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Health Communication in Mass Media

The HPV vaccine and the media: How has the topic been covered and what are the effects on knowledge about the virus and cervical cancer?

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ABSTRACT

Objective: In June 2006, the first vaccine for HPV was approved by the FDA and media coverage about the topic increased significantly. This study sought to explore the nature of the coverage and whether knowledge about HPV was affected by it.
Methods: A content analysis, including 321 news stories from major newspapers, the AP wire and television news networks was conducted. A monthly RDD-recruited Internet survey with a national sample ($n = 3323$) was used to assess changes in population knowledge.
Results: Twenty-three percent of stories did not mention the sexually transmitted nature of the disease and 80% left out information about the need for continued cervical cancer screening after vaccination. Exposure to health-related media content was significantly associated with knowledge about HPV, even controlling for baseline knowledge (OR = 1.62, 95% CI = 1.12–2.35).
Conclusions: Changes in the volume of coverage over time were associated with knowledge about HPV, but the content analysis reveals that many of the stories were missing important information.
Practice implications: Clinicians must consider the potential media source patients are using for HPV-related information in order to correct inaccurate or incomplete information that could affect health behavior.

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1. Introduction

In June 2006, the Food and Drug Administration (FDA) approved the world's first vaccine to prevent cervical cancer [1]. The vaccine targets the human papillomavirus (HPV), a sexually transmitted infection which causes cervical cancer and almost all cases of genital warts [2].

Although HPV infection is common in the U.S., several studies have documented relatively low levels of knowledge about the virus [3,4]. More recent data shows that awareness of HPV is increasing, although many Americans are still unaware of the virus or its strong ties to cervical cancer [5,6]. Some researchers cite lack of knowledge about HPV prevention and transmission as a major barrier to vaccine compliance [7,8]. Others have shown that knowledge can be an important predictor of vaccine behavior [9–11].

One reason knowledge may be lacking is incomplete or inaccurate news coverage [12,13].

If information is presented inaccurately, or if key details about the vaccine are excluded from news stories, patients may be misinformed [12,13]. The clinical implications are an increased burden on physicians to ensure that their patients have adequate information to engage in healthy behaviors. For example, if facts about the need for continued routine cervical cancer screening after vaccination are omitted from media reports, women may wrongly abandon routine screening in the future.

Previous research has found that the media is sometimes inconsistent in reporting detailed information about disease transmission and vaccine characteristics [12,13]. In our study, we build upon that research by using content analysis to describe how widely read newspapers and major television networks presented information about the HPV vaccine in the months directly preceding and following vaccine approval in June 2006. First, we wanted to establish whether the amount of media coverage about HPV increased in those months. Also, we wanted to examine the quality of that coverage: whether it included information relevant for someone considering the vaccination, and whether it cited credible sources for the information provided.

Our second purpose was to establish whether media coverage had any impact on knowledge. This has two specific implications for this study: first, we seek to show that knowledge about HPV

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sharply increased at the time of the FDA announcement, and that it tracked the increases in media coverage. However, we recognize that evidence of associated secular trends may not establish a causal relationship. It is possible that the information spread through exposure to other sources (e.g., medical professionals) or in a two-step flow, with some people learning directly from media coverage, but others because the topic is discussed within social networks [14]. However if there are substantial direct effects of coverage on individual knowledge, those people who report the most exposure to media should be the ones who learn the information. As a result, those who are heavier media users would be more likely to have knowledge at any given time, and, more persuasively, *increases* over time in knowledge would be more often found among those with greater personal exposure to news media. To our knowledge, this is the first study to investigate whether the large volume of media coverage surrounding the approval of the vaccine has significantly impacted the public's knowledge about the topic.

