



Stories about HPV vaccine in social media, traditional media, and conversations

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ABSTRACT

How stories from media and social interactions shape parents' HPV vaccination decisions is poorly understood. We sought to characterize parents' exposure to such stories, as well as associations between story exposure and vaccination behavior. Study participants were 1263 parents of U.S. adolescents who had not yet completed the HPV vaccine series. In 2017, these parents completed an online survey about whether they had heard stories of people who were harmed by HPV vaccine or who got diseases HPV vaccine could have prevented. Almost half of parents had heard HPV vaccine stories, which were about vaccine harms only (19%), vaccine preventable diseases only (11%), or both (15%). Stories of harms more often came from social and traditional media; stories of preventable diseases more often came from conversations (all $p < 0.01$). Parents who heard only stories about harms were less likely than those who heard no stories to have initiated HPV vaccination (23% vs. 33%, aOR:0.48; 95% CI:0.33:0.69). They were more likely to have delayed (79% vs. 66%, aOR:2.00; 95% CI:1.09:3.71) or refused (72% vs. 24%, aOR:8.87; 95% CI:4.09:19.25) HPV vaccination. Exposure to both stories about harms and preventable diseases was similarly associated with initiation, delay and refusal. Exposure to only stories about preventable diseases was not associated with initiation, delay or refusal. In conclusion, stories of HPV vaccine harms may be associated more strongly with vaccination behavior than stories of HPV vaccine preventable diseases. Communication campaigns should consider strategies to elevate stories of preventable diseases in social and traditional media.

1. Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection and is responsible for nearly all cervical cancer, as well as many cases of five other cancers and genital warts (Baseman and Koutsky, 2005). To reduce the high burden of HPV-related disease, the US Advisory Committee on Immunization Practices recommends that adolescents receive two doses of HPV vaccine prior to age 13 (Meites and Markowitz, 2016). However, by 2016, only 43% of 13- to 17-year-olds had received the recommended number of doses (Walker et al., 2017). Parental declination is one barrier to timely vaccination, with over one-third of parents reporting that they have ever refused or delayed HPV vaccination for their children (Gilkey et al., 2017). For this reason, understanding how parents make decisions about HPV vaccination is central to public health efforts to increase uptake.

To date, HPV vaccination decision-making research, including our own, has often focused on parents' knowledge, attitudes and beliefs, along with the factual information and advice they receive from healthcare providers and other professional sources (Brewer and Fazekas, 2007; Gilkey et al., 2016; Jeudin et al., 2014; Williams, 2014; Zimet et al., 2013). Less is known about narrative communication, or “stories” of HPV vaccine-related experiences. Parents may perceive stories as more personal, interesting, credible, and memorable than nonnarrative communication such as statistical evidence (Brewer et al., 2017; Hinyard and Kreuter, 2007). Indeed, several experimental studies suggest that narrative communication can be more effective than nonnarrative communication at influencing HPV-related attitudes, beliefs, and intentions (Hopfer, 2012; Murphy et al., 2013; Nan et al., 2015). Thus, stories may be a powerful tool for encouraging—or discouraging—vaccination. As public health communication campaigns

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increasingly employ cancer survivorship stories and other narratives to promote HPV vaccination, it is important to understand the impact these stories may have on vaccination behavior.

We sought to better understand exposure to HPV vaccine-related stories using data from a national sample of parents of adolescents who had not yet fully completed the HPV vaccine series. The aims of our study were to assess: 1) how often parents recalled hearing two types of stories, those about HPV vaccine harms and preventable diseases; 2) the channels through which parents heard stories, including social media, traditional media, and conversations; and 3) associations between exposure to HPV vaccine-related stories and HPV vaccination behaviors and intentions. By characterizing parents' exposure to HPV vaccine-related stories, this study seeks to identify opportunities to better align narrative communication with the goals of raising HPV vaccination coverage and protecting adolescents from future HPV cancers.

2. Methods

2.1. Data source and procedures

We conducted an online, cross-sectional survey of U.S. parents of adolescents from November 2017 to January 2018. Study participants were members of an existing, national panel of non-institutionalized adults maintained by a survey company. The company constructed the panel from a probability-based sample of U.S. households using address-based sampling frames. Eligible respondents were parents of at least one 9- to 17-year-old child who either had not initiated the HPV vaccine series or had received only the first dose. We focused on parents of children who were not fully vaccinated because they are a high priority for vaccine promotion efforts. Parents with more than one eligible child answered survey items about the child with the most recent birthday.

