGTHS

The present study allowed researchers to investigate an issue of growing concern, vaccination rates. Restrictions and advisories limited non-emergency interaction with healthcare during the Covid-19 pandemic. The HPV vaccination rate for adolescents decreased 4.9% during August and September (i.e., typically routine vaccination months) from 2019 to 2020 (Pingali, Yankey, Elam-Evans, et al., 2021). In addition, discussions on vaccination safety have re-opened with the addition of the COVID-19 vaccine.

The present study used real anecdotal evidence and statistical evidence retrieved from online websites. Many individuals have likely found the same type of information during their own web searches for health-related information.

The current study incorporated two popular health frameworks (i.e., HBM & TPB) to capture a more complete picture of where parents stand in their decision to vaccinate their child against HPV after encountering different types of information. The inclusion of risk appraisals, risk as feelings, and numeracy into the model tests was an innovative approach. Researchers should be encouraged to test similar models to provide a more holistic view on how information is processed and perceived to form health decisions.

4.3 LIMITATIONS

The current study assessed the behavioral intentions of participants but failed to provide participants with the opportunity to schedule appointments for their children to receive the HPV vaccination, which would have provided a more direct assessment of vaccine-related behavior. More generally, participants were asked to respond to hypothetical situations. When given an actual opportunity to vaccinate their child, participants may respond differently than the way they responded to hypothetical scenarios. In addition, when dealing with a sensitive topic such as

sexually transmitted infections, participants may not respond to questions honestly. We cannot be sure that individuals shared accurate information regarding their sexual and medical history.

The present study did not include descriptive items on the child such as gender identity, sex, sexual orientation, or sexual activity. Some of these factors may change the perception of risk that a parent has for their child contracting HPV. It could have been beneficial to investigate if parent and child gender pairings differed across conditions, too. For example, are fathers more or less likely to vaccinate their daughter against HPV? Does their opinion change if their daughter identifies as LBGTQ+?

The order of administration for measures may have also impacted the study results. Individuals completed the eHealth Literacy Scale (eHEALS) and the Subjective Numeracy Scale (SNS) after experimental information was presented. Although the results indicate the impact on numeracy scores was likely low as there were no differences between conditions on those composite scores, significant differences were found on the eHEALS. Administering these scales before experimental assignment is suggested for future replication.

4.4 FUTURE DIRECTIONS

Future studies should investigate how specific populations weigh the relative importance of anecdotal and base rate information on health-related decisions. For example, studies could focus on health disparate populations. Although thorough research exists on how vaccination rates differ between ethnic or socio-economic populations, little research has investigated the impact of anecdotal and statistical evidence on each sub-group. By establishing this comparison, a more culturally tailored presentation of evidence could be provided and, hopefully, provide a greater impact on behavioral intentions to vaccinate against HPV.

The target population should consist solely of individuals who have not been vaccinated or have children who have not been vaccinated yet. Research should also be conducted to examine if individual characteristics of children impact parental decisions to have their child vaccinated. For example, a parent is aware of their child's sexual activity. Does this impact their decision? Does the gender of the parent and the child have influence on reported vaccination likelihoods? These characteristics should be incorporated into model testing to examine their possible relationship in the level of worry or inaction regret that is experienced. In addition, researchers should begin to study how different types of health-related decisions are impacted by anecdotal and base rate information. Model testing should be completed on other vaccines or health behaviors (e.g., decisions to receive surgery).

Future research should include emotion inducing information in their studies. Health campaigns should consider using anecdotal information to aid in healthy decision-making. Health researchers may be able to counteract the effects of negative anecdotes on a positive health behavior by completing studies that vary the intensity of emotion or that address the decreased emotional responses to anecdotes describing prevention versus anecdotes describing adverse outcomes. At this point in time, variations of personally relevant and culturally tailored anecdotes should be studied to attempt to reduce the mediating effect of worry on vaccination decisions.

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Table 1. Screening requirements for participants on Prolific for study participation and inclusion

Screening/Inclusion Steps	Eligibility/ Participation	Criteria	Final Eligibility/ Participation
1. Prolific Filters		• Minimum age set to 22 • Maximum age set to 85 • Must be fluent in English • Must have a child • Youngest child must have been born between 2007-2014 • Must be located in the United States	*N* = 1,551 eligible on Prolific based on criteria
2. Prescreen Required for Primary Study	*N* = 611 participated	• Must be parent/guardian to at least 1 child • One child must be between 9-16 yrs. old • Must answer No or Not Sure to any of their children having received the HPV vaccine	*N* = 306 qualified/ invited to primary study
3. Post Data Collection Filters	*N* = 224 completed primary survey	• 3 cases removed from pilot testing • 11 cases removed because the duration was less than 5 minutes • 4 cases were removed because 50% or more of protocol was not completed	*N* = 206 final sample size included in analyses

Table 2. Three randomly assigned conditions by base rate and number of positive/negative anecdotes

Number of Positive/Negative Anecdotes		
Base rate only	**Base rate +** **5 pos /1 neg**	**Base rate +** **1 pos /5 neg**
Condition I	Condition II	Condition III

Table 3. Ease of reading scores by condition information

Reading Score	Base rate only	Base rate and 5 pos + 1 neg anecdotes	Base rate and 5 neg + 1 pos anecdotes
Flesch Reading Ease	56.1	79.5	75
Gunning Fog	11.3	8.2	9.1
Flesch-Kincaid Grade Level	8.9	5.4	6.4
Coleman-Liau Index	11	6	7
SMOG Index	8.4	6	6.6
Automated Readability Index	8.2	4.5	5.9
Linsear Write Formula	8.1	6.5	7.6
Grade Level Consensus	9	6	7
Reading Level Consensus	Fairly difficult to read	Easy to read	Fairly easy to read
Reader's Age Consensus	13-15 yrs. old	10-11 yrs. old	11-13 yrs. old

Table 4. Valence of positive and negative anecdotes by information set

Information Set	LIWC Positive Emotion	LIWC Negative Emotion
Base Rate	0.00%	0.84%
5 Positive & 1 Negative Anecdote	4.78%	1.20%
5 Negative & 1 Positive Anecdote	1.74%	3.36%

Note. The percentage represents the number of positive/negative words in proportion to the total number of words in each set of information

Table 5. Affect experienced after each piece of experimental information in averages

Condition	Base Rate	Positive Anecdote 1	Positive Anecdote 2	Positive Anecdote 3	Positive Anecdote 4	Positive Anecdote 5	Negative Anecdote 6	Negative Anecdote 7	Negative Anecdote 8	Negative Anecdote 9
Condition 1	4.49 Moderately Positive									
Condition 2	3.94 Slightly Positive	3.36 Slightly Unpleasant	3.33 Slightly Unpleasant	3.62 Slightly Pleasant	3.43 Slightly Unpleasant	3.61 Slightly Pleasant	3.72 Slightly Pleasant			
Condition 3	4.42 Slightly Positive		2.18 Moderately Unpleasant				2.32 Moderately Unpleasant	1.96 Moderately Unpleasant	2.34 Moderately Unpleasant	2.27 Moderately Unpleasant
Total Average	4.28 Slightly Positive		2.76 Slightly Unpleasant				3.03 Slightly Unpleasant			

Note. The scale was from 1 (extremely negative/most unpleasant imaginable) to 6 (extremely positive/most pleasant imaginable); reported averages were rounded for descriptive labeling; total averages were computed for pieces of information given to multiple conditions

Table 6. Participant characteristics for total sample and by study condition

Characteristic	Overall Sample (*N* = 206) *N* (%)	Base Rate Only (*n* = 69) *N* (%)	Base Rate and 5 pos + 1 neg anecdotes (*n* = 69) *N* (%)	Base Rate and 5 neg + 1 pos anecdotes (*n* = 68) *N* (%)
Age				
25-30 years	10 (4.9)	5 (7.2)	1 (1.4)	4 (6.0)
31-40 years	74 (36.1)	27 (39.2)	30 (43.5)	17 (25.3)
41-50 years	87 (42.4)	25 (36.2)	26 (37.7)	36 (53.8)
51-60 years	30 (14.6)	11 (16.0)	10 (14.5)	9 (13.4)
61-72 years	4 (2.0)	1 (1.4)	2 (2.8)	1 (1.5)
Gender				
Male	98 (47.6)	32 (46.4)	31 (44.9)	35 (51.5)
Female	105 (51.0)	35 (50.7)	38 (55.1)	32 (47.1)
Trans Male/ Trans Man	1 (0.5)	1 (1.4)	0 (0)	0 (0)
Non-binary/ third gender	2 (1.0)	1 (1.4)	0 (0)	1 (1.5)
Sex				
Male	98 (47.6)	32 (46.4)	31 (44.9)	35 (51.5)
Female	108 (52.4)	37 (53.6)	38 (55.1)	33 (48.5)

Ethnicity				
Spanish or Hispanic/Latino	18 (8.7)	7 (10.1)	4 (5.8)	7 (10.3)
White or Caucasian	163 (79.1)	60 (87.0)	55 (79.7)	48 (70.6)
Black	26 (12.6)	4 (5.8)	13 (18.8)	9 (13.2)
American Indian/ Native American or Alaska Native	3 (1.5)	0 (0)	2 (2.9)	1 (1.5)
Asian	10 (4.9)	0 (0)	4 (5.8)	6 (8.8)
Native Hawaiian or Other Pacific Islander	1 (0.5)	0 (0)	1 (1.4)	0 (0)
Sexual Orientation				
Heterosexual or straight	174 (84.5)	53 (76.8)	61 (88.4)	60 (88.2)
Gay	1 (0.5)	0	0 (0)	1 (1.5)
Lesbian	2 (1.0)	1 (1.4)	1 (1.4)	0 (0)
Bisexual	22 (10.7)	12 (17.4)	5 (7.2)	5 (7.4)
Asexual/ Demisexual	1 (0.5)	0 (0)	1 (1.4)	0 (0)
Pansexual	2 (1.0)	1 (1.4)	0 (0)	1 (1.5)
Queer	2 (1.0)	1 (1.4)	0 (0)	1 (1.5)
Prefer not to say	2 (1.0)	1 (1.4)	1 (1.4)	0 (0)
Relationship Status				
Single, Never Married	20 (9.7)	6 (8.7)	11 (15.9)	3 (4.4)
In a Relationship	9 (4.4)	7 (10.1)	1 (1.4)	1 (1.5)
Living w/ Partner	16 (7.8)	6 (8.7)	5 (7.2)	5 (7.4)
Married	130 (63.1)	39 (56.5)	42 (60.9)	49 (72.1)
Divorced/ Separated	30 (14.6)	10 (14.5)	10 (14.5)	10 (14.7)
Highest Education				
HS Diploma or GED	26 (12.6)	11 (15.9)	8 (11.6)	7 (10.3)
Some College, No Degree	48 (23.3)	18 (26.1)	18 (26.1)	12 (17.6)
Associates or Technical Degree	25 (12.1)	9 (13.0)	9 (13.0)	7 (10.3)
Bachelor's Degree	77 (37.4)	23 (33.3)	26 (37.7)	28 (41.2)
Graduate or Professional Degree	30 (14.6)	8 (11.6)	8 (11.6)	14 (20.6)

Household Income				
Less than $25,000	22 (10.7)	8 (11.6)	8 (11.6)	6 (8.8)
$25,000 - 49,999	44 (21.4)	16 (23.2)	18 (26.1)	10 (14.7)
$50,000 - 74,999	43 (20.9)	17 (24.6)	14 (20.3)	12 (17.6)
$75,000 - 99,999	39 (18.9)	12 (17.4)	12 (17.4)	15 (22.1)
$100,000 – 149,999	33 (16.0)	8 (11.6)	10 (14.5)	15 (22.1)
$150,000 or more	23 (11.2)	7 (10.1)	6 (8.7)	10 (14.7)
Prefer not to say	1 (0.5)	1 (1.4)	0 (0)	0 (0)
Children in Household Under 18				
0 children *live* with them	6 (2.9)	2 (2.9)	2 (2.9)	2 (2.9)
1 child	100 (48.5)	33 (47.8)	34 (49.3)	33 (48.5)
2 children	73 (35.4)	23 (33.3)	24 (34.8)	26 (38.2)
3 children	21 (10.2)	8 (11.6)	8 (11.6)	5 (7.4)
4 children	4 (1.9)	3 (4.3)	0 (0)	1 (1.5)

Table 7. Chi-square test of independence across conditions for sex and adverse vaccination events

Topic	Response	N Base Rate Only	N Base Rate and 5 pos + 1 neg anecdotes	N Base rate and 5 neg + 1 pos anecdotes	Pearson Chi-Square	df	Significance
Sex	Male Female	32 37	31 38	35 33	0.647	2	0.723
Had an adverse reaction to HPV vaccine	I did Someone I know did A friend of a friend did No one I know has	0 4 3 61	2 2 4 60	1 3 2 62	3.366	6	0.762

Note: *$p < 0.05$, indicating significant differences in distribution among conditions

Table 8. Descriptive characteristics of items for total sample and their pairing to constructs of the Theory of Planned Behavior (TPB) or the Health Belief Model (HBM)

