KANSAS JOURNAL of MEDICINE

Kansan Guardian Perceptions of HPV and the HPV Vaccine and the Role of Social Media

Monique L. R. Luisi, Ph.D.
University of Missouri, School of Journalism, Columbia, MO

Received March 22, 2019; Accepted for publication Aug. 15, 2019; Published online Jan. 31, 2020

ABSTRACT

Introduction. Human papillomavirus (HPV) vaccination rates in Kansas historically have been low among children and adolescents. How Kansas parents and guardians perceive the HPV vaccine may influence vaccination rates among Kansas youth. Social media messages also may influence perceptions, suggesting implications for current and future disease and cancer burden.

Methods. Eligible Kansas guardians of children aged 9 - 17 years completed an online survey. The survey assessed their perceptions about a) HPV and the HPV vaccine, b) HPV and HPV vaccine representation on social media, and c) the effects that social media has on their perceptions about HPV and the HPV vaccine.

Results. Most Kansas guardians (n = 55, 57.9%) indicated seeing information about HPV and the HPV vaccine on social media. Kansas guardians who had reported seeing information on social media about the HPV vaccine were significantly more likely to perceive that the HPV vaccine could kill their child than those who had not seen information (t(79) = 0.019). Additionally, children of wealthier Kansan guardians were vaccinated more than children of less wealthy guardians.

Conclusion. Social media messages may be influencing Kansan guardians to think the HPV vaccine is lethal in their children. Future campaigns increasingly should be focused on HPV vaccine safety and effectiveness. ***Kans J Med 2020;13:9-18.***

INTRODUCTION

The U.S. Centers for Disease Control and Prevention (CDC) estimated that approximately 79 million Americans have human papillomavirus (HPV), with an incidence of 14 million new cases annually.[1] The CDC stated that HPV infection "is so common that most sexually-active men and women will get at least one type of HPV at some point in their lives".[1] While HPV infection does not cause complications in every case, it is linked to genital warts and several types of cancer, including cervical, vulvar, vaginal, penile, anal, and oropharyngeal.[2]

In 2013, Kansas tied for last among U.S. states for the lowest rate of HPV vaccination completion.[3] By county, HPV vaccination completion rates among 11 - 18 year old adolescents ranged from 3% to 48%.[4,5] For females in that age range, the HPV vaccination rates by county ranged from 4% to 58%,[5,6] and for males in the same age range, 1% to 42%.[5,7]

According to the National Immunization Survey-Teen (NIS-Teen),[8] Kansas females and males 13 - 17 years of age consistently ranked low among the 50 U.S. states for receiving at least one, two, and three doses of the HPV vaccine, and for being up-to-date with recommended vaccination series (Table 1 and Table 2).

Table 1. HPV vaccination coverage, U.S. and Kansas females and males (13 - 17 years of age).[8]

Doses	U.S.	Kansas	Kansas Rank (50 U.S. States)
Females			
≥ One dose	68.9%	55.2%	48th
≥ Two doses	57.7%	40.0%	49th
≥ Three doses	44.0%	36.1%	43rd
Up-to-date with recommended vaccination series	53.1%	38.5%	48th
Males			
≥ One dose	62.6%	49.8%	46th
≥ Two doses	48.8%	34.7%	47th
≥ Three doses	34.8%	24.8%	44th
Up-to-date with recommended vaccination series	44.3%	30.4%	47th

Since 2006, HPV vaccines have been available in the U.S.[9] Both females and males can begin receiving an HPV vaccine at age nine, with early vaccination recommended so that recipients develop immunity prior to potential exposure.[10] As of 2016, a two-dose series was approved for children younger than 15 years. While the HPV vaccine can prevent HPV infection, genital warts, and associated cancers, it often is met with feelings of hesitance, fear, and aversion. Studies of online and social media communities resulted in a range of results, from mostly positive attitudes toward the vaccine[11,12] to negative attitudes[13] to being more evenly divided.[14] The presence of negative HPV vaccine-related internet posts are of particular importance, as they can lead to negative perceptions about the vaccine and can encourage audiences to post negative messages, whereas positive messages appear to not encourage positive perceptions and positive message sharing.[15,16]

The influence of social media messages on guardian decision-making to get their children the HPV vaccine, especially in a specific geographical context, is not well-studied. Considering that 88% of U.S. adults use the internet and 79% use social media,[17] it is estimated that 1.9 million Kansas adults are internet users and 1.5 million use social media.[18] Thus, social media messages about HPV and the HPV vaccine likely influence statewide HPV vaccination rates.

The purpose of this study was to evaluate how Kansas guardians of children ages 9 - 17 perceive HPV and the HPV vaccine, perceive social media messages about HPV and HPV vaccines and, in turn, assess how those messages influence their own perceptions about getting their children vaccinated against HPV.