The survey company contacted a random sample of 2857 parents from the panel via email to invite survey participation. A total of 1834 parents responded by visiting the survey website and accessing the screener to confirm having an age-eligible child with 0–1 dose of HPV vaccine. Of these parents, 1313 (72%) met eligibility criteria, provided informed consent, and completed some portion of the survey. After we excluded 50 panelists who did not complete at least two-thirds of the survey, our analytic sample consisted of 1263 parents. The response rate was 61%, using American Association for Public Research Response Rate 4 calculation ([The American Association for Public Opinion Research, 2015](#)). The Institutional Review Board at the University of North Carolina at Chapel Hill approved the study protocol.

2.2. Measures

2.2.1. HPV vaccination initiation

Parents reported their children's HPV vaccination status by answering one item: "How many shots of the HPV vaccine has [NAME] had?" We categorized responses to indicate whether the children had initiated HPV vaccination ("1 shot," "At least one shot, but I don't know how many") or not ("0 shots," "I don't know").

2.2.2. HPV vaccination delay and refusal

Parents who reported having had a discussion with their children's health care provider about HPV vaccination ($n = 581$) answered one item to indicate their decisions about HPV vaccination: "At that visit, what did you decide to do about getting the HPV vaccine for [NAME]?" We categorized responses to indicate HPV vaccination delay ("get the vaccine at a later visit," "think about it later") versus acceptance ("get the vaccine at that visit"). We also categorized responses to indicate HPV vaccination refusal ("never get it") versus acceptance ("get the vaccine at that visit").

2.2.3. HPV vaccination intentions

The survey assessed intention to vaccinate in the future with one item that differed according to whether the child had received 0 versus 1 dose of HPV vaccine: "I am likely to get [NAME] the [next dose of the] HPV vaccine in the next year." Parents indicated their agreement on a 5-point response scale that ranged from strongly disagree (coded as (1)) to strongly agree (5).

2.2.4. Stories of HPV vaccine preventable diseases

The survey introduced the topic of "stories" with the following sentence: "The next questions are about stories you may have heard—in the media or in conversations with other people." Parents indicated the content of stories they had heard about people having diseases the HPV vaccine could have prevented using the following response options: 1) got genital warts; 2) got HPV; 3) had an abnormal Pap smear; 4) got an HPV-related cancer; 5) died from an HPV-related cancer; or 6) had another HPV-related health problem. We categorized parents as having heard any stories about HPV vaccine preventable disease (1) or none (0).

2.2.5. Stories of HPV vaccine harms

Parents indicated the content of stories they had heard about people harmed by HPV vaccine using the following response options: 1) had mild side effects; 2) had serious temporary harms; 3) had serious long-lasting harms; 4) died; or 5) other harms. We categorized parents as having heard any story of harm (1) versus none (0).

2.2.6. Exposure to story type

Using responses to items about HPV vaccine preventable diseases and harms, we created a four-level categorical variable of exposure to story type that captured whether participants had heard: 1) stories of HPV vaccine harms only; 2) stories of HPV vaccine preventable diseases only; 3) stories of both harms and preventable diseases; or 4) neither.

2.2.7. Channel

If parents reported hearing stories of HPV vaccine preventable diseases, the survey assessed the communication channel of each story from a predefined list: 1) social media; 2) traditional media; 3) conversations with other people; or 4) somewhere else. Similarly, the survey asked parents who heard stories of HPV vaccine harms to identify the channel for each story.

2.2.8. Sociodemographics and other covariates

Our survey assessed: child's age, child's sex, and whether the child's provider had recommended HPV vaccination. The survey company provided data on parents' education, race/ethnicity, and annual household income.

