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Mislabeled, fragmented, and conspiracy-driven: a content analysis of the social media discourse about the HPV vaccine in China

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ABSTRACT

Through two theoretical lenses, the Health Belief Model (HBM) and literature explaining conspiracy theories, this study examined media discourse about the Human Papillomavirus (HPV) vaccine in China's cyberspace. Results showed that the media narratives are positive but misleading, and HBM components are presented inconsistently over time. The study also identified emerging conspiracy theories about the HPV vaccine: Chinese conspiracy theorists accused Western countries of using the HPV vaccine to destroy the Chinese ethnic group. These findings demonstrate the influence of public resistance stemming from nationalism on the acceptance of medical knowledge in countries with strong historical legacies, such as China.

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On July 31, 2017, more than 10 years after it was approved for sale in the United States, the Human Papillomavirus (HPV) vaccine was licensed in China (Zhao, 2017). Although the vaccine was newly available to the public in China, it had received growing media attention over the past decade (Li, Nowak, Jin, & Cacciatore, 2018). The introduction of the HPV vaccine to China in 2017 gave rise to a new wave of heated discussions in China's media landscape over its benefits and risks.

This study examines the user-generated content of the discussion about the HPV vaccine on Weibo, one major social media site in China. The social media discourse about the HPV vaccine is worth exploring for several reasons. First, the Internet has become a prominent source of health information (Fox & Duggan, 2013; Koch-Weser, Bradshaw, Gualtieri, & Gallagher, 2010), so media content in cyberspace may play a crucial role in shaping public perceptions of the HPV vaccine. Second, while most newspapers articles are written by journalists (e.g. Li et al., 2018), the construction of social media narratives involves a wide variety of social groups, which pushes scholarship to investigate how multiple social forces on social media can reshape health information. Finally, the vaccine was available in the United States for more than 10 years before it

became available in China. This prompts a question rarely addressed in the existing literature: how do media users in a developing country react to a medical intervention that was not previously available in that country?

We drew from the Health Belief Model (HBM) perspective and were attentive to the cultural context, especially the emerging conspiracy theories about the HPV vaccine. Health-related conspiracy theories are prevalent on the Internet (Briones, Nan, Madden, & Waks, 2012; Daily, Nan, & Briones, 2015), but few scholars have examined them in depth. In fact, media users are very likely to encounter both reliable health information and conspiracy messages in the media, and conspiracy messages may be equally powerful in shaping public perceptions of a health issue. Therefore, both the presentation of HBM factors and the building of conspiracy theories are crucial components of the media discourse. Besides that, the case of China illustrates the features of a health-related social media discourse when a scientific invention was newly introduced to a developing country, a topic that is important to global health communication, but one that has not been thoroughly discussed. These findings could help health advocates better understand the influence of cultural traditions and historical legacies on the ways that new health knowledge is adopted in developing countries.

Literature review

The HPV vaccine in the media

Given the influence that media information about HPV has on public understanding and vaccination decisions, many studies have been devoted to examining media coverage of the vaccine. Existing research shows that cervical cancer prevention is a consistent theme across news stories. For example, content analysis of newspaper articles published over the 19 months following the FDA's approval of the vaccine in the United States revealed that the frame most frequently employed was cancer prevention (Quintero-Johnson, Sioneau, & Scott, 2011). During an identical time period, Habel, Liddon, and Stryker (2009) found that more than 70% of Internet articles on the vaccine explicitly linked it to cervical cancer prevention.

Despite informing the public of the effectiveness of the HPV vaccine on preventing cervical cancer, news stories do not always communicate health issues in a reliable manner. When the HPV vaccine was newly made available to the public in the 2000s, news stories tended to claim that the HPV vaccine could 'eliminate' cervical cancer, but more accurate phrases, such as 'preventing or reducing cervical cancer', were much less prevalent (Calloway, Jorgensen, Saraiya, & Tsui, 2006). In addition, most news stories did not mention the need for continued cervical cancer screenings after vaccination (Kelly, Leader, Mittermaier, Hornik, & Cappella, 2009). Also, despite the fact that the HPV vaccine can prevent a wide variety of STDs, most news stories referred to it as a cervical cancer vaccine only, leaving the association between HPV and STDs almost entirely absent (Habel et al., 2009; Robbins, Pang, & Leask, 2012). This problem became even more obvious when the HPV vaccine was introduced to non-English speaking contexts like China, where journalists translated the HPV vaccine as 'cervical cancer vaccine' (Li et al., 2018). In this study, we investigated if the trends in conventional media extended across cyberspace.

RQ1. How do Weibo users translate the HPV vaccine into Chinese, the literal translation of ‘HPV vaccine’, or ‘cervical cancer vaccine’?

The Health Belief Model (HBM)

The HBM encompasses several major components that predict an individual’s intention to act to prevent, detect, or control illness or medical conditions (Skinner, Tiro, & Champion, 2015). The first factor is perceived susceptibility, defined as ‘belief about the likelihood of getting a disease’ (p.77). The second component is perceived severity, which refers to belief about the seriousness of contracting an illness. Perceived susceptibility and perceived severity can be combined into perceived threat. The third component is perceived benefits, defined as perception of the benefits and advantages of performing a recommended health behavior. The fourth component is perceived barriers, conceptualized as the obstacles to performing the desirable behavior. The next component is self-efficacy, defined as belief in one’s capacities of performing a behavior. Research shows that efficacy information in the media, such as disease prevention examples (Dudo, Dahlstrom, & Brossard, 2007), information that help individuals identify how they can best respond to a risk (Ihekweazu, 2017), and directions on ‘how to’ and ‘when to’ perform a behavior (Zhang, Baker, Pember, & Bissell, 2017), enhances media users’ self-efficacy (Diddi & Lundy, 2017; Zhang et al., 2017). The model suggests that people develop intentions to perform a health behavior if they believe the following: they are susceptible to a condition, the condition could have potentially serious consequences, a course of action is available to them, taking action is beneficial to them, barriers are not strong enough to prevent action, and they believe that they can perform the recommended behavior. Their actions will be triggered by certain direct cues (Skinner et al., 2015).