METHODS

Study Design and Participants. From January 31 - March 21, 2017, data were collected via an online survey. To recruit participants, the researcher contacted each of the 105 Kansas county health department administrators, along with the directors of the Kansas Department of Health and Environment, via an email requesting assistance with distribution. Each email was followed up by phone call. A total of 38 county health departments (Barber, Barton, Butler, Chautauqua, Cherokee, Clark, Clay, Crawford, Douglas, Ellis, Finney, Graham, Grant, Harvey, Hodgeman, Jewell, Johnson, Logan, Marshall, Meade, Osage, Ottawa, Pawnee, Pottawatomie, Reno, Rice, Riley, Shawnee, Sheridan, Sherman, Stafford, Stanton, Stevens, Thomas, Wichita, Wilson, Washington, and Wyandotte), the Bureau of Family Health Director, and the Director of the Bureau of Disease Control agreed to assist in distributing the survey by posting the hyperlink to their department websites and social media pages. The researcher also posted the hyperlink on personal Facebook and Twitter pages. Participants also were encouraged to pass the link on to other potential participants. The survey was also available and compatible for smartphone and tablet use. A total of 233 people started the survey. Responses were voluntary and anonymous. The University of Kansas Human Research Protection Program (HRPP; formerly the Human Subjects Committee – Lawrence [HSCL]) approved the instruments and collection procedures of this study.

Measures. The survey included items on participant demographic characteristics (sex, guardian identity, age, race, ethnicity, highest level of education, annual household income, and region of residence), along with their children's (aged 9 - 17 years) demographic information (sex and age) and HPV vaccination status (did guardian ever talk to this child about HPV vaccination, has a healthcare provider mentioned getting this child vaccinated against HPV, did this child receive the HPV vaccine, and was there intent to get an unvaccinated child vaccinated against HPV). Additional items included HPV and HPV vaccine perceptions, source and social media use, and perceptions about HPV and HPV vaccine-related social media messages.

HPV and HPV vaccine perception survey items were based on the health belief model[19,20] and social amplification of risk framework[21,22] concepts. Unless noted, these outcome measures were indicated on 6-point Likert scales, ranging from "1 - strongly disagree" to "6 - strongly agree".

Source and social media use items asked participants their main source of learning about HPV and the HPV vaccine, which social media accounts they use, if any, if they follow health-related pages, and if they had seen, searched for, or posted about HPV and HPV vaccine-related information on social media.

Perceptions about HPV and HPV vaccine-related social media messages were based on health belief model[19,20] and social amplification of risk framework[21,22] concepts. Unless noted, these outcome measures were indicated on 6-point Likert scales, ranging from "1 - strongly disagree" to "6 - strongly agree".

Statistical Analysis. Descriptive statistics were used to report participant demographic characteristics, demographic characteristics of their children aged 9 - 17 years, and the HPV vaccination status of those children. Correlation analyses (Pearson's R [sex, parental identity, race, ethnicity, and region] and Spearman's Rho [generation, education, and income]) were conducted to test for significant relationships between participant demographic characteristics and their child(ren)'s vaccination status.

Descriptive statistics were employed to report HPV and HPV vaccine perception items. Pearson correlation analyses, along with reliability statistics (Cronbach's alpha) were conducted to develop scales. Linear regressions were used to compare scales. Correlation analyses were conducted to test for relationships between participant demographic characteristics and perception items. ANOVA analyses were used to test relationships between participant demographic group characteristics and perceptions.

Descriptive statistics were calculated for source and social media use items. A one-sample t-test was used to calculate perceptions of social media depiction of the HPV vaccine.

Descriptive statistics were calculated for items about perceptions of HPV and HPV vaccine social media messages. Pearson correlation analyses, along with reliability statistics (Cronbach's alpha) were conducted to develop scales. Paired-samples t-tests compared participants' personal perceptions of HPV and the HPV vaccine to their perceptions of social media messages about HPV and the HPV vaccine. Independent samples t-tests (grouped by whether they had seen related information) and one-sample t-tests were performed to compare participants' perceptions about HPV and the HPV vaccine on social media.

Statistical analyses were performed using Qualtrics[23] and SPSS for Windows, Version 25.0.[24] For all Likert scale items, "I don't know" responses were treated as missing cases and not calculated in the analysis. The number of responses that were calculated are reported.

RESULTS

Participants. Of the 233 people who began the survey, 73 participants were ineligible (screener questions ended the survey for participants who indicated that they did not: consent, currently reside in Kansas, or were not the guardian of at least one child aged 9 - 17 years). Of the remaining 160 eligible participants, 95 had heard of HPV and the HPV vaccine and completed the survey for a participation to completion rate of 41.6%. Most of the participants were female, identified as mothers, belonged to Generation X, were White, non-Hispanic/LatinX, with two- or four-year college degrees, and an annual household income of under $100,000. Most of the participants resided in the Kansas City Metro area and Northeast Kansas. The demographic characteristics of the participants are shown in Table 2.

Table 2. Demographic characteristics of Kansas guardians of children 9 - 17 years.