Measure	Response	*N* (%)	*M*	*SD*	Theory/Model Proposed Construct
How likely are you to get your child vaccinated against HPV?	0 % likely 1 - 25 26 - 50 51 – 75 76 – 99 100	15 (7.5) 34 (17.1) 17 (8.6) 46 (23.1) 47 (23.6) 40 (20.1)	60.14	36.33	Behavioral intentions
How reassured do you feel about the benefits of vaccinating your child?	Extremely reassured (1) Very reassured (2) Moderately reassured (3) Slightly reassured (4) Not at all reassured (5)	42 (20.4) 42 (20.4) 34 (16.5) 52 (25.2) 36 (17.5)	2.99	1.41	
How uncertain do you feel that the vaccine may cause serious side-effects to your child if you vaccinate him/her?	Extremely uncertain (1) Very uncertain (2) Moderately uncertain (3) Slightly uncertain (4) Not at all uncertain (5)	14 (6.8) 32 (15.5) 42 (20.4) 76 (36.9) 42 (20.4)	3.49	1.18	
How serious would it be if your child got cervical cancer or penile cancer?	Slightly serious (1) Moderately serious (2) Very serious (3) Extremely serious (4)	2 (1) 14 (6.8) 41 (20) 148 (72.2)	3.63	0.66	HBM Perceived severity
Without the vaccine, what do you think is the chance that your child will get cervical cancer or penile cancer in the future?	No chance (1) Low chance (2) Moderate chance (3) High chance (4)	4 (1.9) 135 (65.5) 54 (26.2) 13 (6.3)	2.37	0.63	HBM Perceived susceptibility

How effective do you think the HPV vaccine is in preventing genital warts?	Not at all effective (1) Somewhat effective (2) Moderately effective (3) Extremely effective (4)	18 (8.7) 32 (15.5) 80 (38.8) 76 (36.9)	3.04	0.94	HBM Perceived effectiveness/ benefits
How effective do you think the HPV vaccine is in preventing cervical or penile cancer?	Not at all effective (1) Somewhat effective (2) Moderately effective (3) Extremely effective (4)	11 (5.3) 37 (18) 85 (41.3) 73 (35.4)	3.07	0.86	HBM Perceived effectiveness/ benefits
How much would you regret that you did not give your child the HPV vaccine?	None at all (1) A little (2) A moderate amount (3) A lot (4) A great deal (5)	11 (5.3) 14 (6.8) 15 (7.3) 40 (19.4) 126 (61.2)	4.24	1.18	
How worried are you about giving the HPV vaccine to your child?	None at all (1) A little (2) A moderate amount (3) A lot (4) A great deal (5)	32 (15.5) 67 (32.5) 34 (16.5) 32 (15.5) 41 (19.9)	2.92	1.38	
At what age would you vaccinate your child against HPV?	Age 6 – 9 10 – 13 14 – 17 18 – 21 22 – 25 26 or older	 19 (9.3) 108 (53) 52 (25.4) 19 (9.4) 1 (0.5) 5 (2.5)	15 years	12.99	TPB Behavioral Intentions
How often have you visited Twitter to read or make a post?	Never (1) Once a week (2) 2-3 times a week (3) 4-6 times a week (4) Daily (5)	40 (19.5) 66 (32.2) 43 (21.0) 17 (8.3) 39 (19.0)	2.75	1.38	

How believable do you find information posted to social media?	Extremely Unbelievable (1) Somewhat unbelievable (2) Neutral (3) Somewhat believable (4) Extremely believable (5)	14 (6.8) 44 (21.5) 85 (41.5) 58 (28.3) 4 (2.0)	2.97	0.92	
I have concerns about whether the HPV vaccine is safe.	Agree (1) Disagree (2)	126 (61.8) 78 (38.2)	1.38	0.49	HBM Perceived harm/barrier
I have concerns about whether the HPV vaccine is effective.	Agree (1) Disagree (2)	80 (39) 125 (61)	1.61	.49	
I have concerns about possible side effects of the HPV vaccine.	Agree (1) Disagree (2)	148 (72.2) 57 (27.8)	1.28	0.45	HBM Perceived harm/barrier
The HPV vaccine may have long-term side effects.	Agree (1) Disagree (2)	135 (65.9) 70 (34)	1.34	0.48	HBM Perceived harm/barrier
There hasn't been enough research done on the HPV vaccine.	Agree (1) Disagree (2)	85 (41.7) 119 (58.3)	1.58	0.49	
The vaccine only protects against some types of HPV.	Agree (1) Disagree (2)	85 (41.3) 120 (58.3)	1.59	0.49	
The vaccine is too expensive.	Agree (1) Disagree (2)	27 (13.2) 178 (86.8)	1.87	0.34	HBM Self-efficacy TPB Perceived control
The vaccine is being pushed to make money for drug companies.	Agree (1) Disagree (2)	68 (33.5) 135 (66.5)	1.67	0.47	HBM Perceived harm/barrier
My insurance does not cover HPV vaccine.	Agree (1) Disagree (2)	27 (13.2) 178 (86.8)	1.87	0.34	

My insurance does not cover enough of the vaccine.	Agree (1) Disagree (2)	30 (14.8) 173 (85.2)	1.85	0.36	
I'm not sure how to file the insurance claim to get reimbursed.	Agree (1) Disagree (2)	38 (18.6) 166 (81.4)	1.81	0.39	
I've heard it hurts a lot to receive the HPV shot.	Agree (1) Disagree (2)	25 (12.3) 179 (87.7)	1.88	0.33	
I have concerns that my child may faint if they get the HPV shot.	Agree (1) Disagree (2)	41 (20.1) 163 (79.9)	1.80	0.40	
My child has a fear of shots and needles.	Agree (1) Disagree (2)	73 (35.4) 132 (64.1)	1.64	0.48	
I don't think my child needs the HPV vaccine.	Agree (1) Disagree (2)	62 (30.2) 143 (69.8)	1.70	0.46	
My child will be abstinent (not have sex) until marriage.	Agree (1) Disagree (2)	34 (16.6) 171 (83.4)	1.83	0.37	
My child will only have one sexual partner in their lifetime.	Agree (1) Disagree (2)	30 (14.6) 175 (85.4)	1.85	0.35	
Getting the HPV shot takes too much time.	Agree (1) Disagree (2)	10 (4.9) 193 (95.1)	1.95	0.22	
I'm not sure where to get the HPV shot.	Agree (1) Disagree (2)	22 (10.7) 183 (89.3)	1.89	0.31	
Getting the HPV vaccine will make my child more likely to have sex.	Agree (1) Disagree (2)	11 (5.3) 193 (93.7)	1.95	0.23	HBM Perceived harm/barrier

My child is too young to get a vaccine for a sexually transmitted infection like HPV.	Agree (1) Disagree (2)	56 (27.3) 149 (72.7)	1.73	0.45	HBM Perceived harm/barrier
How hard do you think it would be to find a provider or clinic where you can afford the vaccine?	Extremely hard (1) Moderately hard (2) Somewhat hard (3) Somewhat easy (4) Moderately easy (5) Extremely easy (6)	3 (1.5) 1 (0.5) 7 (3.4) 35 (17.1) 61 (29.8) 98 (47.8)	5.17	1.02	HBM Self-efficacy
How hard do you think it would be to find a provider or clinic that is easy to get to?	Extremely hard (1) Moderately hard (2) Somewhat hard (3) Somewhat easy (4) Moderately easy (5) Extremely easy (6)	2 (1) 4 (2) 5 (2.4) 30 (14.6) 60 (29.3) 104 (50.7)	5.21	1.02	HBM Self-efficacy
How hard do you think it would be to find a provider or clinic that has the vaccine available?	Extremely hard (1) Moderately hard (2) Somewhat hard (3) Somewhat easy (4) Moderately easy (5) Extremely easy (6)	1 (0.5) 1 (0.5) 3 (1.5) 40 (19.4) 61 (29.6) 98 (47.6)	5.22	0.90	HBM Self-efficacy
For me, vaccinating my child against HPV is possible.	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	124 (60.5) 36 (17.6) 30 (14.6) 7 (3.4) 4 (1.9) 4 (1.9)	1.75	1.15	TPB Perceived power
If I wanted to get my child vaccinated in the next 6 months, it would be easy.	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4)	129 (62.9) 34 (16.6) 27 (13.2) 10 (4.9)	1.69	1.09	HBM Self-efficacy TPB Perceived power

	Moderately disagree (5) Completely disagree (6)	2 (1) 3 (1.5)			
How much control do you have over your child getting vaccinated?	Complete control (1) Moderate control (2) Some control (3) No control (4)	143 (69.8) 47 (22.9) 11 (5.4) 4 (2)	1.40	0.68	TPB Perceived control
Is vaccinating your child… necessary?	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	73 (36) 44 (21.7) 37 (18.2) 19 (9.4) 10 (4.9) 20 (9.7)	2.55	1.63	TPB Attitudes
Is vaccinating your child… a good idea?	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	90 (44.6) 38 (18.8) 33 (16.3) 13 (6.4) 14 (6.8) 14 (6.8)	2.33	1.58	TPB Attitudes
Is vaccinating your child… beneficial?	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	87 (43.3) 42 (20.4) 37 (18) 12 (5.8) 11 (5.3) 12 (5.8)	2.27	1.50	TPB Attitudes
I will recommend the HPV vaccine to my family and friends.	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	55 (27.1) 29 (14.3) 45 (22.2) 36 (17.7) 13 (6.4) 25 (12.3)	2.99	1.50	TPB Subjective norms

I will speak to others I know about the importance of the HPV vaccine.	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	42 (20.8) 30 (14.9) 54 (26.7) 40 (19.8) 12 (5.9) 24 (11.9)	3.11	1.58	TPB Social norms
I would be willing to support health fairs promoting HPV vaccinations.	Completely agree (1) Moderately agree (2) Somewhat agree (3) Somewhat disagree (4) Moderately disagree (5) Completely disagree (6)	41 (20.2) 25 (12.3) 50 (24.6) 42 (20.7) 12 (5.9) 33 (16.3)	3.29	1.66	TPB Subjective norms
Attend an annual doctor visit	I have My child has Neither of us	146 (70.9) 187 (90.8) 8 (3.9)			
Received all required vaccinations	I have My child has Neither of us	152 (73.8) 172 (83.5) 18 (8.7)			
Receives a yearly flu vaccine	I have My child has Neither of us	83 (40.3) 104 (50.5) 83 (40.3)			
Been recommended for the HPV vaccine by a health professional	I have My child has Neither of us	23 (11.2) 85 (41.3) 109 (52.9)			HBM Cue to action
Received the HPV vaccine	I have My child has Neither of us	24 (11.7) 28 (13.6) 155 (75.2)			

Received the COVID-19 vaccine	I have My child has Neither of us	137 (66.5) 109 (52.9) 58 (28.2)			
Experienced a bad reaction to a vaccine	I have My child has Neither of us	32 (15.5) 19 (9.2) 159 (77.2)			
Been diagnosed as immunocompromised	I have My child has Neither of us	14 (6.8) 4 (1.9) 185 (89.8)			
Been diagnosed with HPV	I have My child has Neither of us	22 (10.7) 2 (1) 178 (86.4)			
Been diagnosed with a different sexual transmitted infection	I have My child has Neither of us	14 (6.8) 3 (1.5) 186 (90.3)			
Been diagnosed with HPV-related cancer	I have My child has Neither of us	1 (0.5) 2 (1) 198 (96.1)			HBM Cue to action
Been diagnosed with genital warts	I have My child has Neither of us	10 (4.9) 1 (0.5) 190 (92.2)			HBM Cue to action
Who makes most of the health decisions for your family?	I do My significant other/ partner A different family member- Divorced spouse Someone else- joint decision between partners	168 (82.4) 29 (14.2) 3 (1.4) 4 (2)			TPB Perceived control

Have you or anyone you know experienced an adverse reaction to the HPV vaccine?	I did Someone I know did A friend of a friend did No one I know has	3 (1.5) 9 (4.4) 9 (4.4) 183 (89.7)			
How old was the person when they experienced the adverse reaction to the HPV vaccine?	Between 9-16 years old Between 16-26 years old Over 25 years old I don't know	10 (55.6) 6 (33.3) 1 (5.6) 1 (5.6)			
How severe was your/their reaction to the HPV vaccine?	Minor Severe I don't know	9 (42.9) 11 (52.4) 1 (4.8)			

Table 9. One-way ANOVA for group comparison across primary variables and supplemental scales

Measure	**Base Rate Only**		**Base Rate and 5 pos + 1 neg anecdotes**		**Base rate and 5 neg + 1 pos anecdotes**		***F*** **(df_1, df_2)**	**η^2**
	M	***SD***	***M***	***SD***	***M***	***SD***		
Behavioral Intentions	71.45	33.24	61.66	34.61	47.13	37.35	8.078** (2, 198)	0.008
Inaction Regret	4.42	1.05	4.20	1.26	4.10	1.21	1.309 (2, 205)	0.013
Worry	2.59	1.32	2.91	1.38	3.25	1.38	3.989* (2, 205)	0.038
Reassurance	2.65	1.38	2.93	1.35	3.40	1.41	5.097* (2, 205)	0.048
Uncertainty	3.75	1.09	3.49	1.184	3.21	1.20	3.820* (2, 205)	0.036
Seriousness of Child Getting Cancer	3.72	0.51	3.62	0.73	3.56	0.70	1.13 (2, 204)	0.011
Chance of Cancer without Vaccine	2.36	0.59	2.36	0.64	2.38	0.67	0.02 (2, 205)	0.000
Effectiveness Preventing Genital Warts	3.20	0.92	3.06	0.91	2.85	0.97	2.45 (2, 205)	0.024

Effectiveness Preventing Cancer	3.20	0.85	3.03	0.86	2.97	0.88	1.35 (2, 205)	0.13
HPV Knowledge Questionnaire Score	10.48	2.12	10.77	1.56	10.53	1.77	0.492 (2, 205)	0.005
eHEALS Score	35.05	4.27	34.54	4.10	32.73	4.77	5.144* (2, 200)	0.049
Subjective Numeracy Scale Score	30.85	6.01	30.00	6.68	29.91	5.27	0.506 (2, 200)	0.005