2. Methods

2.1. Content analysis

The content analysis involved HPV or cervical cancer-related news reports from 18 newspapers with the highest readership in the U.S. (as of July 2004), four broadcast networks (*ABC*, *CBS*, *NBC*, and *CNN*), and the *Associated Press*. News stories were collected from December 2005 to November 2006, which accounted for 6 months before and after the approval of the HPV vaccine. All articles and transcripts were obtained through the archives on Nexis.com by searching for "*HPV* OR *cervical cancer* AND NOT (*budget* OR *profit* OR *Senate*)." The exclusion terms (budget, profit, Senate) were used to eliminate the high return of articles that discussed pharmaceutical earnings and government cancer screening policy. From the search returns, coders excluded obituaries, letters from the public (e.g., letters to the editor), duplicate articles, and articles for which the major focus was something other than health, such as financial reports for the pharmaceutical companies producing the vaccines. The majority of the retained articles (95%) referenced the vaccine, while about 5% of articles were solely about cervical cancer and not the vaccine.

Electronic copies of news stories were downloaded from the Internet by a research assistant and were coded by two of the authors, who also designed the coding scheme of the content analysis. The coding scheme covered primary topics about the vaccine, such as general information about HPV transmission, attention given to key words like "cervical cancer" and "STI," recommendations for cancer screening, and journalistic features. A sample set of stories was consensus coded by the two coders, and all points of disagreement were resolved before the remaining stories were coded. Reliability (Krippendorf's α) between the two coders on the sample set was .9774 (averaged across all coding categories for each article). News stories were coded for article source (newspaper or television); location of first mention of HPV, cervical cancer, and STI (headline or body of text); the presence of a description of HPV as a sexually transmitted infection and the presence of discussion of the need for continued cervical cancer screening exams after vaccination.

2.2. Cross-sectional and longitudinal surveys

The Annenberg National Health Communication Survey (ANHCS) is a joint effort of the Annenberg Schools for Communication at the University of Pennsylvania and the University of Southern California. ANHCS is a monthly survey, administered by Knowledge Networks, Inc., with an online research panel recruited through nationwide random-digit-dialling of landline telephones, to produce a nationally representative sample. Participants who do not initially have access to the Internet in their homes are provided free hardware and Internet access with which to complete the survey. Approximately 250 people are surveyed each month.

2.2.1. Cross-sectional data for tracking population knowledge over time

Data used in the cross-sectional study is for the months from December 2005 to November 2006, the same months for which we had media coverage information. Due to administrative error, no survey was conducted in September 2006. Panel recruitment rates were 30% and survey completion rates averaged 77%. The total sample size for the cross-sectional sample was 3323.

2.2.2. Longitudinal data for linking exposure to health media coverage to changes in knowledge

The longitudinal survey was implemented through the same research procedures and with the same questionnaire as the ANHCS survey described above, however, it used a separate sample of 1044 individuals. For these additional 1044 subjects, knowledge and exposure data were measured at two different times, 1 year apart. Participants were initially surveyed during a specific month between March and July 2005, and again during the same month in 2006. This prospective data allows us to investigate causal direction by predicting knowledge in 2006 from reported exposure, controlling for baseline knowledge. The follow-up response rate for the longitudinal sample was 84%.

2.2.3. Survey measures

2.2.3.1. HPV knowledge. For both the cross-sectional and longitudinal surveys, knowledge was measured with a single item: "Which of the following is associated with cervical cancer?" Answer options (in random order) included: "human papillomavirus," "one or more abortions," "high blood pressure," "a history of regular smoking," "breastfeeding one or more children," and "don't know". All answers other than "human papillomavirus," (including "don't know") were recoded as "incorrect," to create a dichotomous variable. There was a concern about misclassification with this answer, as a link between smoking and cervical cancer has been established in the literature. It is possible some respondents were aware of both risk factors, but chose smoking as the answer and therefore were coded as having no knowledge of the HPV–cervical cancer link. However, we can be confident that this did not bias the results much, as only 2.8% chose the smoking answer.

2.2.3.2. Control variables: general news use. An index of general news use was created by averaging three items, including: in the past 7 days, on how many days did you... [Read a newspaper?]; [Watch the national news on television?]; [Watch the local news on television?]. The range for the averaged index was 0–7 (mean = 3.2, SD = 1.8).