	Participants (n = 95)
Sex, No. (%)	
Female	83 (87.4)
Male	12 (12.6)
Guardian identity, No. (%)	
Mother	83 (87.4)
Father	10 (10.5)
Other	2 (2.1)
Age, years (Generation)[25]	
Age group, No. (%)	(n = 85)
31 - 36 (Millennials)	14 (14.7)
37 - 52 (Generation X)	67 (78.8)
53 - 60 (Boomers)	4 (4.2)
Race, No. (%)	
White	84 (88.4)
Asian	3 (3.2)
American Indian or Alaska Native	2 (2.1)
Black or African American	2 (2.1)
Multiracial	2 (2.1)
Other	1 (1.1)
Ethnicity, No. (%)	
Non-Hispanic/LatinX	91 (95.8)
Hispanic or LatinX	4 (4.2)
Highest level of education, No. (%) (n = 94)	
Less than a college degree	21 (22.1)
Two or four-year college degree	48 (50.5)
Graduate degree	25 (26.3)
Annual household income, No. (%) (n = 87)	
Under $100K	59 (62.1)
$100K +	28 (29.5)
Region of residence[5] (n = 94)	
Northeast	21 (22.1)
North Central	6 (6.3)
Northwest	8 (8.4)
Southeast	9 (9.5)
South Central	18 (18.9)
Southwest	9 (9.5)
Kansas City Metro	23 (24.2)

Participants' Children. The participants reported having one to four children (M = 1.70, SD = 0.70), aged 9 - 17 years. Most of these children were female, with a median age of 13 years. Most of the participants reported having conversations about the HPV vaccine with their children. Most of the participants also reported that a healthcare provider had spoken to them about vaccinating most of their children. However, most children had not been vaccinated against HPV. The median age of vaccinated children was 14 years, and the median age of unvaccinated children was 11 years. Among the unvaccinated children, parents most often reported that they definitely planned to get their children vaccinated before the child turns 18. The demographic characteristics and the HPV vaccination status information about the participants' children ages 9 - 17 years are shown in Table 3.

Table 3. Demographic characteristics of Kansas guardians' children, 9 - 17 years.

Characteristics	Children (n = 160)
Sex, No. (%)	**(n = 158)**
Female	102 (63.8)
Male	56 (35.0)
Age, years	
Median (variance)	13 ± 2.50
Talk to child about HPV vaccine, No. (%) (n = 155)	
Yes	96 (60.0)
No	59 (36.9)
Talked to healthcare provider about getting child HPV vaccine, No. (%) (n = 157)	
Yes	110 (68.8)
No	43 (26.9)
HPV vaccination status, No. (%) (n = 155)	
At least one dose	62 (38.8)
No doses	93 (58.1)
Unvaccinated children (n = 93)	
Intent to get child HPV vaccine before 18 years, No. (%)	
Definitely yes	25 (26.8)
Probably yes	20 (21.5)
Might or might not	16 (17.2)
Probably not	13 (14.0)
Definitely not	19 (20.4)

Tests for significant relationships between guardian demographics (generation, race, ethnicity, education, income, and region of residence) and child vaccination status (receiving at least one dose, no dose) show that children of guardians reporting an annual household income of $100,000 or more were significantly more likely to have received at least one dose of the HPV vaccine, compared to children of guardians with annual household incomes of less than $100,000 ($p = 0.003$). All other relationships were found to be statistically insignificant.

HPV and HPV Vaccine Perceptions. Table 4 summarizes the participants' HPV and HPV vaccine perceptions. HPV vaccine effectiveness perception items (n = 3) were correlated significantly and comprised the HPV vaccine effectiveness perception scale (α = 0.76). Table 5 provides the correlation coefficients of HPV vaccine effectiveness perceptions. Additionally, HPV vaccine harm perception items (n = 5) were correlated significantly and comprised the HPV vaccine harm perception scale (α = 0.97). Table 6 provides the correlation coefficients for HPV vaccine harm perceptions.

Table 4. Participant HPV and HPV vaccine perceptions.

Variable	Mean	SD	(n)
HPV Susceptibility			
My child is at risk to contract HPV.	4.34	1.47	92
HPV Severity			
HPV causes genital warts.	5.11	1.14	79
HPV causes cancer.	5.51	.62	91
HPV can kill my child.	4.21	1.50	90
HPV Vaccine Benefits			
HPV vaccine effectiveness perceptions scale (α = 0.76)	4.72	1.17	71
HPV vaccine can prevent HPV.	4.60	1.38	91
HPV vaccine can prevent genital warts.	4.50	1.58	72
HPV vaccine can prevent cancer.	4.58	1.43	88
I am a good parent if I get my child the HPV vaccine.	3.99	1.66	86
HPV Vaccine Barriers and Risks			
HPV vaccine harm perception scale (α = 0.97)	2.94	1.82	72
It is risky for my child to receive the HPV vaccine.	2.81	1.69	89
There are more risks for my child getting the HPV vaccine than having HPV.	2.36	1.62	85
My child will experience harmful side effects if they receive the HPV vaccine.	2.63	1.49	81
My child is more likely to be harmed by the HPV vaccine than having HPV.	2.43	1.66	84
The HPV vaccine could kill my child.	2.25	1.45	85
The HPV vaccine will encourage increased sexual activity.	1.48	0.76	94
I have been discouraged from getting my child the HPV vaccine.	2.37	1.52	92
The HPV vaccine is inconvenient to get for my child.	2.41	1.46	87
Cues to Action			
I have been encouraged to get my child the HPV vaccine.	4.50	1.37	92
Self-Efficacy			
I can protect my child from HPV.	4.96	1.18	94

Table 5. Correlation coefficients of HPV vaccine effectiveness perceptions.