Note: *$p < 0.05$ and **$p < 0.005$ indicating significant differences between conditions

Table 10. Post-hoc *t*-tests using Tukey's HSD to determine differences in primary variables between groups

Variable	**Item**	**C1 vs. C2** ***t*(df)**	**C2 vs. C3** ***t*(df)**	**C1 vs. C3** ***t*(df)**
Behavioral Intentions	How likely are you to get your child vaccinated against HPV in the next year?	$t(131) = 1.66$, $p = 0.98$	$t(130) = 2.32$, $p = 0.02$*	$t(131) = 3.97$, $p = 0.00$**
Risk Appraisal	How worried are you about giving the HPV vaccine to your child?	$t(136) = 1.39$, $p = 0.17$	$t(135) = 1.43$, $p = 0.16$	$t(135) = 2.85$, $p = 0.005$*
Feelings of Risk	How reassured do you feel about the benefits of vaccinating your child?	$t(136) = 1.18$, $p = 0.24$	$t(135) = 1.99$, $p = 0.48$	$t(135) = 3.13$, $p = 0.002$**
	How uncertain do you feel about that the vaccine may cause serious side-effects to your child if you vaccinate him/her?	$t(136) = 1.35$, $p = 0.18$	$t(135) = 1.41$, $p = 0.16$	$t(135) = 2.79$, $p = 0.006$*

Note: *$p < 0.05$ and **$p < 0.005$ indicating significant differences between conditions; C1 was base rate only condition; C2 was base rate plus mostly positive anecdotes condition; C3 was base rate plus mostly negative anecdotes condition

Table 11. Post hoc *t*-tests using Tukey's HSD to determine differences in eHealth literacy between groups

eHEALS Composite Score	**N**	**Mean**	**SD**	**St. Error**	**Base Rate Only**	**Base Rate + 5 Positive/1 Negative Anecdote**
Base Rate Only	67	35.05	4.27	0.52		
Base Rate + 5 Positive/1 Negative Anecdote	67	34.54	4.10	0.50	$t(132) = 0.70$, $p = 0.48$	
Base Rate + 5 Negative/1 Positive Anecdote	67	32.73	4.77	0.58	$t(132) = 2.96$, $p = 0.004$**	$t(132) = 2.35$, $p = 0.2$

Note: $p^* < 0.05$; $p^{**} < 0.005$, indicating significant differences in eHealth literacy between groups; larger means indicate greater literacy

Table 12. One-way ANOVA and Chi-square tests for Health Belief Model items by construct

Construct	Item	Base Rate Only		Base Rate and 5 pos + 1 neg anecdotes		Base rate and 5 neg + 1 pos anecdotes		F (df_1, df_2) or χ^2 (df)
		M	*SD*	*M*	*SD*	*M*	*SD*	
Seriousness/ Susceptibility	How serious would it be if your child got cervical cancer?	3.70	0.548	3.61	0.738	3.56	0.699	0.794 (2, 204)
	What do you think is the chance that your child will get cervical or penile cancer?	2.36	0.591	2.38	0.624	2.38	0.670	0.964 (2, 204)
Effectiveness/ Benefits	How effective do you think the HPV vaccine is in preventing cervical or penile cancer?	3.17	0.884	3.01	0.855	2.97	0.880	1.011 (2, 205)
	How effective do you think the HPV vaccine is in preventing genital warts?	3.17	0.947	3.04	0.905	2.85	0.966	2.003 (2, 205)
Harms/ Barriers	I have concerns about whether the vaccine is safe.	32 agree		44 agree		51 agree		χ^2 (1) = 11.712**
	I have concerns about the possible side effects of the HPV vaccine.	44 agree		48 agree		57 agree		χ^2 (1) = 41.087**
		38 agree		45 agree		53 agree		

	The HPV vaccine may have long-term side effects.				χ^2 (1) = 21.146**
	The vaccine is being pushed to make money for drug companies.	25 agree	20 agree	24 agree	χ^2 (1) = 21.353**
	Getting the HPV vaccine will make my child more likely to have sex.	2 agree	5 agree	4 agree	χ^2 (1) = 163.361**
	My child is too young to get a vaccine for a sexually transmitted infection like HPV.	12 agree	22 agree	22 agree	χ^2 (1) = 42.893**
Self-efficacy	How hard do you think it would be to find a provider or clinic where you can afford the vaccine?	5.26 1.086	5.22 0.808	5.03 1.133	0.986 (2, 205)
	How hard do you think it would be to find a provider or clinic that is easy to get to?	5.29 1.092	5.19 0.918	5.18 1.050	0.232 (2, 205)
	How hard to you think it would be to find a provider or clinic that has the vaccine available?	5.36 0.901	5.13 0.886	5.18 0.913	1.192 (2, 204)

	If I wanted to get my child vaccinated in the next 6 months, it would be easy.	1.53 1.073	1.60 0.995	1.93 1.163	2.635 (2, 205)
	The vaccine is too expensive.	9 agree	4 agree	15 agree	χ^2 (1) = 109.223**
Cues to Action	I have been recommended for the HPV vaccine by a health professional	5 have	9 have	9 have	χ^2 (1) = 124.272**
	My child has been recommended for the HPV vaccine by a health professional	34 have	34 have	25 have	χ^2 (1) = 6.291*
	Neither of us have been recommended for the HPV vaccine by a health professional	32 have not	40 have not	38 have not	χ^2 (1) = 0.951
	I have been diagnosed with HPV-related cancer	0 have	1 has	0 have	χ^2 (1) = 202.019**
	My child has been diagnosed with HPV-related cancer	0 have	1 has	1 has	χ^2 (1) = 198.078**
	Neither of us have been diagnosed with HPV-related cancer	69 have not	65 have not	65 have not	χ^2 (1) = 178.951**

	I have been diagnosed with genital warts	5 have	2 have	3 have	$\chi^2(1) = 167.942$**
	My child has been diagnosed with genital warts	0 have	1 has	0 have	$\chi^2(1) = 202.019$**
	Neither of us have been diagnosed with genital warts	64 have not	64 have not	63 have not	$\chi^2(1) = 150.369$**

Note: *$p < 0.05$ and **$p < 0.005$ indicating significant differences between conditions

Table 13. Post-hoc Chi-square tests for group comparisons of the Health Belief Model items by construct

Construct	**Item**	**C1 vs. C2** **χ^2 (df)** ***n***	**C2 vs. C3** **χ^2 (df)** ***n***	**C1 vs. C3** ***t*(df)** or **χ^2 (df)** ***n***
Harm/Barriers	I have concerns about whether the vaccine is safe.	χ^2 (1) = 1.642	χ^2 (1) = 22.407**	χ^2 (1) = 5.681
	I have concerns about the possible side effects of the HPV vaccine.	χ^2 (1) = 15.333**	χ^2 (1) = 40.265**	χ^2 (1) = 29.681**
	The HPV vaccine may have long-term side effects.	χ^2 (1) = 5.681	χ^2 (1) = 26.471**	χ^2 (1) = 14.029**
	The vaccine is being pushed to make money for drug companies.	χ^2 (1) = 16.124**	χ^2 (1) = 15.791**	χ^2 (1) = 11.102**
	Getting the HPV vaccine will make my child more likely to have sex.	χ^2 (1) = 110.431**	χ^2 (1) = 102.382**	χ^2 (1) = 114.051**
	My child is too young to get a vaccine for a sexually transmitted infection like HPV.	χ^2 (1) = 35.507**	χ^2 (1) = 16.941**	χ^2 (1) = 35.507**
Self-efficacy	The vaccine is too expensive.	χ^2 (1) = 90.889**	χ^2 (1) = 70.618**	χ^2 (1) = 56.696**

Cues to Action	I have been recommended for the HPV vaccine by a health professional	$\chi^2(1) = 87.681$**	$\chi^2(1) = 73.529$**	$\chi^2(1) = 87.681$**
	My child has been recommended for the HPV vaccine by a health professional	$\chi^2(1) = 2.348$	$\chi^2(1) = 8.500$**	$\chi^2(1) = 2.899$
	I have been diagnosed with HPV-related cancer	$\chi^2(1) = 134.029$**	$\chi^2(1) = 132.029$**	$\chi^2(1) = 0$
	My child has been diagnosed with HPV-related cancer	$\chi^2(1) = 134.029$**	$\chi^2(1) = 128.118$**	$\chi^2(1) = 134.029$**
	Neither of us have been diagnosed with HPV-related cancer	$\chi^2(1) = 122.464$**	$\chi^2(1) = 116.735$**	$\chi^2(1) = 122.464$**
	I have been diagnosed with genital warts	$\chi^2(1) = 111.420$**	$\chi^2(1) = 132.059$**	$\chi^2(1) = 107.855$**
	My child has been diagnosed with genital warts	$\chi^2(1) = 134.029$**	$\chi^2(1) = 132.029$**	$\chi^2(1) = 0$
	Neither of us have been diagnosed with genital warts	$\chi^2(1) = 100.899$**	$\chi^2(1) = 102.382$**	$\chi^2(1) = 97.507$**

Note: A Bonferroni correction was used to determine significant differences, *$p < 0.017$ and **$p < 0.005$ indicating significant differences between conditions

Table 14. One-way ANOVA and Chi-square tests for the Theory of Planned Behavior Model items by construct

Construct	Item	Base Rate Only		Base Rate and 5 pos + 1 neg anecdotes		Base rate and 5 neg + 1 pos anecdotes		F (df_1, df_2) or χ^2 (df)
		M	*SD*	*M*	*SD*	*M*	*SD*	
Behavioral Intentions	How likely are you to get your child vaccinated against HPV?	70.43	34.05	61.70	34.87	47.13	37.35	7.373** (2, 198)
	At what age would you vaccinate your child against HPV?	16.11	17.03	15.54	14.18	13.57	3.29	0.716 (2, 203)
Perceived Power/ Control	Vaccinating my child against HPV is possible.	1.66	1.153	1.60	0.949	1.97	1.293	2.065 (2, 205)
	If I wanted to get my child vaccinated in the next 6 months, it would be easy.	1.53	1.073	1.60	0.995	1.93	1.163	2.635 (2, 205)
	How much control do you have over your child getting vaccinated?	1.37	0.663	1.43	0.719	1.38	0.670	0.124 (2, 205)
	Who makes most of the health decisions for your family?	*n* = 70		*n* = 68		*n* = 68		χ^2 (3) = 369.42**
	The vaccine is too expensive.	*n* = 70		*n* = 68		*n* = 68		χ^2 (2) = 109.223**

Attitudes	Is vaccinating your child necessary?	2.29	1.554	2.50	1.607	2.90	1.680	2.462 (2, 203)
	Is vaccinating your child a good idea?	2.01	1.510	2.34	1.513	2.67	1.673	2.991 (2, 202)
	Is vaccinating your child beneficial?	2.04	1.509	2.18	1.346	2.63	1.584	2.850 (2, 201)
Subjective/ Social Norms	I will recommend the HPV vaccine to my family and friends	2.58	1.675	3.04	1.652	3.37	1.594	4.018* (2, 203)
	I will speak to others I know about the importance of the HPV vaccine	2.72	1.647	3.10	1.556	3.52	1.429	4.535* (2, 202)
	I would be willing to support health fairs promoting HPV vaccinations	2.97	1.680	3.18	1.648	3.73	1.582	3.906* (2, 203)

Note: *$p < 0.05$ and **$p < 0.005$ indicating significant differences between conditions

Table 15. Post-hoc *t*-tests and Chi-square tests for group comparisons of the Theory of Planned Behavior items by construct

Construct	Item	C1 vs. C2 *t*(df) or χ^2 (df)	C2 vs. C3 *t*(df) or χ^2 (df)	C1 vs. C3 *t*(df) or χ^2 (df)
Behavioral Intentions	How likely are you to get your child vaccinated against HPV?	$t(131) = 1.66$, $p = 0.98$	$t(130) = 2.32$, $p = 0.02$	$t(131) = 3.97$, $p = 0.00$**
Perceived Power/ Control	Who makes most of the health decisions for your family?	$\chi^2(3) = 242.416$**	$\chi^2(3) = 249.588$**	$\chi^2(2) = 151.066$**
	The vaccine is too expensive.	$\chi^2(1) = 90.889$**	$\chi^2(1) = 70.618$**	$\chi^2(1) = 58.696$**
Subjective/ Social Norms	I will recommend the HPV vaccine to my family and friends	$t(135) = -1.634$, $p = 0.105$	$t(133) = -1.177$, $p = 0.241$	$t(134) = -2.828$, $p = 0.005$**
	I will speak to others I know about the importance of the HPV vaccine	$t(134) = -1.392$, $p = 0.166$	$t(133) = -1.631$, $p = 0.105$	$t(133) = -3.020$, $p = 0.005$**
	I would be willing to support health fairs promoting HPV vaccinations	$t(135) = -0.723$, $p = 0.471$	$t(133) = -1.995$, $p = 0.048$	$t(134) = -2.715$, $p = 0.007$**

Note: A Bonferroni correction was used to determine significant differences, *$p < 0.017$ and **$p < 0.005$ indicating significant differences between conditions

Table 16. Bivariate Correlations ($N = 138$)

	2	3	4	5	6	7	8	9
1. Positive Anecdote vs Base Rate	-.07	.09	.02	-.06	-.09	.04	-.15	-.12
2. Inaction Regret		**.34****	**.31****	-.03	**.60****	-.06	**.76****	**.34****
3. Reassurance about Benefits			**.34****	**.31****	**.56****	-.03	-.06	**.76****
4. Perceived Risk (HMB)				.08	**.58****	.04	-.06	**.40****
5. Perceived Severity (HMB)					**.34****	-.05	.10	**.37****
6. Perceived Effectiveness (HBM)						-.02	.06	**.58****
7. Perceived Control (HBM)							.00	.04
8. Numeracy								.05
9. Vaccination Likelihood								**--**

Note. **$p<0.01$. Assignment to positive anecdote condition was coded as 1 and assignment to base rate condition was coded as 0. Inaction regret = anticipated feelings of regret if parent decided not to vaccinate and child were to acquire cancer. Reassurance about benefits = reassurance about the benefits of vaccinating one's child.