2.2.9. Survey instrument development

We developed new survey items, used items from previous research about parents, adolescents, and health care providers ([Brewer et al., 2011](#); [Gilkey et al., 2016](#); [Gilkey et al., 2015](#); [Kornides et al., 2018](#); [Reiter et al., 2010](#); [Reiter et al., 2009](#)), or adapted items from other sources ([Centers for Disease Control and Prevention, 2015](#); [North Carolina Health and Human Services, 2017](#)). We cognitively tested new items in the survey with a convenience sample of 16 parents of adolescents ages 9 to 17 to ensure the clarity of survey items. We pre-tested the instrument with 31 parents from the national panel, to ensure proper survey functionality. The full HPV SIP survey instrument is available online at www.unc.edu/~ntbrewer/hpv.htm.

2.3. Statistical analysis

For each communication channel, we assessed whether a greater proportion of parents had heard stories of HPV vaccine harms than HPV vaccine preventable diseases, using McNemar's test. We assessed

associations between exposure to story type and vaccination behaviors using multivariable logistic regression, reporting results as adjusted odds ratios (aOR). We modelled the candidate correlate of story type exposure as a categorical variable (HPV vaccine harms only, HPV vaccine preventable diseases only, both harms and preventable diseases, and neither). We conducted separate regressions for each HPV vaccination outcome (initiation, delay, and refusal). Models adjusted for demographic variables that correlate with HPV vaccination (Dorell et al., 2014; Gilkey et al., 2012; Reiter et al., 2013; Walker et al., 2017): child's sex, child's age, receipt of a provider recommendation, parent's education, ethnicity/race, and annual household income.

We assessed associations between story type exposure and HPV vaccination intentions using multivariable linear regression adjusting for the same variables, reporting results as unstandardized (*B*) and standardized (*b*) regression coefficients. Because an earlier part of the survey evaluated HPV vaccination messages, we additionally adjusted for the content of the messages that participants saw. Conducted in SAS version 9.4, statistical tests were two-tailed with a critical α of 0.05.

For each outcome, we conducted sensitivity analysis by rerunning analysis after removing parents who reported they did not know their child's HPV vaccination initiation status. The significance and direction of the findings remained the same for all outcomes when these parents were removed from the sample.

3. Results

3.1. Participant characteristics

The mean age of adolescents was 13 years (Table 1). Most parents were non-Hispanic white (70%), Hispanic (14%), or non-Hispanic Black (10%). Over one-fourth of parents (28%) had a high school or less

education, and nearly one-fifth (19%) had a household income of less than \$35,000.

3.2. Exposure to HPV vaccine-related stories

Overall, almost half of parents (564/1263; 45%) reported having heard a story about HPV vaccine. In terms of story type, 19% had heard only stories about HPV vaccine harms, 11% had heard only stories about HPV vaccine preventable diseases, and 15% had heard both stories about harms and preventable diseases.

3.2.1. Content

Among 564 parents exposed to HPV vaccine stories, parents heard content related to the preventable disease topics of abnormal Pap smears (27%), HPV (24%), HPV-related cancers (23%), genital warts (21%), other HPV-related health problems (15%), and death from an HPV-related cancer (9%). They heard content related to the HPV vaccine-related harms topics of serious long-lasting harms (35%), mild side effects (26%), temporary serious harms (21%), and death (16%).

3.2.2. Channel

Among the 564 parents exposed to HPV vaccine stories, parents heard stories about HPV vaccine preventable diseases via conversations (33%), traditional media (19%), somewhere else (17%), and social media (11%). They heard stories about HPV vaccine harms via social media (30%), traditional media (29%), conversations (24%), and somewhere else (10%). Conversations were more often a channel for stories about preventable diseases ($p < 0.01$, Fig. 1). Traditional and social media were more often channels for stories about harms (both $p < 0.01$).

3.3. Associations between story type exposure and HPV vaccination

3.3.1. HPV vaccination initiation

About one-third of parents (29%) reported that their child had initiated HPV vaccination, 60% of parents reported that their child had not initiated HPV vaccination, and 11% reported that they did not know whether their child had initiated HPV vaccination. As previously described, we combined parents with an unvaccinated child with those who did not know their child's vaccination status for further analyses. Parents who reported hearing stories only about HPV vaccine harms had lower odds of initiation compared to parents who had heard no stories (aOR:0.48; 95% CI:0.33:0.69), as did parents who heard stories about both harms and preventable diseases (aOR:0.31; 95% CI:0.20:0.50, Table 2). Exposure only to stories about HPV vaccine preventable diseases was not associated with initiation.