Variables		HPV vaccine can prevent HPV.	HPV vaccine can prevent genital warts.	HPV vaccine can prevent cancer.
HPV vaccine can prevent HPV.	Pearson's Correlation			
	Sig. (2-tailed)			
	n			
HPV vaccine can prevent genital warts.	Pearson's Correlation	0.500**		
	Sig. (2-tailed)	< 0.0001		
	n	71		
HPV vaccine can prevent cancer.	Pearson's Correlation	0.661**	0.556**	
	Sig. (2-tailed)	< 0.0001	< 0.0001	
	n	87	71	

**Correlation is significant at the 0.001 level (2-tailed).

Analyses showed that income had a significant positive correlation with participants feeling like they are good guardians if they get their child the HPV vaccine (p = 0.047) and with being encouraged to get their child the HPV vaccine (p = 0.014). All other relationships were found to be insignificant. A regression analysis found that the HPV vaccine harm perception scale had a significant positive correlation with the perception that the HPV vaccine would cause their child to become more sexually active (p = 0.011). Also, an analysis found that higher scores on the HPV vaccine harm perception scale (β = -0.451) significantly predicted lower scores on the HPV vaccine effectiveness perception scale, explaining 38.5% of the variance (R = 0.620; F [1, 57] = 35.63; p < 0.0001). Furthermore, an analysis of variance showed that the effect of region on participants' perception of HPV vaccine inconvenience for their children was significant (F [6, 80) = 2.96; p = 0.012; see Table 7 for means).

Source and Social Media Use. About 5% of participants reported that social media was their main source of information about HPV and the HPV vaccine; however, healthcare providers were still the main source of information in both cases. Figures 1 and 2 provide summaries.

Most participants reported using social media, specifically a Facebook account (Figure 3).

Table 6. Correlation coefficients of HPV vaccine harm perceptions.

Variables		It is risky for my child to receive the HPV vaccine.	There are more risks for my child getting the HPV vaccine than having HPV.	My child will experience harmful side effects if they receive the HPV vaccine.	My child is more likely to be harmed by the HPV vaccine than having HPV.	The HPV vaccine could kill my child.
It is risky for my child to receive the HPV vaccine.	Pearson's Correlation	———				
	Sig. (2-tailed)					
	n					
There are more risks for my child getting the HPV vaccine than having HPV.	Pearson's Correlation	0.874**	———			
	Sig. (2-tailed)	0.0001				
	n	85				
My child will experience harmful side effects if they receive the HPV vaccine.	Pearson's Correlation	0.910**	0.912**	———		
	Sig. (2-tailed)	0.0001	0.0001			
	n	80	78			
My child is more likely to be harmed by the HPV vaccine than having HPV.	Pearson's Correlation	0.881**	0.845**	0.878**	———	
	Sig. (2-tailed)	0.0001	0.0001	0.0001		
	n	84	81	77		
The HPV vaccine could kill my child.	Pearson's Correlation	0.783**	0.709**	0.712**	0.848**	———
	Sig. (2-tailed)	0.0001	0.0001	0.0001	0.0001	
	n	83	80	77	78	

** Correlation is significant at the 0.001 level (2-tailed).

Table 7. Participant perception of HPV vaccine inconvenience for children, region.

Region	Mean	SD	n
South Central	3.06	1.55	18
North Central	3.00	1.23	5
Northeast	2.94	1.68	17
Southeast	2.56	1.74	9
Kansas City Metro	2.00	1.15	22
Northwest	1.57	0.79	7
Southwest	1.33	0.50	9
Total	2.41	1.46	87

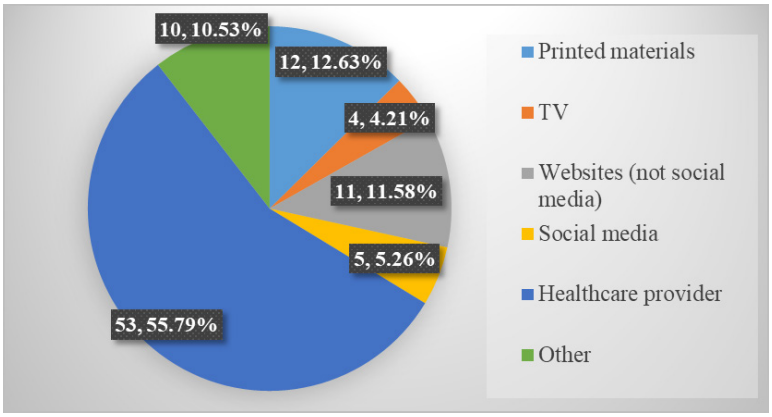

Figure 1. Participant main source for HPV information (n = 95).