2.2.3.3. Health media use. An index of health media use was created from five media use items. These included: how often have you... [Read such health sections]; [Read magazines or newsletters that focus on health]; [Watched such health segments]... in the past 30 days? and "About how often have you read this sort of information on the Internet in the past 30 days?" (all measured on a four-point scale: "not at all," "less than once per week," "once per week," and "a few times per week"). The fifth question was "Have you read health information on the Internet when you were not trying to find out about a specific health concern?: yes/no". The two Internet items were combined to form one interval-level

variable. Then, the four interval-level variables were averaged to create an index with a range of 0–3 (mean = .66, SD = .60).

2.2.3.4. Demographic variables. Gender, age and education were measured in the core of the survey. Age was measured on a continuous scale, but, as its relationship with knowledge appeared non-monotonic, it was recoded as a categorical variable (18–29; 30–44; 45–59; 60 and older). Education, measured as the highest degree received, was recoded from a categorical variable to an interval-level variable, ranging from 8 years for less than high school to 20 years for a doctoral degree.

2.2.3.5. History of cervical cancer. Participants were asked whether a doctor had ever diagnosed them with cancer. Those who answered "yes" were asked whether they had ever had cervical cancer. Because the prevalence was extremely low in this sample, (less than 1%) participants with a history of cervical cancer remained in the sample, but the variable was not included in the analyses. Unfortunately, the survey did not include questions related to history of abnormal pap test or history of HPV, which might also be associated with knowledge.

2.3. Data analysis

The content analysis is presented as simple percentages for each coded variable and with chi-square tests to compare differences in coded variables between print and broadcast news sources. Over-time in amount of monthly coverage are presented in two ways. The mean number of stories per month, with confidence intervals, is shown for the pre- and post-FDA announcement periods. Also, the actual number of stories per month is presented in a figure showing change over time.

In the same figure, the percentage of respondents who knew the HPV–cervical cancer link is graphed as well to show how knowledge tracked coverage. Also, the percentage with correct answers to the knowledge question (and confidence intervals) is presented for months prior to May 2006 compared to the months including and following May. This cutoff point was chosen because the increase in media coverage began prior to and in anticipation of the FDA approval. In order to compare those exposed to lower amounts of media coverage to those exposed to high amounts, this distinction was most appropriate. Weights were used to adjust the survey sample to the Current Population Survey. STATA 10 SVY programs were used for all weighted analyses.

To test the longitudinal hypothesis (linking health media use with knowledge), we used logistic regression predicting the knowledge of the HPV–cervical cancer link measure at follow-up from follow-up media exposure (because this was the coverage that occurred during the appropriate time), with baseline knowledge entered into the model as a control variable. The model also included control variables which were identified a priori as having likely associations with the independent and dependent variables. These controls included age [15,16], gender [17], race and ethnicity [18,19], exposure to general news media [20] and education [15,16,21,22].

3. Results

3.1. Participants

Demographics for both the cross-sectional and longitudinal samples are described in Table 1.

3.2. Describing the media coverage

A total of 222 stories were included in the content analysis. There was significant variation in the number of articles by month (mean = 19, SD = 26.5). The largest numbers of stories occurred in May (n = 53), June (n = 90) and July (n = 23), just prior to and after the FDA approval. For December through April, the mean number of stories appearing each month was 4.4 (95% CI = 2.38–6.41) For May–September, the mean number of articles was significantly larger: 39.4 (95% CI = 11.14–67.66).

Table 1
Demographic characteristics of cross-sectional and longitudinal samples.

	Cross-sectional sample (%)	Longitudinal sample (%)
Gender		
Male	48%	47%
Female	52%	53%
Age (years)		
18–29	17%	17%
30–44	28%	26%
45–59	30%	27%
60+	25%	30%
Race/ethnicity		
White, non-hispanic	76%	79%
Black, non-hispanic	10%	8.5%
Hispanic	9%	8%
Other, non-hispanic	4%	4%
Education		
Less than high school	16%	15%
High school	34%	33%
Some college	27%	27%
Bachelor's degree	14%	15%
Graduate degree	9%	9%
History of cervical cancer	<1%	<1%

The cross-sectional sample is from the ANHCS survey from December 2005 to November 2006 (excluding September 2006). The longitudinal sample was surveyed between March and July 2005 and then again between March and July 2006. For the longitudinal sample, all demographics were measured at baseline. Ns: cross-sectional = 3323 and longitudinal = 1044.