3.3.2. HPV vaccination delay and refusal

Of the 581 parents who reported having discussed HPV vaccination with their child's provider, over half ($n = 345$; 59%) indicated that they decided to delay HPV vaccination at that visit, about one-fifth ($n = 102$; 18%) indicated refusing HPV vaccination, and about one-fourth ($n = 134$, 23%) indicated accepting HPV vaccination. Parents who heard stories about HPV vaccine harms only or stories about both harms and preventable diseases had greater odds of having delayed versus accepted HPV vaccination (aOR:2.00; 95% CI:1.09:3.71 and aOR:2.31; 95% CI:1.12:4.77, Table 2). Exposure to stories about HPV vaccine preventable diseases only was not associated with delay.

Similarly, parents who reported hearing stories about HPV vaccine harms only or stories of both harms and preventable diseases had greater odds of having refused versus accepted HPV vaccination (aOR:8.87; 95% CI:4.09:19.25 and aOR:9.49; 95% CI:3.81:23.65, Table 2). Exposure to stories about HPV vaccine preventable diseases only was not associated with refusal.

Table 1
Sample characteristics, United States, 2017 ($n = 1263$).

	<i>n</i>	(%)
Child characteristics		
Sex		
Male	674	(53)
Female	589	(47)
Age (years)		
9–10	395	(31)
11–12	275	(22)
13–14	238	(19)
15–17	355	(28)
HPV vaccination initiation (1 dose)		
No	903	(71)
Yes	360	(29)
Parent characteristics		
Sex		
Male	583	(46)
Female	680	(54)
Education		
High school or less	350	(28)
Some college or more	913	(72)
Race/ethnicity		
Non-Hispanic white	888	(70)
Non-Hispanic black	120	(10)
Hispanic	172	(14)
Non-Hispanic, other or multiple race	83	(6)
Household characteristics		
Annual income		
\$0–\$34,999	213	(17)
\$35,000–\$74,999	341	(27)
$\geq 75,000$	709	(56)
Region		
Northeast	193	(15)
Midwest	312	(25)
South	447	(35)
West	311	(25)

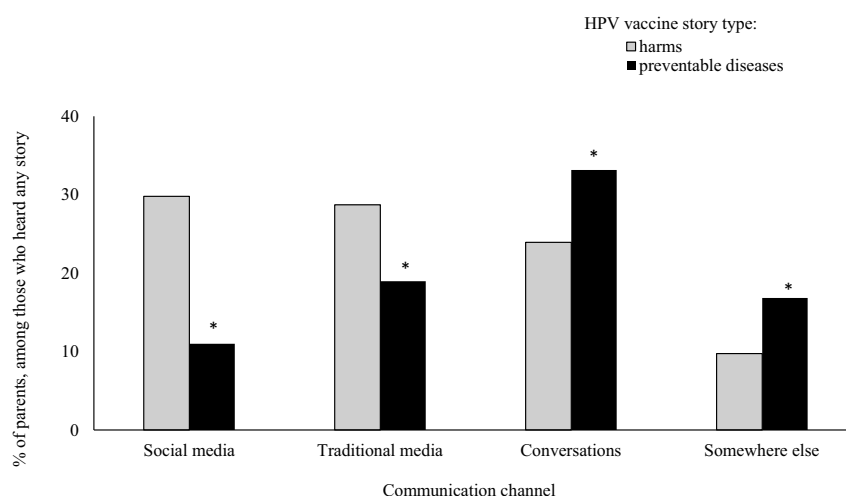


Fig. 1. HPV vaccine stories by communication channel, among parents who heard any story, United States, 2017 ($n = 564$) $*p < 0.01$.

3.3.3. HPV vaccination intentions

Parents' mean vaccination intentions score was 3.19 (SD: 1.33). Parents who reported hearing stories about HPV vaccine harms only or stories of both harms and preventable diseases had lower HPV vaccination intentions ($B = -0.76$; 95% CI: -0.94 – -0.57 and $B = -0.54$; 95% CI: -0.74 – -0.33 , Table 3). Exposure to stories about HPV vaccine preventable diseases only was associated with higher HPV vaccination intentions ($B = 0.30$; 95% CI: 0.06 – 0.53).