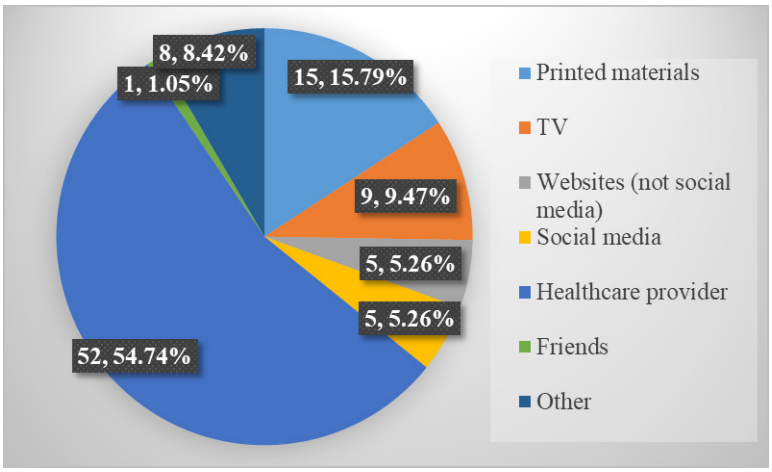

Figure 2. Participant main source of HPV vaccine information (n = 95).

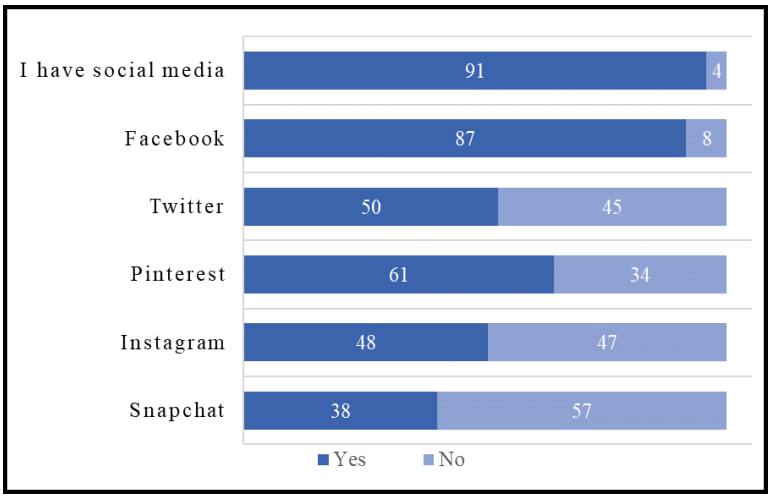

Figure 3. Participant social media use (n = 95).

Forty participants (42.1%) indicated that they follow health-related pages on social media. Related to social media use and HPV, most (n = 57, 60.0%) had seen information about HPV, 20 participants (21.1%) searched for information, and 15 (15.8%) posted or shared information. Concerning the HPV vaccine and social media, most participants had seen information about the vaccine (n = 56, 58.9%), 15 (15.8%) had searched for information, and 14 (14.7%) had posted information to social media. When asked on a 5-point Likert scale (recoded - 2 = "always against," 2 = "always in favor"), participants did not perceive that social media was significantly in favor or against the HPV vaccine (n = 55, M = 0.00, SD = 1.20, t(54) = 0.00, p = 1.00).

Perceptions of HPV and HPV Vaccine Social Media Messages. Of the 95 respondents, 55 (57.9%) indicated seeing information about HPV and the HPV vaccine on social media. Table 8 provides summaries of these participants' characteristics.

Table 8. Demographic characteristics of Kansas guardians of children (9 - 17 years), who viewed HPV and HPV vaccine information on social media.

Characteristics	Participants (n = 55)
Sex, No. (%) (n = 55)	
Female	49 (89.1)
Male	6 (10.9)
Guardian identity, No. (%) (n = 55)	
Mother	50 (90.9)
Father	5 (9.1)
Age, years (Generation)[25]	
Age group, No. (%)	(n = 49)
31 - 36 (Millennials)	7 (12.7)
37 - 52 (Generation X)	41 (74.5)
53 - 60 (Boomers)	1 (1.8)
Race, No. (%) (n = 54)	
White	51 (92.7)
Non-White	3 (5.5)
Ethnicity, No. (%) (n = 55)	
Non-Hispanic/LatinX	53 (96.4)
Hispanic or LatinX	2 (3.6)
Highest level of education, No. (%) (n = 55)	
Less than a college degree	11 (20.0)
Two or four-year college degree	29 (52.7)
Graduate degree	15 (27.3)
Annual household income, No. (%) (n = 50)	
Under $100,000	33 (60.0)
$100,000 or more	17 (30.9)
Region of residence[5] (n = 55)	
Northeast	9 (16.4)
North Central	5 (9.1)
Northwest	6 (10.9)
Southeast	6 (10.9)
South Central	12 (21.8)
Southwest	5 (9.1)
Kansas City Metro	12 (21.8)

Table 9 summarizes participant perceptions of social media messages about HPV and the HPV vaccine. Social media-based HPV vaccine effectiveness perception items (n = 3) were correlated significantly and comprised the social media-based HPV vaccine effectiveness perception scale (α = 0.90). Table 10 provides the correlation coefficients of social media-based HPV vaccine effectiveness perceptions. Additionally, social media-based HPV vaccine harm perception items (n = 5) were correlated significantly and comprised the social media-based HPV vaccine harm perception scale (α = 0.96). Table 11 provides the correlation coefficients for social media-based HPV vaccine harm perceptions.