Table 17. Path analysis of direct effects of positive moderated mediation model

Direct Effects			***β***	***SE***	***p***
Positive Anecdote vs Base Rate	→	Vaccination Likelihood	-.13	.11	0.95
Positive Anecdote vs Base Rate	→	Inaction Regret	.00	.10	0.23
Inaction Regret	→	Vaccination Likelihood	**.63**	**.06**	**<.001**

Note. β standardized path coefficient, *SE* standard error. Assignment to positive anecdote condition was coded as 1 and assignment to base rate condition was coded as 0. Inaction regret = anticipated feelings of regret if parent decided not to vaccinate and child were to acquire cancer.

Table 18. Total, Direct, and Indirect Effects of Regret on Vaccination Likelihood ($N = 138$)

Effect	Point Estimate	Product of Coefficient		Bootstrapping 5000 Times CI Bias Corrected	
		SE	z	Lower	Upper
Total	-8.50	5.76	--	-19.90	2.88
Direct	-5.26	4.48	--	-14.13	3.61
Indirect	-3.24	3.66	-.88	-10.58	3.96

Table 19. Influence of Experimental Condition and Numeracy and their Interaction on Regret (*N* = 138).

Variable	B	**SE**	*B*	95% CI	*t*	*p*
Positive Anecdote vs Base Rate	-.167	.206	-.070	-1.57,.24	-.80	.421
Numeracy	.012	.129	.012	-.24,.26	.09	.927
Positive Anecdote x Numeracy	.049	.169	.039	-.28..38	.28	.773

Note. Continuous variables were mean centered.

Table 20. Influence of Inaction Regret and Reassurance and their Interaction on Likelihood of Vaccination ($N = 138$)

Variable	B	**SE**	*B*	95% CI	*t*	*p*
Regret	7.40	2.45	.259	2.55,12.26	3.09	.003
Reassurance	14.74	1.57	.596	11.62,17.86	9.35	**.001**
Regret x Reassurance	-.946	1.27	-.055	-3.47,1.57	-.74	.460

Note. Continuous variables were mean centered.

Table 21. Bivariate Correlations ($N = 138$)

	2	3	4	5	6	7	8	9
1. Negative Anecdote vs Base Rate	**.20***	**.21***	.00	-.09	-.11	.01	-.07	**-.28****
2. Worry about Side Effects		**.63****	**-.26****	-.13	**-.61****	-.08	-.10	**-.72****
3. Uncertain about Side Effects			-.16	**-.23****	**-.35****	-.03	-.00	**-.51****
4. Perceived Risk (HMB)				.10	.16	.04	.02	**.31****
5. Perceived Severity (HMB)					.13	.05	.11	**.26****
6. Perceived Effectiveness (HBM)						.10	.13	**.67****
7. Perceived Control (HBM)							-.00	.10
8. Numeracy								.10
9. Vaccination Likelihood								**--**

Note. *$p<0.05$;**$p<0.01$. Assignment to negative anecdote condition was coded as 1 and assignment to base rate condition was coded as 0. Worry about side effects = feelings of worry to vaccinate because of negative vaccine side effects. Uncertain about side effects = Uncertainty about the potential serious negative side effects that the vaccine may cause.

Table 22. Path analysis of direct effects of negative moderated mediation model

Direct Effects		***β***	***SE***	***p***
Negative Anecdote vs Base Rate →	Vaccination Likelihood	**-.14**	**.11**	**<0.05**
Negative Anecdote vs Base Rate →	Worry about side effects	**.20**	**.11**	**<0.05**
Worry about Side Effects →	Vaccination Likelihood	**-.69**	**.05**	**<.001**

Note. β standardized path coefficient, *SE* standard error. Assignment to negative anecdote condition was coded as 1 and assignment to base rate condition was coded as 0. Worry about side effects = feelings of worry to vaccinate because of negative vaccine side effects.

Table 23. Total, Direct, and Indirect Effects of Worry on Vaccination Likelihood ($N = 138$)

Effect	Point Estimate	Product of Coefficient		Bootstrapping 5000 Times CI Bias Corrected	
		SE	z	Lower	Upper
Total	-.21.21	6.03	--	-33.15	-9.27
Direct	-10.85	4.36	--	-19.48	-2.23
Indirect	**-10.35**	**4.39**	**-2.35**	**-19.02**	**-1.99**

Table 24. Influence of Experimental Condition, Numeracy and their interaction on Worry (N = 138)

Variable	B	**SE**	*B*	95% CI	*t*	*p*
Negative Anecdote vs Base Rate	.59	.23	.216	.13,1.05	2.54	.012
Numeracy	-.03	.146	-.029	.01,.23	-.253	.801
Negative Anecdote vs Base Rate x Numeracy	-.15	.21	-.086	-.58,.26	-.734	.459

Note. All continuous variables were mean centered.

Table 25. Influence of Worry and Uncertainty and their Interaction on Vaccination Likelihood (*N* = 138)

Variable	B	**SE**	*B*	95% CI	*t*	*p*
Worry	**-18.26**	**2.05**	**-.68**	**-22.32,-12.21**	**-8.90**	**.001**
Uncertainty	1.46	2.58	.04	-3.63,6.57	.569	.570
Worry x Uncertainty	2.02	1.36	.09	-.67,4.72	1.48	.141

Note. All continuous variables were mean centered.

Table 26. Path analysis of direct effects of post hoc negative anecdote model with Health Belief Model constructs

Direct Effects		***β***	***SE***	***p***
Negative Anecdote vs Base Rate	→ Worry about Side Effects	**.20**	**.23**	**<.05**
Negative Anecdote vs Base Rate	→ Vaccination Likelihood	**-.15**	**3.79**	**<.001**
Worry about Side Effects	→ Vaccination Likelihood	**-.41**	**1.76**	**<.001**
Worry about Side Effects	→ Perceived Risk of Cancer	**-.26**	**.03**	**<.01**
Worry about Side Effects	→ Perceived Vaccine Effectiv	**-.61**	**.04**	**<.001**
Worry about Side Effects	→ Perceived Severity of Canc	-.07	.03	n.s
Perceived Risk of Cancer	→ Vaccination Likelihood	**.14**	**3.07**	**<.01**
Perceived Vaccine Effectiveness	→ Vaccination Likelihood	**.37**	**2.66**	**<.001**
Perceived Severity of Cancer	→ Vaccination Likelihood	.02	2.97	n.s

Note. β standardized path coefficient, *SE* standard error. Assignment to negative anecdote condition was coded as 1 and assignment to base rate condition was coded as 0. Worry about side effects = feelings of worry to vaccinate because of negative vaccine side effects.