Story headlines focused on cancer prevention more often than STI prevention. "Cervical cancer" appeared in the headline in 50.0% of stories, while "STI" or "sexually transmitted infection" appeared in headlines of 3.6% of stories. Most stories, 78%, eventually mentioned that HPV was a sexually transmitted infection and 99% mentioned its link to cervical cancer. Only 20% of stories included information for women about the continued need for routine cervical cancer screening after vaccination.

Seventy-three percent of news stories about the vaccine appeared in newspapers or on the AP wire compared to 27% on broadcast TV. No significant differences were found between print and broadcast news stories in the use of credibility, exemplars, or description of HPV as a sexually transmitted infection. However, newspapers (24%) were significantly more likely than television news stories (10%) to mention the need for continued cervical cancer screening after the vaccine ($\chi^2 = 5.49$; $p < .05$; data not shown in table).

3.3. Tracking population knowledge over time

Knowledge rapidly grew as coverage increased (see Fig. 1). About 35% (95% CI = 33–38%) of the sample knew about the HPV–cervical cancer link in the period before May 2006. By June–August, the number with that knowledge had grown to 52% (95% CI = 49–54%) and by the final 2 months of 2006, 59% (95% CI = 55–62%).

In the cross-sectional sample, the pre- and post-FDA announcement periods are significantly different in knowledge, as the confidence intervals for the period before May—36% (95% CI = 34%–39%)—and between June and August—52% (95% CI = 49%–54%)—do not overlap.

Strikingly, despite the fact that major news coverage ended by August 2006, knowledge remained high, and indeed may have continued to grow even after coverage of the vaccine virtually

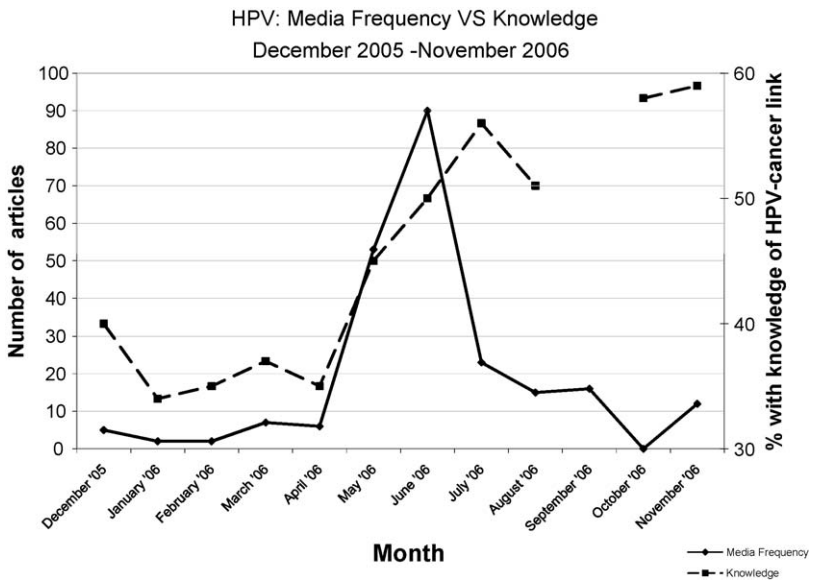

Fig. 1. Number of stories and % of population with knowledge of HPV by month. Number of articles was recorded as part of the content analysis. Percent of sample with knowledge of HPV–cervical cancer link is from the Annenberg National Health Communication Survey cross-sectional sample (December 2005 to November 2006). Survey was not fielded in September 2006.

disappeared. The beginning of an apparent decline in knowledge between June and August seems to have been reversed; October and November showed the highest levels of knowledge. We speculate about the reasons for that resurgence in knowledge in the discussion.