Table 9. Participant perceptions of social media of HPV and HPV vaccine messages.

Variable	Mean	SD	n
HPV Susceptibility			
Your child is at risk to contract HPV.	4.41	1.38	54
HPV Severity			
HPV causes genital warts.	4.61	1.30	44
HPV causes cancer.	4.86	1.30	51
HPV can kill my child.	4.00	1.77	48
HPV Vaccine Benefits			
Social media-based HPV vaccine effectiveness perceptions scale (α = 0.90)	4.50	1.16	37
HPV vaccine can prevent HPV.	4.28	1.44	46
HPV vaccine can prevent genital warts.	4.28	1.41	39
HPV vaccine can prevent cancer.	4.28	1.45	46
I am a good parent if I get my child the HPV vaccine.	3.51	1.69	47
HPV Vaccine Risks and Barriers			
Social media-based HPV vaccine harm perception scale (α = 0.96)	3.53	1.56	44
It is risky for your child to receive the HPV vaccine.	3.69	1.71	51
There are more risks for your child getting the HPV vaccine than having HPV.	3.43	1.73	51
Your child will experience harmful side effects if they receive the HPV vaccine.	3.59	1.71	51
Your child is more likely to be harmed by the HPV vaccine than having HPV.	3.65	1.64	48
The HPV vaccine could kill your child.	3.28	1.73	50
The HPV vaccine will not encourage increased sexual activity.	4.06	1.77	51
Society discourages you from getting your child the HPV vaccine.	3.78	1.72	50
The HPV vaccine is inconvenient.	2.74	1.51	43
Cues to Action			
Society encourages you to get your child the HPV vaccine.	3.75	1.66	48
Self-Efficacy			
I can protect my child from HPV.	4.72	1.25	53

Table 10. Correlation coefficients of social media-based HPV vaccine effectiveness perceptions.

Variables		HPV vaccine can prevent HPV.	HPV vaccine can prevent genital warts.	HPV vaccine can prevent cancer.
HPV vaccine can prevent HPV.	Pearson's Correlation			
	Sig. (2-tailed)	———		
	n			
HPV vaccine can prevent genital warts.	Pearson's Correlation	0.783**		
	Sig. (2-tailed)	0.0001	———	
	n	47		
HPV vaccine can prevent cancer.	Pearson's Correlation	0.917**	0.663**	
	Sig. (2-tailed)	0.0001	0.0001	———
	n	45	39	

**Correlation is significant at the 0.001 level (2-tailed).

When comparing personal perceptions to perceptions of social media messages, personal context scores were significantly higher for HPV causing warts and cancer, HPV vaccine harm, HPV vaccine discouragement, and HPV vaccine encouragement. Personal context scores were significantly lower for HPV vaccine encouraging increased sexual activity of child (Table 12).

When participants were grouped by whether they reported seeing information about HPV on social media, there were no significant differences between groups on how they scored on HPV-related items. Concerning perceptions about the HPV vaccine, a one-sample t-test analyzed if what they read on social media increases or decreases their fear about getting their child the HPV vaccine (-1 = decreases, 0 = neither increases nor increases, and 1 = increases). Results indicated that participants perceived that their fears were neither significantly increased or decreased by social media ($M = 0.11$, $SD = 0.50$; $t(54) = 1.63$, $p = 0.109$). Participants who had reported seeing information on social media about the HPV vaccine ($M = 2.50$, $SD = 1.62$) were significantly more likely to perceive that the HPV vaccine could kill their child than those who had not seen information ($M = 1.74$, $SD = 0.85$; $t(79) = 0.019$). All other tests found relationships to be statistically insignificant.

Table 11. Correlation coefficients of social media-based HPV vaccine harm perceptions.

Variables		It is risky for my child to receive the HPV vaccine.	There are more risks for my child getting the HPV vaccine than having HPV.	My child will experience harmful side effects if they receive the HPV vaccine.	My child is more likely to be harmed by the HPV vaccine than having HPV.	The HPV vaccine could kill my child.
It is risky for my child to receive the HPV vaccine.	Pearson's Correlation	———				
	Sig. (2-tailed)					
	n					
There are more risks for my child getting the HPV vaccine than having HPV.	Pearson's Correlation	0.766**	———			
	Sig. (2-tailed)	0.0001				
	n	60				
My child will experience harmful side effects if they receive the HPV vaccine.	Pearson's Correlation	0.922**	0.751**	———		
	Sig. (2-tailed)	0.0001	0.0001			
	n	50	50			
My child is more likely to be harmed by the HPV vaccine than having HPV.	Pearson's Correlation	0.810**	0.835**	0.907**	———	
	Sig. (2-tailed)	0.0001	0.0001	0.0001		
	n	47	47	47		
The HPV vaccine could kill my child.	Pearson's Correlation	0.689**	0.655**	0.724**	0.736**	———
	Sig. (2-tailed)	0.0001	0.0001	0.0001	0.0001	
	n	50	49	49	46	

**Correlation is significant at the 0.001 level (2-tailed).

Table 12. Comparing personal and social media perceptions about HPV and HPV vaccine messages.