Figure 1. Moderated Mediation Model – Positive

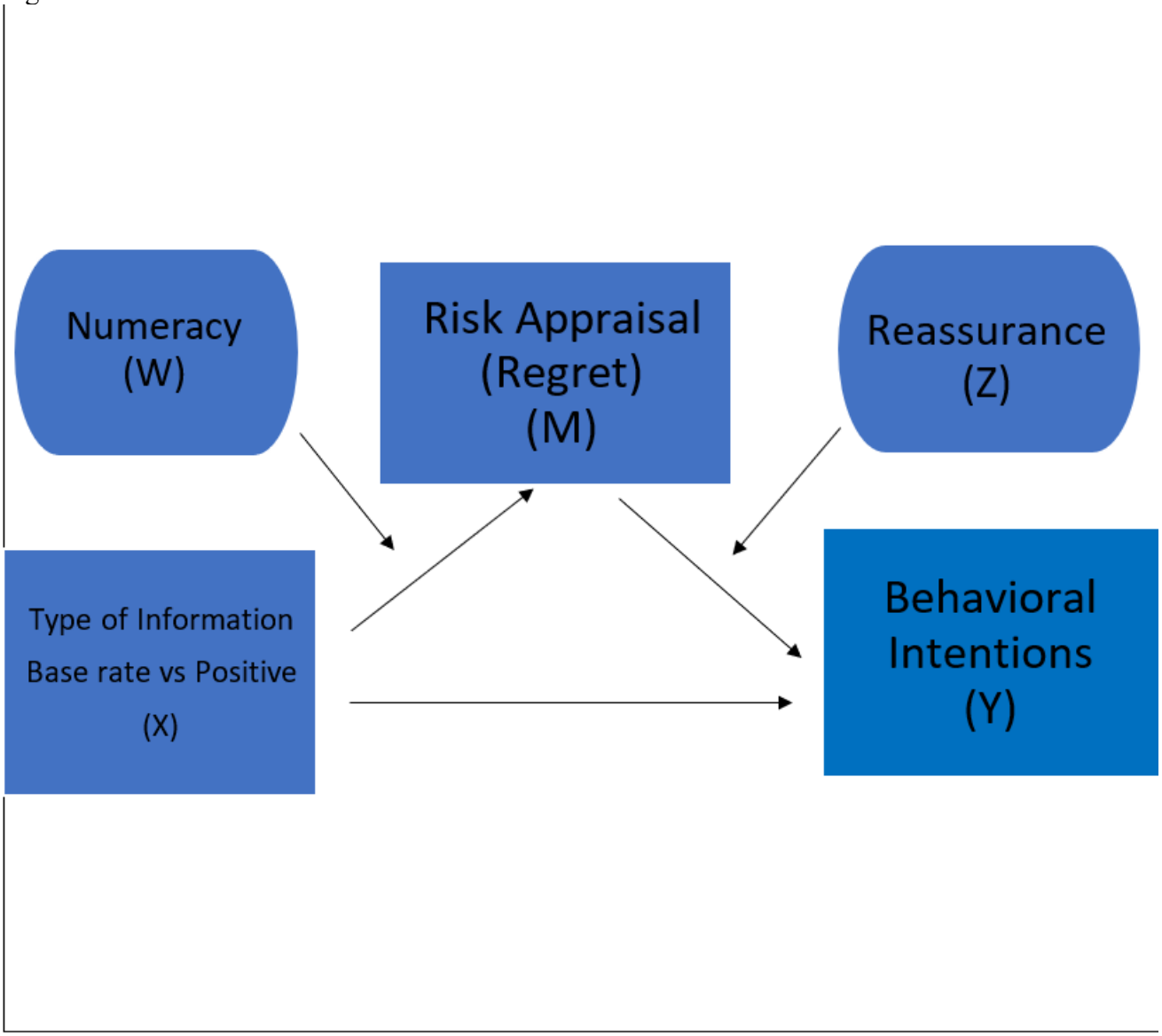


Figure 2. Moderated Mediation Model 2- Negative

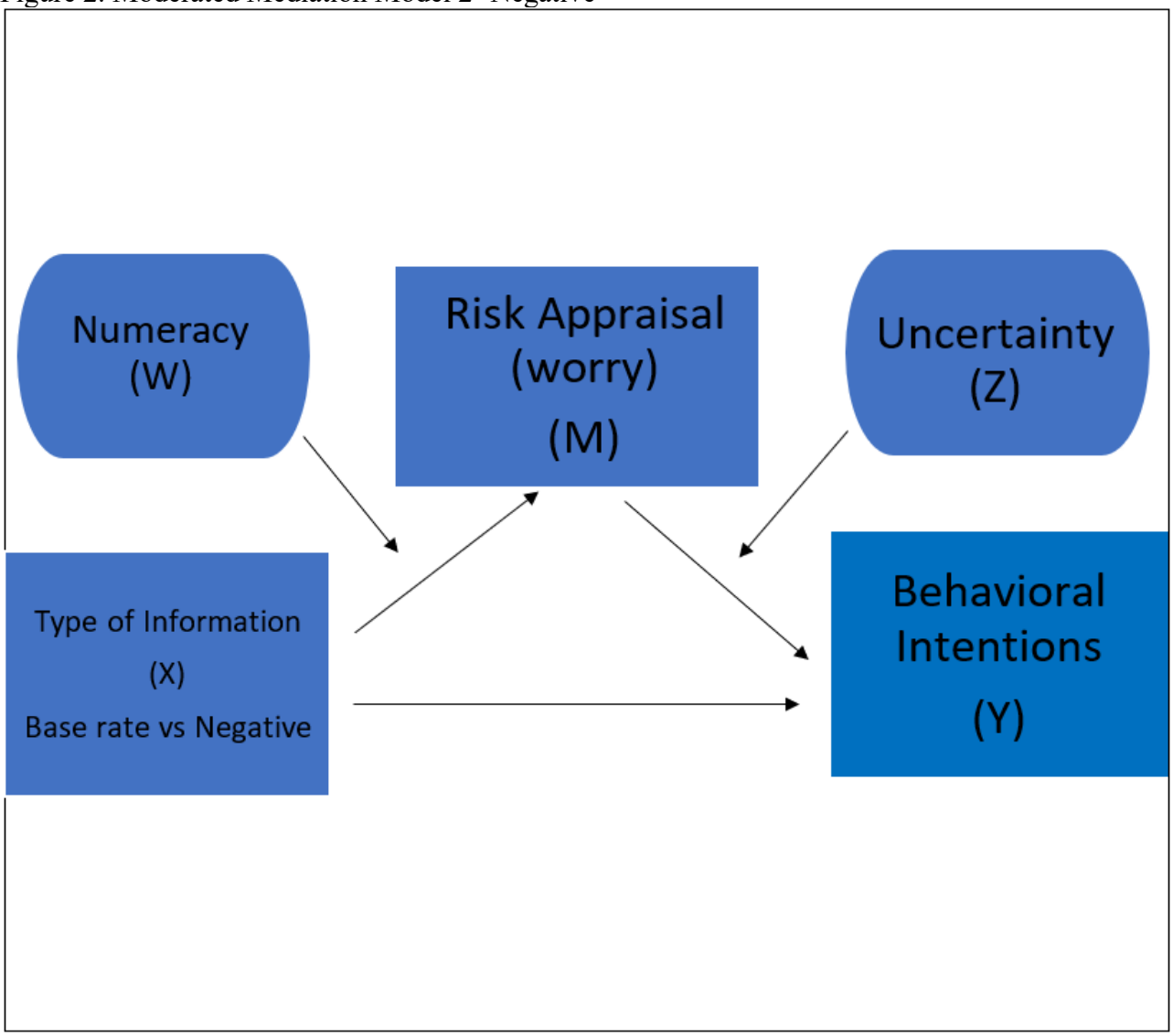
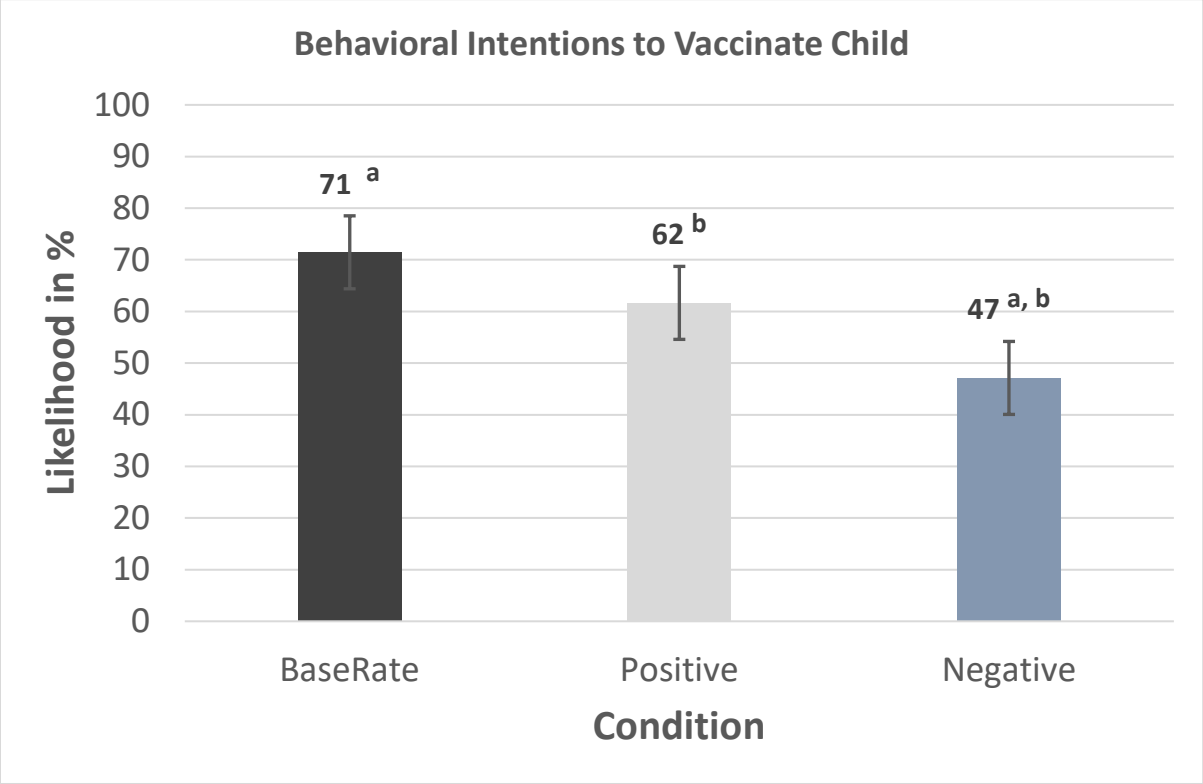
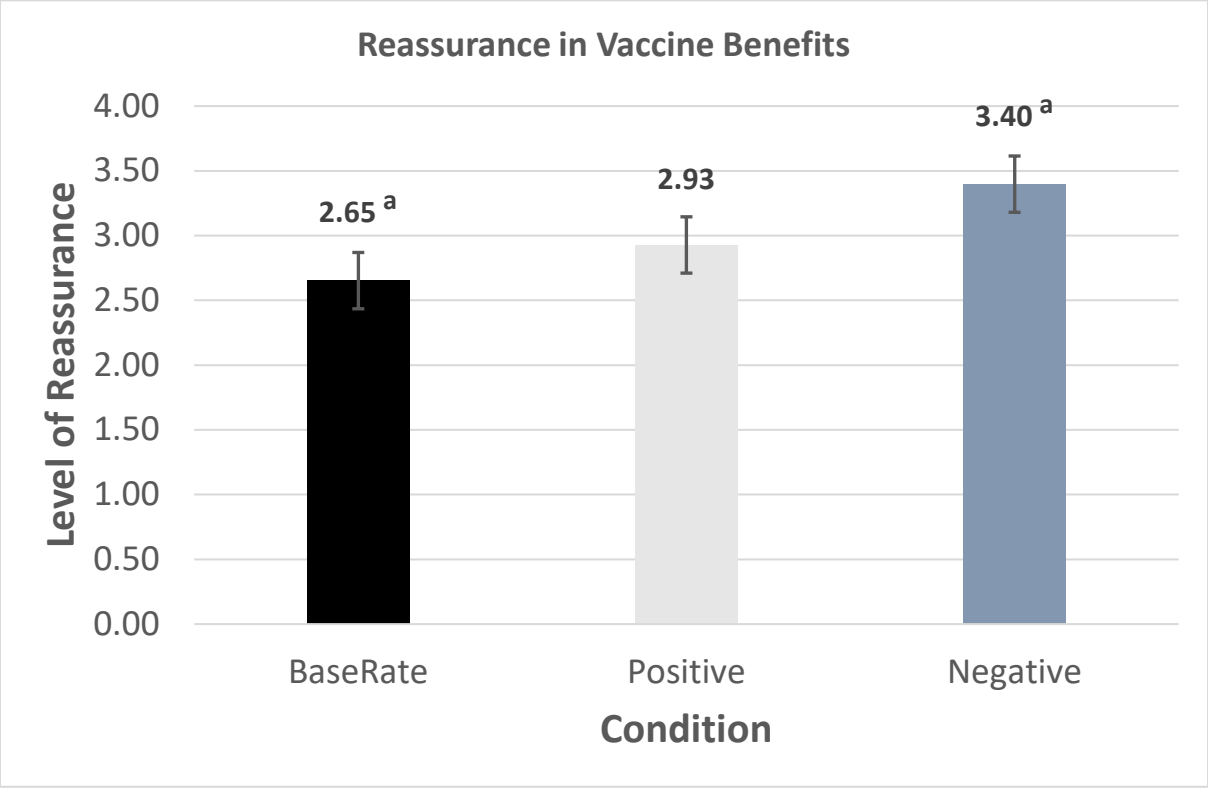


Figure 3. Bar graph depicting means and differences in behavioral intentions to vaccinate their child by condition



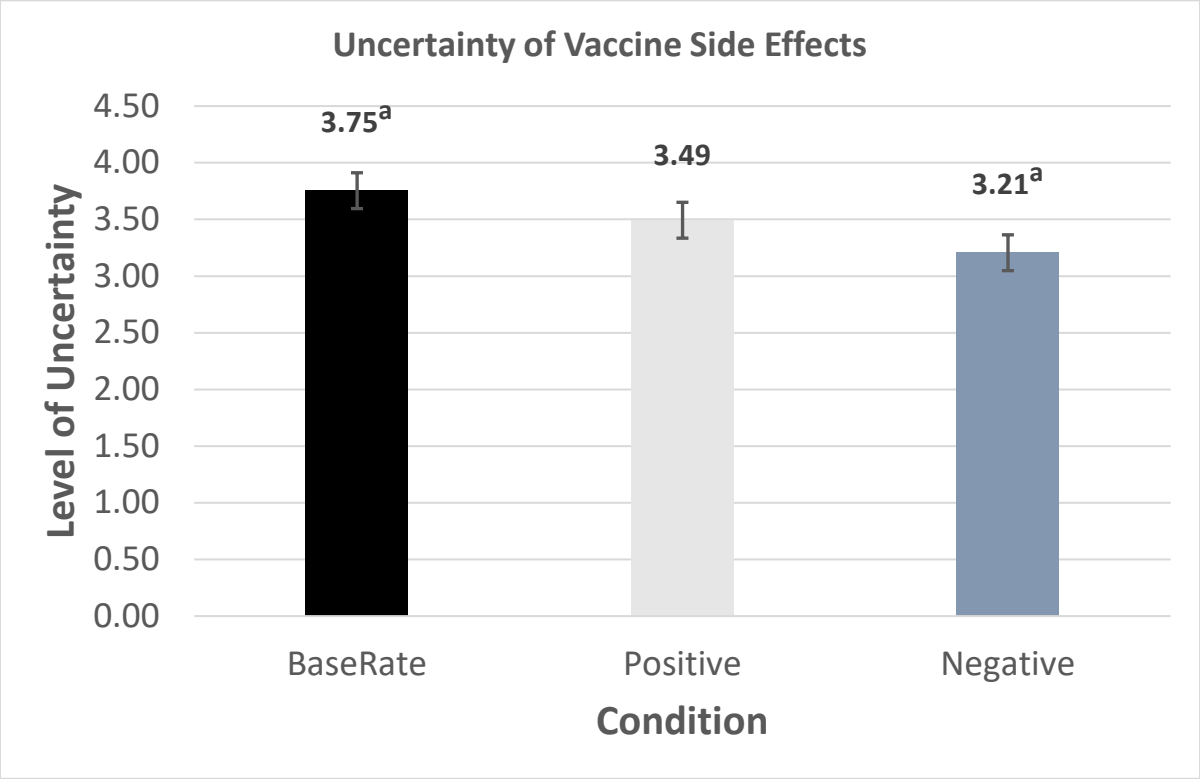
Note. Significant group differences are denoted by the group's corresponding letter; higher means indicate greater likelihood

Figure 4. Bar graph depicting means and differences in the reassurance of benefits of vaccinating their child by condition



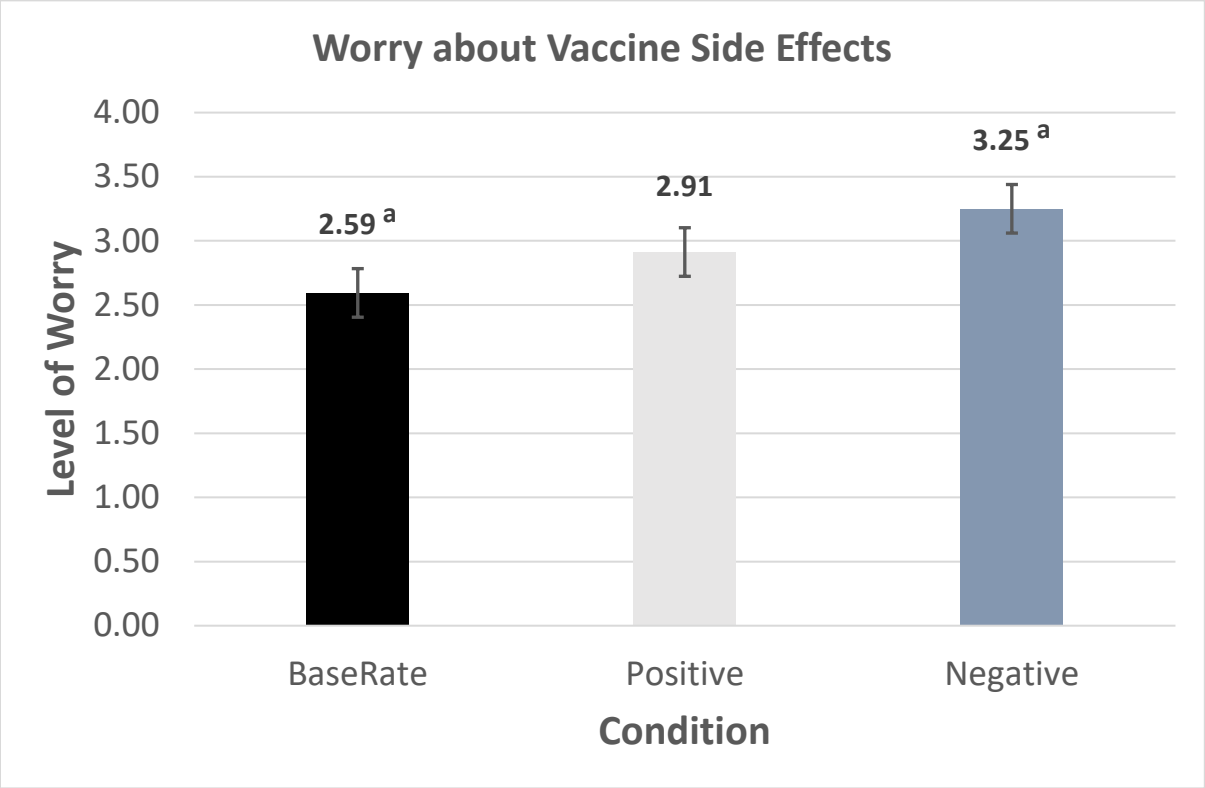
Note. Significant group differences are denoted by the group's corresponding letter; lower means indicate greater reassurance