4. Discussion

Our findings suggest that many parents of US adolescents are exposed to stories about HPV vaccination, and that stories about HPV vaccine harms may be especially powerful. About one-third of parents in our sample had heard stories of harms, whether alone or in combination with stories about HPV vaccine preventable diseases. Compared to parents who had heard no stories, these parents had less often initiated vaccination, and they had more often delayed or refused vaccination. Contrary to our expectations, we found little evidence to suggest a positive association between hearing stories about HPV vaccine preventable diseases and vaccination behavior. Although parents who had heard only these stories had higher intentions to vaccinate than those who had heard no stories, the two groups were similar in terms of HPV vaccination initiation, delay, and refusal. In this way, our findings suggest that HPV vaccination is at present linked more strongly to stories about the harms, versus preventive benefits, of vaccination.

Table 2

Associations between HPV vaccine-related story types and vaccination behaviors, United States, 2017.

HPV vaccine story type	Parents reporting HPV vaccine initiation/total parents who heard story type ^a ($n = 1263$)				Parents reporting HPV vaccine delay/total parents who heard story type ^b ($n = 479$)				Parents reporting HPV vaccine refusal/total parents who heard story type ^c ($n = 236$)			
	n/N	(%)	aOR	(95% CI)	n/N	(%)	aOR	(95% CI)	n/N	(%)	aOR	(95% CI)
HPV vaccine story type												
Harms only	55/243	(23)	0.48	(0.33:0.69)	63/80	(79)	2.00	(1.09:3.71)	44/61	(72)	8.87	(4.09:19.25)
Both harms and diseases	29/188	(15)	0.31	(0.20:0.50)	55/66	(83)	2.31	(1.12:4.77)	28/39	(72)	9.49	(3.81:23.65)
Preventable diseases only	42/133	(32)	0.89	(0.57:1.38)	51/67	(76)	1.43	(0.75:2.74)	1/17	(6)	0.15	(0.02:1.48)
Neither (no stories)	234/699	(33)	1		176/266	(66)	1		29/119	(24)	1	

Note: Model adjusted for child's sex, child's age, receipt of a provider recommendation, parent's education, parent race/ethnicity, annual household income. aOR = adjusted odds ratio; CI = confidence interval.

^a Model compared parents who had versus had not initiated HPV vaccination, using the full sample.

^b Model compared parents who had delayed versus accepted HPV vaccination, in the subsample of parents who had discussed it with a provider.

^c Model compared parents who had refused versus accepted HPV vaccination, in the subsample of parents who had discussed it with a provider.

Table 3

Association between HPV vaccine-related story types and intention to vaccinate, United States, 2017 ($n = 1263$).

HPV vaccine story type	Intentions mean (SD)	B	(95% CI)	b
Harms only	2.62 (1.40)	-0.76	(-0.94: -0.57)	-0.23
Both harms and preventable diseases	2.84 (1.42)	-0.54	(-0.74: -0.33)	-0.14
Preventable diseases only	3.71 (1.27)	0.30	(0.06:0.53)	0.07
Neither (no stories)	3.39 (1.19)			-

Note: Model adjusted for child's sex, child's age, receipt of a provider recommendation, parent's education, parent race/ethnicity, annual household income, and message condition. SD = standard deviation; B = unstandardized regression coefficient; CI = confidence interval; b = standardized regression coefficient.

Although the cross-sectional design of our survey precludes causal inference, these findings are consistent with prior studies that suggest that negative messages in social media or from health care providers can be a deterrent to HPV vaccination (Fenton et al., 2018; Nan and Madden, 2012), even when mixed with more positive messages (Fontenot et al., 2018).

Our findings align with research demonstrating that negative information is more influential in shaping perceptions and decisions than positive information (Ito et al., 1998). People tend to attend to, trust, and share negative information to a greater extent than positive

information (Bebbington et al., 2017; Siegrist and Cvetkovich, 2001). Prospect theory elaborates on the outsized influence of negative information through the phenomenon of loss aversion, or the tendency to overvalue and protect against losses, even at the expense of potential corresponding gains (Kahneman and Tversky, 1979; Treadwell and Lenert, 1999). In the context of our study, stories of HPV vaccine harms may be more negative, sensational, and controversial than stories of HPV vaccine preventable diseases. Therefore, parents may devote more attention to and more fully process stories of harms compared with stories of HPV vaccine preventable diseases.