3.4. Linking exposure to health information to knowledge

Finally, we further explore whether the increasing level of knowledge can be attributed to health media exposure in the longitudinal sample. Table 2 presents the results of a logistic regression predicting follow-up knowledge of the HPV–cervical cancer link from baseline knowledge, from potential confounders, and from health media exposure. Because baseline knowledge is controlled, we interpret these results as evidence about who learned about the HPV–cervical cancer link during the year between measurements. People with more education were more likely to have learned about the HPV–cervical cancer link (OR = 1.15, 95% CI = 1.04–1.23) and males were less likely (OR = .47, 95% CI = .34–.70). Those age 45–59 and those over age 60 were less likely to have learned about the link than the youngest age group—18–29 years old (45–59: OR = .48, 95% CI = .27–.88; 60 plus: OR = .45, 95% CI = .23–.94). Race and ethnicity were not significant predictors of learning, nor was exposure to general news media. Those interviewed in May 2006 or later (the months with the greatest amounts of media coverage) were significantly more likely to be aware of the link between HPV and cervical cancer, even after controlling for baseline knowledge (OR = 2.75, 95% CI = 1.86–4.07).

Table 2
Results of logistic regression predicting learning about HPV from exposure to health media, controlling for baseline knowledge.

	Main effects of baseline knowledge; demographics; date of interview and media exposure		
	B	OR	(95% CI)
Baseline knowledge	2.03***	7.65	(4.91–10.56)
Demographics			
Age 30–44 (vs. 18–29)	−.11	.90	(.53–1.56)
Age 45–59 (vs. 18–29)	−.73*	.48	(.27–.88)
Age 60+ (vs. 18–29)	−.81*	.45	(.23–.94)
Education (years)	.14***	1.15	(1.04–1.23)
Gender (male)	−.76***	.47	(.34–.70)
Black race	−.11	1.04	(.44–1.78)
Other race	−.09	.92	(.44–1.92)
Hispanic	.04	1.04	(.56–1.93)
Media use			
General news exposure (0–7 days)	.02	1.02	(.92–1.14)
Health media exposure (0–3 sources)	.48*	1.62	(1.12–2.35)
Time			
Surveyed in May or after	1.01***	2.75	(1.86–4.07)

Number of non-missing cases = 994. Data is from the Annenberg National Health Communication Survey (spring 2005 and spring 2006). Data was weighted and STATA 10 SVY programs were used for all weighted analyses.
*$p < .05$; ***$p < .001$.

The focus of this analysis was exposure to health media. Respondents who indicated heavy use of health media were significantly more likely to have gained knowledge of the HPV–cervical cancer link (OR = 1.62, 95% CI = 1.12–2.35). Somewhat surprisingly, there was no larger effect of health media exposure after April 2006 than before April 2006; there was no significant interaction between period of follow-up interview and exposure to health media (data not shown).

4. Discussion and conclusion

4.1. Discussion

The results of the content analysis describing media coverage showed that the HPV vaccine received a substantial amount of media coverage at the time of FDA approval. However, coverage was not always ideal, with the majority of news stories lacking vital pieces of information about the vaccine or HPV prevention. This finding mirrors those of other studies showing that the quality of printed HPV materials [21] and Internet-based cancer information [23] were suboptimal in educating patients. An alternative paradigm for the use of media stories as a source of information is that the stories can be used by patients as a decision aid [24]. In this case, someone might use news stories in deciding whether or not to vaccinate herself or a daughter. If media content is going to be used in the context of decision making, then stories need to include

accurate and balanced information regarding risks and benefits. Future content analyses of the HPV vaccine in the media could take this approach and look for fair reporting of the vaccine and its effects.

As expected, the amount of media coverage about cervical cancer, HPV, and the vaccine increased sharply just prior to and after FDA approval. However, the increase was not permanent; within 2 months, the number of articles had essentially returned to levels recorded earlier in the spring of 2006.