Variable	Mean	SD	n	t	df	Significance (2-tailed)
HPV Susceptibility						
Child is at risk to contract HPV	-0.19	1.94	53	-0.707	52	0.483
HPV Severity						
HPV causes genital warts	0.66	1.44	41	2.92	40	0.006*
HPV causes cancer	0.69	1.35	51	3.63	50	0.001**
HPV can kill my child	0.13	2.12	46	0.42	45	0.679
HPV Vaccine Benefits						
HPV vaccine effectiveness perceptions scale	0.190	1.23	35	0.92	34	0.37
Good parenting if child receives HPV vaccine	0.39	1.54	46	1.72	46	0.092
HPV Vaccine Risks and Barriers						
HPV vaccine harm perception scale	0.95	2.66	38	1.82	37	0.03*
HPV vaccine encouragement of increased sexual activity	-1.58	1.81	52	-6.29	52	0.0001**
Discouragement from getting child HPV vaccine	-1.06	2.17	48	-3.40	48	0.001**
HPV vaccine inconvenience	-0.10	1.44	42	-0.43	41	0.672
Cues to Action						
Encouragement to get child HPV vaccine	0.69	2.17	48	2.19	47	0.03*
Self-Efficacy						
Ability to protect child from HPV	-1.57	1.35	53	1.62	52	0.11

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.001 level (2-tailed).

DISCUSSION

This study suggested that social media may have a negative influence on Kansas guardian perceptions of the HPV vaccine. While guardians who reported seeing information about the HPV vaccine on social media perceived a divided climate and were not being influenced by it, they were significantly more likely to believe that the HPV vaccine can kill their child. This is aligned with findings that exposure to negative social media messages about the HPV vaccine can lead to audiences holding negative perceptions.[15,16] The idea of parents fearing vaccines is also not a completely new concept. A survey of U.S. adults found that 32% believe that the risks of childhood vaccine side effects are "medium" or "high".[26]

Guardians appear to take the threat of HPV, in terms of causing cancer and genital warts, seriously. The participants believed their perceptions of HPV risks to be stronger than social media depictions. However, Kansas guardians also believed that their perceptions of the HPV vaccine's potential to cause harm to their children were also stronger than social media depictions.

Healthcare providers are the dominant primary source for information about HPV and the HPV vaccine. While a small percentage of guardians reported that social media is their main source of information about HPV and the HPV vaccine, most participants reported seeing information about these topics on social media. This result further suggested that social media is influencing many Kansas guardians about the HPV vaccine. Future efforts to increase HPV vaccination rates among Kansas children may best be directed at addressing social media messaging, guardians' fears about the HPV vaccine killing their children, and HPV vaccine effectiveness, rather than the threat that HPV poses.

The study suggested that, even though vaccination can begin as early as age 9, Kansas guardians are waiting until their children are teenagers before getting them the HPV vaccine. Regionally, guardians residing in South Central and North Central Kansas, mostly rural areas, perceived the vaccine as inconvenient. The CDC reported that adolescents in rural areas trail urban adolescents in HPV vaccination rates.[27] Future research can analyze inconvenience factors that particularly address rural citizens and perceptions of the HPV vaccine. Furthermore, children of guardians with an annual household income of under $100,000 are more likely to not receive the HPV vaccine. This is contrary to national reports, where adolescents above the poverty line trail those who are below it for HPV vaccination rates.[28] For wealthier guardians, being encouraged to get their children vaccinated and feeling like they are good parents for doing so, appeared to have a role in the higher vaccination rates among their children. Future research with larger, representative, and non-convenience samples exploring guardian reasons for delayed HPV vaccination, lower vaccination rates among lower socioeconomic groups, and comparing Kansas with other regions can enhance understanding of and improve HPV vaccination uptake among children in Kansas.

CONCLUSION

This study showcased the perceptions that Kansas guardians of children ages 9 - 17 have about HPV and the HPV vaccine, their perceptions of how HPV and the HPV vaccine are represented on social media, and the potential influence that social media has on their perceptions. Given the ubiquity of social media and the pervasiveness of HPV and HPV vaccine messages, its potential effects should not be ignored. Continued research and efforts to understand and harness the power of social media on the HPV vaccine are needed, specifically fear and acceptance, among Kansas guardians. These efforts are necessary to increase vaccination uptake among their children, thereby reducing the future HPV-related disease burden.