This study also found differences in how parents receive stories about HPV vaccination. Consistent with prior research demonstrating that social media is a significant channel of vaccine-critical content (Briones et al., 2012; Dunn et al., 2015; Keelan et al., 2010), our study found that stories of HPV vaccine harms are most common in social media. In addition, the finding that stories of HPV vaccine harms are also common in traditional media aligns with other studies demonstrating a prevalence of vaccine-critical content in local or national news (Gollust et al., 2015). In contrast, our study found that conversations were the most common channel of HPV vaccine preventable diseases. Future research to assess the interaction between story type and behavior by communication channel could reveal whether parents are more likely to be influenced by information on certain channels versus others. Given the potency of cancer survivors' personal narratives, we were surprised that the stories about HPV vaccine's preventive benefits were not more impactful. It may be that stories about potential prevention that are shared through conversations lack the potency and depth of more "media ready," first-hand accounts of harm and loss. Additionally, stories of preventable diseases may not have foregrounded the role of HPV vaccination; parents may not have known or thought of HPV vaccine when they heard stories of preventable diseases and therefore were not influenced to change vaccination behavior.

In terms of implications for public health, our study suggests stories of HPV vaccine harms could act as a significant barrier to communication campaigns seeking to promote timely vaccination. Given the strong associations between stories of harms and vaccination behavior, future research should evaluate specific strategies to counter misinformation found in stories of HPV vaccine harms. Developing effective strategies for negating vaccine-critical content, particularly narratives, is an emerging and important area of research (Betsch and Sachse, 2013). By using evidence-based strategies to identify and counter misinformation about HPV vaccine, the impact of these stories on parents' decision making may be attenuated. Alternatively, public health communication campaigns may need more effective strategies for developing narrative content that promotes the preventive benefits of vaccination, particularly in the context of traditional and social media, as our study suggests that stories of preventable diseases were less common in these venues and less strongly linked to vaccination. Several studies have identified effective strategies such as combining narratives with expert opinion (Hopfer, 2012), presenting a combination of narrative and statistical content (Nan et al., 2015), and describing HPV vaccination as a cancer prevention strategy (Gilkey et al., 2018; Malo et al., 2016). Finally, healthcare providers play a highly influential role in parents' vaccination decisions (Gilkey et al., 2016; Gilkey et al., 2015; Reiter et al., 2013) and are likely to be the most effective antidote to vaccine-critical stories, such as stories of HPV vaccine harms.

Our study is novel in quantifying exposure to HPV vaccine stories across various channels. Strengths include a relatively large, national sample and good response rate. The primary limitation is the cross-sectional design that precludes assessment of the temporal sequence between exposure to stories and HPV vaccination behavior. It may be that exposure to stories about HPV vaccine-related harms encourage parents to refuse or delay vaccination. Alternatively, parents who delay or refuse may be more likely to seek information about vaccine harms to justify their decision. In either case, these findings are troublesome as

exposure to vaccine-critical media content has been associated with greater misconceptions about vaccines (Kortum et al., 2008), reduced intentions to vaccinate (Betsch et al., 2010), and reduced likelihood of vaccination (Fabry et al., 2011). The self-reported nature of our variables of HPV vaccination initiation, delay, and refusal is another limitation of this study; however, research suggests that parents' recall of HPV vaccination initiation is fairly accurate (Ojha et al., 2013). Finally, our study focused on parents of children who had not yet completed the HPV vaccine series because these parents represent a high priority audience for public health efforts to promote HPV vaccination; the generalizability of the findings to parents of fully vaccinated children remains to be established.

5. Conclusion

In conclusion, US parents who heard stories of HPV vaccine harm, whether alone or in combination with stories of HPV vaccine preventable diseases, were less likely to have initiated and more likely to have delayed or refused HPV vaccination for their adolescent children. Exposure to stories of HPV vaccine preventable diseases was not associated with vaccination behavior but was associated with higher intentions. These findings highlight the urgent need for effective public health communication strategies that convey the preventive benefits of HPV vaccination.

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