The results of tracking the population knowledge over time suggested that the spike in media coverage occurred at the same time as a large increase in HPV–cervical cancer knowledge among the sample. Those who reported higher media exposure were more likely to know about the cause of HPV at all times throughout the survey.

While media coverage quickly leveled off, knowledge remained high, never dipping below original baseline levels. We offer two explanations for why knowledge tracked upward with coverage, but did not follow it down. One explanation is that knowledge, once gained, does not go away. As a person learned about the relationship between HPV and cervical cancer, the knowledge was retained. That may explain the slowed reduction in knowledge compared to the reduction in coverage, which appears to happen between June and August of 2006. However, that would not explain the relatively high level of knowledge depicted in Fig. 1 for October and November of that year. It may be that this pattern is but a chance difference, however, alternately, one may wonder whether there was some new source of information at play. It is possible that the advertising that Merck initiated for its vaccine was having an effect on knowledge.

One of the strengths of this study is the ability to support a claim that the comparable secular trends between media coverage and HPV–cervical cancer knowledge reflect influence of media coverage on knowledge. We can show that health media exposure is related to change in knowledge. Effectively, the analysis is showing that those more exposed to health media were more likely to learn about the cause of cervical cancer. The ability to statistically control for baseline knowledge provides support for an inference that the influence runs from media exposure to knowledge, rather than through some other source of information.

We show that knowledge tracks increases in media coverage, and change in knowledge is sharpest among those reporting exposure to health media. It is still possible that some other source of information may track media coverage over time and exposure to that source of information would be correlated with exposure to health media. The most likely rival would be exposure to commercial advertising, specifically Merck's campaign to increase awareness about the link between cervical cancer and HPV, which was launched during the same time period as the media coverage we are investigating [25]. Logically, people who were exposed to large amounts of media coverage because they watched more television or read more newspapers would be the same ones with high exposure to advertisements and might have learned about HPV through those messages. However, given that media exposure has the same effect on knowledge both before and after the May 2006 period, and thus before and after the launch of Merck's campaign, this does not appear to be a likely threat. As noted above, it is more likely to explain the maintenance or increase in knowledge in the October–November 2006 period, than the overall increase in knowledge.

Another weakness of the study is that knowledge was assessed by a single item focusing on disease etiology. We would have preferred to have a multi-item index to capture HPV and vaccine knowledge. While people may very well associate HPV and cervical cancer, it is also important to understand whether they know that HPV is a sexually transmitted disease; how high the prevalence is or that they still need to be screened for cervical cancer after receiving a vaccine. We also had no measure of awareness about the vaccine. Because these were secondary analyses based on data collected for other purposes, and the HPV questions were created with no foreknowledge of the launch of the vaccine, we were limited in the available measures. Next steps involve discovering whether news coverage affects this broader range of knowledge.

Lastly, we recognize that the survey response rate is low, raising concerns about possible bias. Unfortunately, these rates are in the range of what current survey research can achieve, particularly when the survey is administered to members of an ongoing panel. The results are weighted to the Current Population Survey sample to minimize this possible bias. Also, the major claims in the study are focused on comparisons over time, or on associations within the sample, with claims of representativeness to the population a secondary issue. Finally, recent research suggests that low recruitment rates may not bias observed results as much as previously thought [26,27].

4.2. Conclusion

There is substantial support here that the media plays an important role in the education of the public, particularly when the topic is about new medical applications and prior knowledge is low. People will undoubtedly improve their knowledge about the vaccine and the link between HPV and cervical cancer as they are increasingly exposed to newspaper articles and television reports regarding HPV. Therefore, journalists have a crucial role in presenting comprehensive stories, so as not to misinform readers or foster false conclusions.

4.3. Practice implications

Where the media fails to provide such accurate and comprehensive information, physicians must be vigilant about filling in the gaps. In addition, the results suggest that Americans may learn about the details of preventive health measures like the HPV vaccine through exposure to health media sources like health magazines, health sections of newspapers and health segments of television news, while those who focus only on general news sources can miss important information. Promotion of such health-related media sources as supplements to physician counseling may be a good way to ensure patients receive the information they need to prevent cervical cancer.

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