Figure 5. Bar graph depicting means and differences in uncertainty about the vaccine side effects on their child by condition



Note. Significant group differences are denoted by the group's corresponding letter; lower means indicate greater uncertainty

Figure 6. Bar graph depicting means and differences in worry about the vaccine side effects on their child by condition



Note. Significant group differences are denoted by the group's corresponding letter; higher means indicate greater worry

Figure 7. Path analysis of post hoc negative anecdote model and constructs of the Health Belief Model

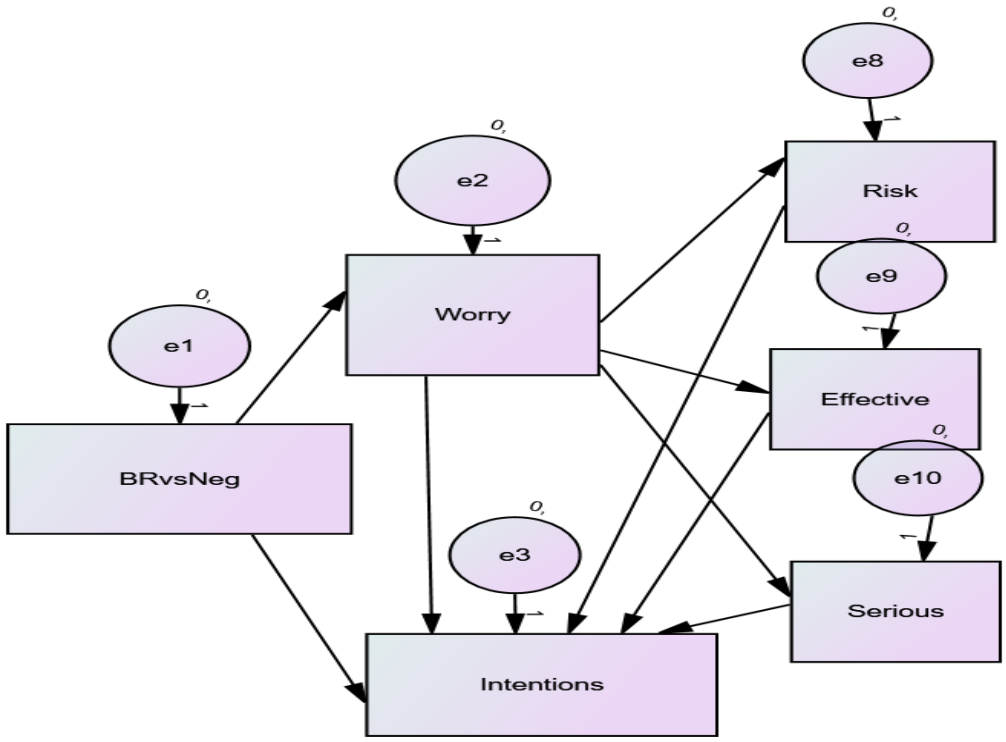
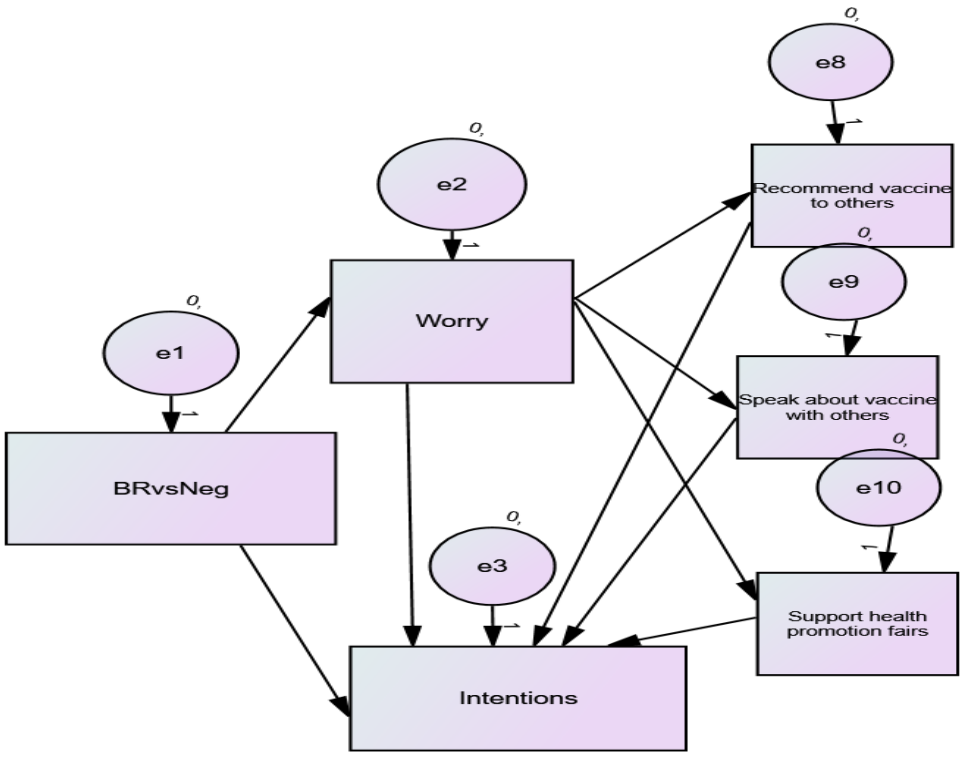


Figure 8. Path analysis of post hoc negative anecdote model and constructs of the Theory of Planned Behavior Model



Appendices

Appendix A

Screening Survey

Parent? Are you a parent or guardian of at least one child?

- ○ Yes
- ○ No

ChildFakeage Is one of your children between the ages of 1-8?

O Yes

O No

Childage Is one of your children between the ages of 9-16?

- ○ Yes
- ○ No

ChildFake1 Which of the following best describes how your child communicates with you?

O My child tells me everything

O My child tells me the important things

O My child tells me some things

O My child avoids communicating with me

ChildFake2 Have any of your children receive the flu vaccine within the last 3 years?

O Yes

O No

ChildHPVVacc Have any of your children received the Human Papillomavirus Vaccine (HPV)?

- Yes
- No
- Not Sure

End of Block: Screening Survey

Appendix B

Thank you for Did Not Qualify

TY Thank you for your interest in this survey. Unfortunately, you do not meet the requirements to participate. We greatly appreciate your support in our academic research. Have a wonderful day!

End of Block: NoQual

Appendix C

Informed Consent

University of Texas at El Paso (UTEP) Institutional Review Board
Research Information Sheet

Protocol Title: Parental Decisions, Factors, and Information on Vaccines
Principal Investigator: Candice Coffman, M.A.
UTEP: Psychology Department

Introduction

You are being asked to take part in the research project described below. Please take your time making a decision. Before agreeing to take part in this research study, please read the consent form that describes the study in its entirety.

Why is this study being done?

You have been asked to take part in a research study that is investigating how parents interpret health information and communications about vaccines and make decisions about vaccinating their children. Our findings may help public health officials develop more effective strategies for communicating health information to the public.

Approximately 200 participants will be enrolling in this study.

You are being asked to be in the study because you are a parent or guardian of a child between the ages 9-16 years who has not completed certain vaccinations.

If you decide to enroll in this study, your involvement will last about 45 consecutive minutes.

If you agree to take part in this study, you will be asked to: read health-related information about a vaccine and answer a survey online using Prolific. After reading the information, you will be asked to react to the information you have read and answer questions about how the information you read made you feel. You will also be asked to complete a survey. The survey will request that you provide demographic information including age, sex, gender, ethnicity, English language ability, sexual orientation, marital status, education level, household income, and information about your child. In addition, the survey will contain questions about your previous knowledge of the vaccine, your thoughts about the vaccine, your preferences for searching for information online, your access to healthcare, your health history related to sexually transmitted infections and vaccinations, your routine health behaviors, and whether you make health related decisions based on numerical information.

Risks and Benefits

A potential risk of answering the survey is loss of confidentiality if the information you provide to us were to be seen by others who are not part of the study. Every effort will be made to keep your study records confidential, but we cannot guarantee it.

You may feel discomfort when answering survey questions related to you and your child's medical history and your beliefs regarding vaccinations.

You have the right to refuse to answer specific questions or end the survey at any time without penalty.

Although there are no direct benefits for participating in this study, the research will help researchers design communication campaigns to promote vaccination and hence, the public's health.

What other options are there?

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

If you choose to take part, you have the right to skip any questions or stop at any time. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

Will I be paid to participate in this study? What are my costs?

There are no direct costs for participating in this study.

You will be compensated $10 for participation in this study.

What if I want to withdraw, or am asked to withdraw from this study?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty or loss of benefit.

The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm. The researcher may also exclude your responses if you do not meet the sampling criteria.

What about confidentiality and my personal information?

Your part in this study is confidential. Your individual privacy will be maintained in all published and written data resulting from the study. All records will be stored in a password protected electronic file. Only researchers directly associated with this project will have access to these surveys. Your participation is also completely anonymous. Your name will not be connected to any of the answers you provide on this survey. None of the information will identify you by name.

Who do I call if I have questions or problems?

You may ask any questions you have now. If you have questions or concerns, or if you have a research-related problem you may call Candice Coffman at (417) 414-0689 or cfcoffman@miners.utep.edu or Julia Lechuga at (915) 747-7221.

You can contact the Human Subjects Protection office to speak to someone independent of the research team if you have questions or concerns about your rights as a research participant, please contact the UTEP Institutional Review Board (IRB) at (915-747-6590) or irb.orsp@utep.edu.

Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. Please feel free to print a copy for your records.

I agree to participate in this research project. Clicking Accept and completing the Date field serves as my electronic signature:

Consent Clicking Accept and completing the Date field serves as my electronic signature:

- Accept
- Withdraw

Date Date: Month/Day/Year

Captcha Click the box below to confirm:

End of Block: Informed Consent

Appendix D

Demographics

DemoInstr **Please answer the following questions about yourself:**

---

*

Age How old are you?

_____

Ethnicity Choose one or more ethnicities that you consider yourself to be:

- ☐ Hispanic/Latino
- ☐ White or Caucasian
- ☐ Black or African American
- ☐ American Indian/Native American or Alaska Native
- ☐ Asian
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Other (please specify): _____
- ☐ Prefer not to say

Language How well would you describe your ability to...

	Not well at all	Slightly well	Moderately well	Very well	Extremely well
Speak in English	○	○	○	○	○
Read in English	○	○	○	○	○
Understand someone speaking English	○	○	○	○	○

Gender How do you describe yourself?

- ○ Male
- ○ Female
- ○ Trans Male / Trans Man
- ○ Trans Female / Trans Woman
- ○ Non-binary / third gender
- ○ I would like to self-describe: _____
- ○ Prefer not to say

Sex What sex were you assigned at birth, such as on an original birth certificate?

- ○ Male
- ○ Female
- ○ Intersex

Orientation Do you consider yourself to be:

- ○ Heterosexual or straight
- ○ Gay
- ○ Lesbian
- ○ Bisexual
- ○ Other (please specify) _____
- ○ Prefer not to say

MaritalStatus What is your current marital status?

- ○ Single, never married
- ○ In a relationship
- ○ Living with a partner
- ○ Married
- ○ Divorced/Separated
- ○ Widowed
- ○ Prefer not to say

Education What is the highest level of education you have completed?

- ○ Some high school or less
- ○ High school diploma or GED
- ○ Some college, but no degree
- ○ Associates or technical degree
- ○ Bachelor's degree
- ○ Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS etc.)
- ○ Prefer not to say

Income What was your total household income before taxes during the past 12 months?

- ○ Less than $25,000
- ○ $25,000-$49,999
- ○ $50,000-$74,999
- ○ $75,000-$99,999
- ○ $100,000-$149,999
- ○ $150,000 or more
- ○ Prefer not to say

HouseholdChildren How many children under 18 live with you?

_____

Appendix E

HPV-Knowledge Questionnaire

InstrKQ **Please complete the following questions to the best of your ability. It is okay if you do not know the answer. Indicate your best guess.**

Pre:KQ1 Only women can get infected with HPV

- ○ True
- ○ False

Pre:KQ2 HPV can cause cervical cancer in women

- ○ True
- ○ False

Pre:KQ3 HPV can cause cancer in areas such as the head and neck

- ○ True
- ○ False

Pre:KQ4 HPV causes cancer in women only

- ○ True
- ○ False

Pre:KQ5 HPV can cause genital warts

- ○ True
- ○ False

Pre:KQ6 A person could have HPV for many years without knowing it

- ○ True
- ○ False

Pre:KQ7 HPV is transmitted through sex

- ○ True
- ○ False

Pre:KQ8 Most people infected with HPV have visible signs or symptoms of the infection

- ○ True
- ○ False

Pre:KQ9 A person's chances of getting infected with HPV increase with the number of sexual parters they have

- ○ True
- ○ False

Pre:KQ10 Nearly all sexually active people will become infected with HPV at some point

- ○ True
- ○ False

Pre:KQ11 The HPV vaccine is only recommended for girls

- ○ True
- ○ False

Pre:KQ12 Full protection against HPV requires more than 1 dose of the vaccine

- ○ True
- ○ False

Pre:KQ13 The HPV vaccine is most effective if given to people who have not yet started having sex

- ○ True
- ○ False

End of Block: Pre:HPV-KQ

Appendix F

Main Experimental Instructions

HPVDesc The Human Papillomavirus, also known as HPV, is contracted by having vaginal, anal or oral sex with a person who has the virus. HPV is the most common sexually transmitted infection (STI). HPV can cause cervical, anal, and throat cancer. A vaccine for HPV is available which can help protect against contracting HPV. The Centers for Disease Control and Prevention recommend that children between the ages of 9 and 12 be vaccinated. This age recommendation is to ensure that the child is vaccinated before he/she engages in sexual intercourse.