REFERENCES

[1] U.S. Centers for Disease Control and Prevention. Human papillomavirus (HPV): Genital HPV infection - fact sheet. 2017. Available at: http://www.cdc.gov/std/HPV/STDFact-HPV.htm. Accessed March 22, 2019.
[2] U.S. Centers for Disease Control and Prevention. Human papillomavirus (HPV): The link between HPV and cancer. 2015. Available at: http://www.cdc.gov/hpv/cancer.html. Accessed March 22, 2019.
[3] Hart M. Kansas tied for lowest rate of teen HPV vaccination. August 2, 2015. Available at: https://www.cjonline.com/news/business/2015-08-02/kansas-tied-lowest-rate-teen-hpv-vaccination. Accessed April 1, 2019.
[4] Immunize Kansas Coalition. Kansas HPV vaccination rates: 11-18 year olds receiving three HPV vaccinations. 2017. Available at: http://www.immunizekansascoalition.org/images/ hpv/3dose_all_final4.jpg. Accessed March 22, 2019.
[5] Kansas Adjutant General's Department. Regional Councils. 2017. Available at: http://www.kansastag.gov/KSHLS.asp?PageID=303. Accessed March 22, 2019.
[6] Immunize Kansas Coalition. Kansas HPV vaccination rates: 11-18 year old females receiving three HPV vaccinations. 2017. Available at: http://www.immunizekansascoalition.org/ images/hpv/3dose_female_final4.jpg. Accessed March 22. 2019.
[7] Immunize Kansas Coalition. Kansas HPV vaccination rates: 11-18 year old males receiving three HPV vaccinations. 2017 Available at: http://www.immunizekansascoalition.org/ images/ hpv/3dose_male_final4.jpg. Accessed March 22, 2019.
[8] U.S. Centers for Disease Control and Prevention. 2015 adolescent human papillomavirus (HPV) vaccination coverage report. 2017. Available at: http://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/hpv/reports/2015.html. Accessed March 22, 2019.
[9] U.S. Food and Drug Administration. June 8, 2006 approval letter - human papillomavirus quadrivalent (types 6, 11, 16, 18) vaccine, recombinant. Rockville, MD: Department of Health and Human Services, 2006.
[10] Schuchat A. HPV "coverage". N Engl J Med 2015; 372(8):775-776. PMID: 25693018.
[11] Battles HT. Exploring ethical and methodological issues in internet-based research with adolescents. Int J Qual Methods 2010; 9:27-39.
[12] Ache KA, Wallace LS. Human papillomavirus vaccination coverage on YouTube. Am J Prev Med 2008; 35(4):389-392. PMID: 18675530.
[13] Briones R, Nan X, Madden K, Waks L. When vaccines go viral: An analysis of HPV vaccine coverage on YouTube. Health Commun 2012; 27(5):478-485. PMID: 22029723.
[14] Keelan J, Pavri V, Balakrishnan R, Wilson K. An analysis of the human papilloma virus vaccine debate on MySpace blogs. Vaccine 2010; 28(6):1535-1540. PMID: 20003922.
[15] Dunn AG, Leask J, Zhou X, Mandl KD, Coiera E. Associations between exposure to and expression of negative opinions about human papillomavirus vaccines on social media: An observational study. J Med Internet Res 2015; 17(6):e144. PMID: 26063290.
[16] Nan X, Madden K. HPV vaccine information in the blogosphere: How positive and negative blogs influence vaccine-related risk perceptions, attitudes, and behavioral intentions. Health Commun 2012; 27(8):829-836. PMID: 22452582.
[17] Pew Research Center. Social media use over time. Feb. 6, 2018. Available at: http://www.pewinternet.org/data-trend/social-media/social-media-use-all-users/. Accessed March 22, 2019.
[18] United States Census Bureau. QuickFacts: Kansas. 2017. Available at: http://www.census.gov/quickfacts/table/PST045215/20. Accessed Jan. 15, 2017.

[19] Rosenstock I. Historical origins of the Health Belief Model. Health Education Monograph 1974; 2(4):328-335. https://dx.doi.org/10.1177/109019817400200403.
[20] Rosenstock I, Strecher VJ, Becker MH. Social learning theory and the Health Belief Model. Health Educ Q 1988; 15(2):175-183. PMID: 3378902.
[21] Kasperson JX, Kasperson RE, Pidgeon N, Slovic P. The social amplification of risk: Assessing fifteen years of research and theory. In: Pidgeon N, Kasperson RE, Slovic P, (Eds). The Social Amplification of Risk. London: Cambridge University Press, 2003, pp. 13 - 46. ISBN: 9780521520447.
[22] Kasperson RE, Renn O, Slovic P, et al. The social amplification of risk: A conceptual framework. Risk Analysis 1988; 8(2):177-187.
[23] Qualtrics.com. Qualtrics. Provo, UT: Qualtrics, 2019.
[24] IBM Corporation, IBM SPSS Statistics for Windows. Armonk, NY: IBM Corporation, 2017.
[25] Pew Research Center. Generations and age. January 17, 2019. Available at: https://www.pewresearch.org/topics/generations-and-age/. Accessed July 26, 2019.
[26] Pew Research Center. 5 facts about vaccines in the U.S. March 19, 2019. Available at: https://www.pewresearch.org/fact-tank/2019/03/19/5-facts-about-vaccines-in-the-u-s/. Accessed July 26, 2019.
[27] U.S. Centers for Disease Control and Prevention. Human papillomavirus (HPV): HPV vaccination coverage. Available at: https://www.cdc.gov/hpv/hcp/vacc-coverage/index.html. Accessed July 26, 2019.
[28] Henry J Kaiser Family Foundation. The HPV vaccine: Access and use in the U.S. October 9, 2018. Available at: https://www.kff.org/womens-health-policy/fact-sheet/the-hpv-vaccine-access-and-use-in-the-u-s/. Accessed July 26, 2019.

Keywords: HPV vaccines, social media, decision making