BRInstr Imagine that you are considering vaccinating your child against the Human Papillomavirus (HPV). Before making a decision, you search the web and find a website with information on the HPV vaccine. Imagine that you retrieved the following information about the vaccine. Please read carefully as you will be asked to remember this information and tweet it.

End of Block: Instructions

Condition 1: Base Rate Only

C1BR The information is derived from an HPV fact sheet from the CDC website:

The Human Papillomavirus, also known as HPV, is transmitted through vaginal, anal or oral sex with a person who has the virus. HPV is the most common sexually transmitted infection. Approximately 1 out of every 2 people will eventually be infected with at least one form of the HPV virus. Some forms of HPV can cause cancer. A vaccine is available that protects against HPV and prevents most cervical cancers, most types of anal cancer, and most types of throat cancers caused by HPV. In addition, the vaccine prevents the development of most genital warts.

A small percentage of patients experience minor side effects after receiving the vaccine such as headache, dizziness, and nausea. These are considered minor, common side effects because they are experienced by patients 0.025% of the time after receiving the HPV vaccine. That is, for every *100* vaccinations, minor side effects were reported by patients approximately 2 times.

In very rare cases, more serious reactions to the HPV vaccine have been reported such as stroke, muscle weakness due to nerve damage, and the possibility of one's appendix bursting. These reactions were reported in less than 1% of doses administered (i.e., 0.000007%). That is, out of *100* vaccinations, only 1 serious, adverse reaction was reported. Thus, the majority of people do not experience any problems after receiving the vaccine.

C1BRS How positive or negative did you find the above information?

- ○ Extremely negative
- ○ Moderately negative
- ○ Slightly negative
- ○ Slightly positive
- ○ Moderately positive
- ○ Extremely positive

Condition 2: Base Rate and Mostly Positive Anecdotes

C2BR The information is derived from an HPV fact sheet from the CDC website:

The Human Papillomavirus, also known as HPV, is transmitted through vaginal, anal or oral sex with a person who has the virus. HPV is the most common sexually transmitted infection. Approximately 1 out of every 2 people will eventually be infected with at least one form of the HPV virus. Some forms of HPV can cause cancer. A vaccine is available that protects against HPV and prevents most cervical cancers, most types of anal cancer, and most types of throat cancers caused by HPV. In addition, the vaccine prevents the development of most genital warts.

A small percentage of patients experience minor side effects after receiving the vaccine such as headache, dizziness, and nausea. These are considered minor, common side effects because they are experienced by patients 0.025% of the time after receiving the HPV vaccine. That is, for every *100* vaccinations, minor side effects were reported by patients approximately 2 times.

In very rare cases, more serious reactions to the HPV vaccine have been reported such as stroke, muscle weakness due to nerve damage, and the possibility of one's appendix bursting. These reactions were reported in less than 1% of doses administered (i.e., 0.000007%). That is, out of *100* vaccinations, only 1 serious, adverse reaction was reported. Thus, the majority of people do not experience any problems after receiving the vaccine.

C2BRS How positive or negative did you find the above information?

- ○ Extremely negative
- ○ Moderately negative
- ○ Slightly negative
- ○ Slightly positive
- ○ Moderately positive
- ○ Extremely positive

End of Block: C2Instr

Start of Block: C2

C2AnecInstr **The website you find during your online search includes web postings from individuals who described their experiences with the HPV vaccine. These web postings are described below. Please read the web postings and then respond to the questions.**

1Pos "I'm happy that my doctor was able to give me the injection. It's a huge value if it is possible to protect me from Cancer. The injection felt similar to a B vitamin shot. I do plan on continuing the shots. I decided it will be worth it, if I'm protected from cervical cancer. Three days after the shot, my arm is a little red & there is a lump. Both of my grandmothers died from cancer in their mid-thirties. I wish I knew my grandmothers & maybe if they were able to get this vaccine, I would have had the chance to meet them."

C21PS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

2Pos "I have been dating my boyfriend for about 3 years now and he is such an amazing guy that I love deeply. We are finally at the stage of moving forward in our relationship and ready to become engaged, married, and have kids. One of the first things that attracted me to him was how honest and trustworthy he was. On our first date he came forth and told me he had HPV. I was grateful that he told me about this. He is my first serious relationship and my first sexual partner. I was a virgin when I met him. I decided to get the HPV vaccine before starting a sexual

relationship with my boyfriend. I'm so grateful that something like it is available. I now feel comfortable having that type of relationship with my boyfriend and having kids someday. I don't know what I would have done without the vaccine."

C22PS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

3Pos "I have gotten all three shots. All three shots have been fine. This is an approved vaccine. This vaccine is out there to protect you, improve your quality of life, and hopefully reduce large risks. I rather have all three shots than get cancer and die."

C23PS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

4Pos “HPV vaccine. I wish I had it sooner. Forget all the medical mumbo jumbo- HPV can cause warts and they suck. All you hear about is women getting them. But another part of it you don't hear about is men getting them. I've had them on my, well, I'll just say it, anus. They are extremely painful and even more painful to get rid of. The doctor told me I had HPV. She said they can cause major problems if not taken care of - cancers, sterility and more. I was shocked. The doctor put me at ease and then said here comes the fun part. She brought out a canister of nitrous and said alright, bend over and we'll burn them off. BURN them off??? Yes. Burn. I asked the doctor how I could have prevented this. She told me about the HPV vaccine. Although the vaccine won’t get rid of the type of HPV I already have. I’ve decided to get it anyway to help prevent some of the other cancer causing types. I don’t want this to get any worse by getting more types. Everyone should get the vaccine.”

C24PS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

5Pos “So why does the HPV vaccine make my list of blessings? One reason is that is provides protection against, what seems to me, a fairly equal opportunity virus. I’m active, eat pretty well, don’t smoke, and enjoy hiking and skiing and playing basketball. But HPV didn’t seem to care that I was an otherwise healthy person. I had my tonsils removed to test that the swollen lymph node on the right side of my throat was indeed due to cancer – HPV-positive oropharyngeal cancer, to be specific. Another reason why I think the HPV vaccine is a blessing is that I have two teenage sons. So I’m thankful that even if, they only make almost all the right choices, there’s at least one thing I can be almost certain of: with the HPV vaccine neither of them will be diagnosed with HPV-positive throat cancer.”

C25PS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

6Neg “I would personally NEVER get the HPV vaccine because I actually know someone who is now paralyzed from the waist down because of it. She is the same age as my brother (21) and her whole life is now affected because her over-protective mother didn’t do her research (the girl was 16 when the shot was given- it is also when her mother found out the girl was sexually active…). I also read that a 17 year old girl names Jessica had a side effect from her HPV vaccines. She died instantly. After weeks of headaches, sore muscles and joints and always being tired her heart stopped. Her parents wrote that they were devastated.”

C26NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

End of Block: C2

Condition 3: Base Rate and Mostly Negative Anecdotes

C2BR The information is derived from an HPV fact sheet from the CDC website:

The Human Papillomavirus, also known as HPV, is transmitted through vaginal, anal or oral sex with a person who has the virus. HPV is the most common sexually transmitted infection. Approximately 1 out of every 2 people will eventually be infected with at least one form of the HPV virus. Some forms of HPV can cause cancer. A vaccine is available that protects against HPV and prevents most cervical cancers, most types of anal cancer, and most types of throat cancers caused by HPV. In addition, the vaccine prevents the development of most genital warts.

A small percentage of patients experience minor side effects after receiving the vaccine such as headache, dizziness, and nausea. These are considered minor, common side effects because they are experienced by patients 0.025% of the time after receiving the HPV vaccine. That is, for every *100* vaccinations, minor side effects were reported by patients approximately 2 times.

In very rare cases, more serious reactions to the HPV vaccine have been reported such as stroke, muscle weakness due to nerve damage, and the possibility of one's appendix bursting. These reactions were reported in less than 1% of doses administered (i.e., 0.000007%). That is, out of *100* vaccinations, only 1 serious, adverse reaction was reported. Thus, the majority of people do not experience any problems after receiving the vaccine.
.

C3BRS How positive or negative did you find the above information?

- ○ Extremely negative
- ○ Moderately negative
- ○ Slightly negative
- ○ Slightly positive
- ○ Moderately positive
- ○ Extremely positive

End of Block: C3Instr

Start of Block: C3

C3AnecInstr **The website you find during your online search includes web postings from individuals who described their experiences with the HPV vaccine. These web postings are described below. Please read the web postings and then respond to the questions.**

6Neg "I would personally NEVER get the HPV vaccine because I actually know someone who is now paralyzed from the waist down because of it. She is the same age as my brother (21) and her whole life is now affected because her over-protective mother didn't do her research (the girl was 16 when the shot was given- it is also when her mother found out the girl was sexually active…). I also read that a 17 year old girl names Jessica had a side effect from her HPV vaccines. She died instantly. After weeks of headaches, sore muscles and joints and always being tired her heart stopped. Her parents wrote that they were devastated."

C36NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

7Neg “Last June I had gotten my HPV vaccine shot and was as sick as a dog. I had horrible migraines, excruciating lower stomach pains, crazy irregular menstrual cycles, was losing hair, was always tired, had constant arthritis like pains all over my body, and had occasional episodes of rapid heartbeat and trouble breathing. I became extremely depressed and was just miserable all the time.”

C37NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

8Neg “I got the HPV vaccination. You know, the one for the prevention of cervical cancer where the commercial always ended in ‘one less’? Too bad I ended up being one more. Around three weeks after I got the first vaccine I had my first seizure. It basically went downhill from there. The doctors told us that there was no possible way that this vaccination was causing my problems; so naturally, we believed them, and I got the last two shots. Ironically, things got progressively worse. And now, over three and a half years later, I am still dealing with my problems. About two years after my seizures started, one of my friends named Caleigh also began to have seizures. Caleigh had just gotten her first vaccination. Her seizures were so violent that she actually bruised up her wrist until it was swollen. All the pieces started to fall into place. We both had seizures a couple weeks after we got the shot. I feel the HPV vaccination has taken what should have been some of the best years of my life.”

C38NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

9Neg “HPV shots are kind of new for guys. I had the first two shots and did fine. The pain at the injection site was minimal. I had the third shot on thursday, and a few minutes later my arms started to go numb. I was already driving on my way home. My hands became so numb that I couldn't even hold the steering wheel, and my whole body was shaking so badly. Then severe dizziness set in, and increasing difficulty swallowing and breathing. I barely made it to the emergency room fast enough. When I got there it took me three attempts to grab my cell phone to call my mom. The doctors at the ER gave me steroids to keep my throat open, and lots of antihistamines in an IV. Yesterday I was still dizzy, and got another numb sensation in my hands, and my muscles in my legs were really sore and I had a fever. Still had some difficulty swallowing. I have never had a bad reaction to any medication ever in my entire life.”

C39NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

10Neg “A week after my sister got the shot, she started to complain here and there, of a headache and of feeling sick to her stomach. When she would tell me these things, I would tell her to lie down, murmur to her that she had probably had a long day, or I would give her some Tylenol. A few weeks later, I noticed my sister kept dropping her phone. She was crying, she was drooling, and her eyes were not looking right. She was rushed to the ER. She had an MRI, a CAT scan, an EEG, and a spinal tap done. Whatever they were looking for, they did not find, all the tests were negative. In the four days we were at the hospital, she had stopped talking, stopped eating, stopped walking, and was now urinating on herself. She eventually lost lung functioning and was placed on a ventilator for several months. I thought vaccines would keep people safe and healthy. I didn’t know that vaccines could do this. No one ever told me.”

C310NS How pleasant or unpleasant did you find the above experience?

- ○ Most unpleasant imaginable
- ○ Moderately unpleasant
- ○ Slightly unpleasant
- ○ Slightly pleasant
- ○ Moderately pleasant
- ○ Most pleasant imaginable

2Pos “I have been dating my boyfriend for about 3 years now and he is such an amazing guy that I love deeply. We are finally at the stage of moving forward in our relationship and ready to become engaged, married, and have kids. One of the first things that attracted me to him was how honest and trustworthy he was. On our first date he came forth and told me he had HPV. I was grateful that he told me about this. He is my first serious relationship and my first sexual partner. I was a virgin when I met him. I decided to get the HPV vaccine before starting a sexual relationship with my boyfriend. I’m so grateful that something like it is available. I now feel comfortable having that type of relationship with my boyfriend and having kids someday. I don’t know what I would have done without the vaccine.”

C32PS How pleasant or unpleasant did you find the above experience?

- Most unpleasant imaginable
- Moderately unpleasant
- Slightly unpleasant
- Slightly pleasant
- Moderately pleasant
- Most pleasant imaginable

End of Block: C3

Appendix G

Primary Measures

After reading the information above…

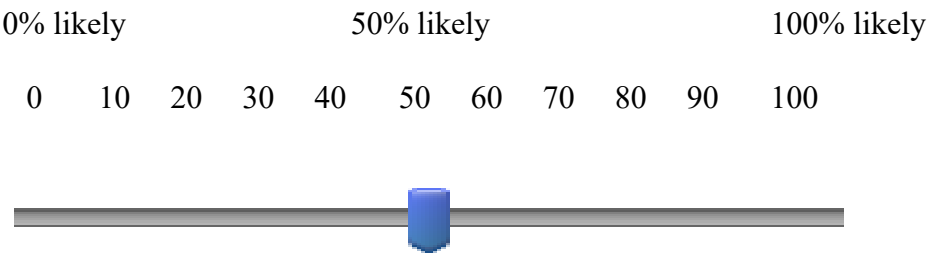
1. How reassured do you feel about the benefits of vaccinating your child?

- ○ Extremely reassured
- ○ Very reassured
- ○ Moderately reassured
- ○ Slightly reassured
- ○ Not at all reassured

2. How uncertain do you feel that the vaccine may cause serious side-effects to your child if you vaccinate him/her?

- ○ Extremely uncertain
- ○ Very uncertain
- ○ Moderately uncertain
- ○ Slightly uncertain
- ○ Not at all uncertain

3. POVaccInt In your opinion, how likely are you to get your child vaccinated against HPV? Slide the bar to indicate your likelihood:



4. At what age would you vaccinate your child against HPV? _____

5. How serious would it be if your child got cervical or penile cancer?

- Slightly serious
- Moderately serious
- Very serious
- Extremely serious

6. Without the vaccine, what do you think is the chance that your child will get cervical or penile cancer in the future?

- No chance
- Low chance
- Moderate chance
- High chance

7. How effective do you think the HPV vaccine is in preventing genital warts?

- ○ Not at all effective
- ○ Somewhat effective
- ○ Moderately effective
- ○ Extremely effective

8. How effective do you think the HPV vaccine is in preventing cervical or penile cancer?

- ○ Not at all effective
- ○ Somewhat effective
- ○ Moderately effective
- ○ Extremely effective

Appendix H

Risk Appraisals

Imagine that your child had cervical or penile cancer, but the HPV vaccine might have prevented it. How much would you regret that you did not give your child the HPV vaccine?

- ○ None at all
- ○ A little
- ○ A moderate amount
- ○ A lot
- ○ A great deal

WorryCause The HPV vaccine can cause adverse side effects for both girls and boys. How worried are you about giving the HPV vaccine to your child?

- ○ None at all
- ○ A little
- ○ A moderate amount
- ○ A lot
- ○ A great deal

Appendix I

eHEALS

EHInstr I would like to ask you for your opinion and about your experience using the Internet for health information. For each statement, tell me which response best reflects your opinion and experience *right now*.

---

eHUse How **useful** do you feel the Internet is in helping you in making decisions about your health?

- ○ Not at all useful
- ○ Slightly useful
- ○ Unsure
- ○ Very useful
- ○ Extremely useful

---

eHImp How **important** is it for you to be able to access health resources on the Internet?

- ○ Not at all important
- ○ Slightly important
- ○ Unsure
- ○ Very important
- ○ Extremely important

---

eHWhat I know **what** health resources are available on the Internet

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHWhere I know **where** to find helpful health resources on the Internet

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHHow I know **how** to find helpful health resources on the Internet

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHHInt I know **how to** use the Internet to answer my questions about health

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHHInfo I know how to use **the health information** I find on the Internet to help me

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHEval I have the skills I need to **evaluate** the health resources I find on the Internet

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHQual I can tell **high quality** health resources from **low quality** health resources on the Internet

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

---

eHConf I feel **confident** in using information from the Internet to make health decisions

- Strongly disagree
- Somewhat disagree
- Undecided
- Somewhat agree
- Strongly agree

End of Block: eHeals

Appendix J

Social Media Use Questions

FreTwit How often have you visited Twitter to read or make a post?

- ○ Never
- ○ Once a week
- ○ 2-3 times a week
- ○ 4-6 times a week
- ○ Daily

SMInfo How believable do you find information posted to social media (i.e., Twitter, Facebook, Blogs, etc.)?

- ○ Extremely unbelievable
- ○ Somewhat unbelievable
- ○ Neutral
- ○ Somewhat believable
- ○ Extremely believable

End of Block: SocialMedia

Appendix K

Barriers to Healthcare and Obtaining the HPV Vaccine Questions

Please select which of the following may prevent you from vaccinating your child against HPV (select all that apply)

1. ___I have concerns about whether the HPV vaccine is safe.
2. ___I have concerns about whether the HPV vaccine is effective.
3. ___I have concerns about possible side effects of the HPV vaccine.
4. ___The HPV vaccine may have long-term side effects.
5. ___There has not been enough research done on the HPV vaccine.
6. ___The vaccine only protects against some types of HPV.
7. ___The vaccine is too expensive.
8. ___The vaccine is being pushed to make money for drug companies.
9. ___My insurance does not cover HPV vaccine.
10. ___My insurance does not cover enough of the vaccine.
11. ___I'm not sure how to file the insurance claim to get reimbursed.
12. ___I've heard it hurts a lot to receive the HPV shot.
13. ___I have concerns that my child may faint if they get the HPV shot.
14. ___My child has a fear of shots and needles.
15. ___I don't think my child needs the HPV vaccine.
16. ___My child will be abstinent (not have sex) until marriage.
17. ___My child will only have one sexual partner in their lifetime.
18. ___Getting the HPV shot takes too much time.
19. ___I'm not sure where to get the HPV shot.
20. ___Getting the HPV vaccine will make my child more likely to have sex.
21. ___My child is too young to get a vaccine for a sexually transmitted infection like HPV.

How hard do you think it would be to find a provider or clinic where you can afford the vaccine?

- ○ Extremely hard
- ○ Moderately hard
- ○ Somewhat hard
- ○ Somewhat easy
- ○ Moderately easy
- ○ Extremely easy

How hard do you think it would be to find a provider or clinic that is easy to get to?

- ○ Extremely hard
- ○ Moderately hard
- ○ Somewhat hard
- ○ Somewhat easy
- ○ Moderately easy
- ○ Extremely easy

How hard do you think it would be to find a provider or clinic that has the vaccine available?

- ○ Extremely hard
- ○ Moderately hard
- ○ Somewhat hard
- ○ Somewhat easy
- ○ Moderately easy
- ○ Extremely easy

Please indicate your level of agreement on the following statements:

For me, vaccinating my child against HPV is possible.

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

If I wanted to get my child vaccinated in the next 6 months, it would be easy.

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

How much control do you have over your child getting vaccinated?

- ○ Complete control
- ○ Moderate control
- ○ Some control
- ○ No control

Is vaccinating your child….

…Necessary

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

…A good idea

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

…Beneficial

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

I will recommend the HPV vaccine to my family and friends

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

I will speak to others I know about the importance of the HPV vaccine

- ○ Completely agree
- ○ Moderately agree

- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

I would be willing to support health fairs promoting HPV vaccinations

- ○ Completely agree
- ○ Moderately agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Moderately disagree
- ○ Completely disagree

Appendix L

Health History Questionnaire

History While thinking about your child, aged between 9-16 years old, please indicate whether the following statements are true for you and/or your child:

	I have	My child has	Neither of us
Attend an annual doctor visit	☐	☐	☐
Received all required vaccinations (e.g., MMR, TB, etc.)	☐	☐	☐
Receives a yearly flu vaccine	☐	☐	☐
Been recommended for the HPV vaccine by a health professional	☐	☐	☐
Received the HPV vaccine	☐	☐	☐
Received the COVID-19 vaccine	☐	☐	☐
Experienced a bad reaction to a vaccine	☐	☐	☐
Been diagnosed as immunocompromised	☐	☐	☐
Been diagnosed with HPV	☐	☐	☐
Been diagnosed with a different sexually transmitted infection	☐	☐	☐
Been diagnosed with HPV-related cancer	☐	☐	☐
Been diagnosed with Genital warts			

Decisions Who makes most of the health decisions for your family?

- ○ I do
- ○ My significant other/partner does
- ○ My parent or grandparent
- ○ A different family member (please specify) _____
- ○ Someone else (please specify) _____

End of Block: HealthHistory

Appendix M

Prior Vaccination Exposure Questions

KnowExp Have you or anyone you know experienced an adverse reaction to the HPV vaccine?

- ○ I did
- ○ Someone I know did
- ○ A friend of a friend did
- ○ No one I know has

AgeExp How old was the person when they experienced the adverse reaction to the HPV vaccine?

- ○ between 9-16 years old
- ○ between 16-25 years old
- ○ Over 25 years old
- ○ I don't know

SevExp How severe was your/their reaction to the HPV vaccine?

- ○ Minor (e.g., headache, dizziness, nausea)
- ○ Severe (e.g., appendicitis, Guillain-Barré syndrome)
- ○ I don't know

End of Block: VaccExpos

Appendix N

Subjective Numeracy Test

1. How good are you at working with fractions?

1	2	3	4	5	6
Not at all Good					Extremely Good

2. How good are you at working with percentages?

1	2	3	4	5	6
Not at all Good					Extremely Good

3. How good are you at calculating a 15% tip?

1	2	3	4	5	6
Not at all Good					Extremely Good

4. How good are you at figuring out how much a shirt will cost if it is 25% off?

1	2	3	4	5	6
Not at all Good					Extremely Good

5. When reading the newspaper, how helpful do you find table and graphs that are part of a story?

1	2	3	4	5	6
Not at all Helpful					Extremely Helpful

6. When people tell you the chance of something happening, do you prefer that they use words (“it rarely happens”) or numbers (“there’s a 1% chance”)?

1	2	3	4	5	6
Always Prefer Words					Always Prefer Numbers

7. When you hear the weather forecast, do you prefer predictions using percentages (e.g., “there will be a 20% chance of rain today”) or predictions using only words (e.g., “there’s a small chance of rain today”)?

1	2	3	4	5	6
Always Prefer Percentages					Always Prefer Words

8. How often do you find numerical information to be useful?

1	2	3	4	5	6
Never					Very Often

Appendix O

Debriefing

PayInstr In order to receive your $10 payment, please copy the unique code below to enter into your Prolific payment portal:

[UNIQUE CODE]

DBText **The Relative Impact of HPV Vaccination Information**

Dear Participant,

During this study, you were asked to read information about the Human Papillomavirus (HPV) vaccine. You were then asked to answer questions on your perception of the vaccine. As stated in the consent form, the purpose of the study was to examine how individuals respond differently to information about vaccinations. Although you may have read information describing different experiences with the Human Papillomavirus vaccine, the vaccine is considered low risk. Notably, the Center for Disease Control and American Pediatric Association recommend that all individuals between 9-26 years of age receive the HPV vaccine.

If you read the 'blog posts,' please note that these experiences have not been verified. There is no evidence to conclude that the outcomes described by a few individuals were directly caused by the HPV vaccine. In addition, it is not advised to consider a few experiences as more valuable than the millions included in the study by the CDC. Less than 1% of individuals experienced a severe side effect.

For more information about HPV and the HPV vaccine, please visit https://www.cdc.gov/hpv/index.html or talk with your health professional.

To avoid influencing the perceptions of future participants, we ask that you do not discuss this study with your peers as it may affect our ongoing data collection.

You are reminded that your original consent document included the following information:

Your part in this study is confidential. Any of your information from Amazon Mechanical Turk will be stored separately from survey materials. All records will be stored in a password protected electronic file. Only researchers directly associated with this project will have access to these surveys. Your participation is also completely anonymous. Your name will not be

connected to any of the answers you provide on this survey. None of the information will identify you by name.

If you have any concerns about your participation or the data you provided in light of this disclosure, please discuss this with us. We will be happy to provide any information we can to help answer questions you have about this study.

If your concerns are such that you would now like to have your data withdrawn, we will do so.

If you have questions about your participation in the study or would like information on the results, please contact me, Candice Coffman, at cfcoffman@miners.utep.edu, or my faculty advisor, Dr. Julia Lechuga, at julialec@utep.edu.

If you have questions about your rights as a research participant, you may contact the UTEP Institutional Review Board (IRB) at 915-747-8841 or irb.orsp@utep.edu.

If you have experienced distress as a result of your participation in this study, please seek professional help. The following resources are free in the United States:

CDC National HIV and AIDS Hotline
(800) 232-4636

Childhelp National Child Abuse Hotline
(800) 422-4453

Crisis Text Line
Text HOME to 741741

National Sexual Assault Hotline
(800) 656-4673

National Suicide and Crisis Lifeline
988
Chat online

National Suicide Prevention Lifeline (Options for Deaf and Hard of Hearing)
For TTY Users: Use your preferred relay service or dial 711 then 988
Chat online

Substance Abuse and Mental Health Services Administration National Helpline
(800) 662-4357

Veterans Crisis Line

988, then PRESS 1
Text 838255
Chat online

Please again accept our appreciation for your participation in this study.

End of Block: Debrief

Curriculum Vita

Candice Coffman earned her Bachelor of Arts degree in Psychology from Texas State University in 2010. Candice received her Master's degree in Experimental Psychology from the University of Texas at El Paso in 2022.

Candice Coffman has served as a research assistant and assistant instructor for the UTEP Psychology Department. She has also assisted in the UTEP Provost's Office with programmatic assessment and university accreditation. While finishing her Master's degree, she served as the Director of Faculty Support and Instructional Quality for Drury University. She is currently a Community Health Field Specialist for University of Missouri's Extension Office.

Candice Coffman's dissertation, *The Power of a Story*…., was supervised by Dr. Julia Lechuga.

This dissertation was typed by Candice Coffman

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