In addition to predicting and explaining behavioral intentions, the HBM has implications for content analysis research. The HBM framework provides researchers with a valuable theoretical lens through which the quality of health messages in the media can be evaluated (e.g. Dudo et al., 2007). Since social media have become a prominent source of health information and media messages play a crucial role in shaping public perceptions of health issues (Johnson & Case, 2012), how the HBM components are presented in the media indirectly predicts public perceptions of a social issue. If, for example, media narratives place much emphasis on the susceptibility of a health problem, but they largely ignore the benefits of performing a preventive behavior, it would be reasonable to predict that such media content might give rise to widespread panic. Therefore, understanding the presentation of HBM components in media narratives builds a foundation for future media effects and message development research.

Scholars have used the HBM to explore various kinds of health content in the media, such as health organizations’ use of Twitter during the Breast Cancer Awareness Month (Diddi & Lundy, 2017) and public service announcements promoting healthy-eating behavior on YouTube (Zhang et al., 2017). While most HBM components can be directly measured in content analysis research, self-efficacy is rarely explicitly presented in media messages. Instead, it is efficacy information that is more often measured (e.g. Diddi & Lundy, 2017; Dudo et al., 2007; Ihekweazu, 2017; Zhang et al., 2017). We adopted the same approach in this study.

The HBM has been applied to HPV vaccine-related media messages. Madden, Nan, Briones, and Waks (2012) examined the presence of HBM components in 89 top search results from major search engines. The study showed that more than half of the websites mentioned individuals' susceptibility to and the severity of HPV infections, the effectiveness of the HPV vaccine, the risks associated with the HPV vaccine, and efficacy information about how to obtain the vaccine (Madden et al., 2012). Another study found that most user-generated YouTube videos about the HPV vaccine had a negative tone. These videos emphasized the low effectiveness and high risks associated with the HPV vaccine, but few discussed individuals' susceptibility to HPV or provided efficacy information (Briones et al., 2012). In terms of blog posts, regardless of their distinct attitudes toward the vaccine, bloggers prioritized safety, efficacy, and risks in their discussions of the HPV vaccine (Keelan, Pavri, Balakrishnan, & Wilson, 2010). A more recent content analysis study suggested that news stories about the HPV vaccine in Chinese newspapers centered on the benefits of the vaccine, self-efficacy, and cues to act (Li et al., 2018). These studies show that media content related to the HPV vaccine varies across media platforms and societal contexts. We asked the following questions:

RQ2: To what extent do Weibo posts about the HPV vaccine reflect the HBM components of susceptibility, severity, benefits, barriers, and efficacy information?

RQ2a: What are the correlations between HBM components in Weibo posts about the HPV vaccine?

A wide variety of social groups are involved in online conversations about health and science. For example, health business corporations, educational institutions, government agencies, nonprofit organizations, and community groups actively use Twitter to promote health literacy (Park, Rodgers, & Stemmler, 2013). However, different groups do not contribute equally to science communication in cyberspace. Before the 2008 Beijing Olympic Games, for example, the United States Embassy in Beijing released daily PM2.5 readings, alerting the Chinese public of the poor air quality in Beijing, a severe environmental problem that used to be covered by the Chinese government. During this 'PM2.5 crisis', political and professional elites were the most powerful groups in defining the risk, while established media outlets played a key role in disseminating information, and laypersons played a more peripheral role in interacting with elite and established media (Chen, Tu, & Zheng, 2017).

The trend has also been reflected in China. During major food safety crises in China, while food producers, government institutes, media professionals, and experts disseminated health and political information during the communication process, ordinary users only used social media to voice their anger and anxiety due to their lack of scientific expertise and limited influence in public affairs. The interactive feature of social media has empowered ordinary users to voice their viewpoints, but in the Chinese context, risk information was mainly communicated from authorities to the general public. The pattern showed that health communication in Chinese cyberspace still followed a traditional top-down pattern, in which ordinary users were involved in communication but did not play a prominent role in managing information flow or setting public agenda (Mou, 2014). Regarding the HPV vaccine, we aimed to examine whether and how organizational users and individual users contribute different content to social media.

RQ3: How does the content created by different groups of Weibo users reflect HBM constructs differently?

Media coverage of the HPV vaccine has changed over time. In the early 2000s, when the HPV vaccine was newly developed and tested in the lab, it received tremendous media attention. A content analysis study of 285 U.S. newspapers from 2003 to 2005 suggested that news stories about the HPV vaccine provided information on the experimental status and efficacy of the vaccine, and they explained the associations between cervical cancer and HPV. However, stories published during the early stage of the development of the HPV vaccine did not offer more detailed information about HPV, such as the short-lived nature of HPV infections and the fact that only a very small percentage of HPV infections caused cervical cancer, resulting in ‘an incomplete picture or lack of understanding of the complexity of HPV’ (Calloway et al., 2006, p. 803). After the HPV vaccine received FDA approval, more detailed health information was included in news stories (Quintero-Johnson et al., 2011). We aimed to investigate whether the approval of the HPV vaccine has led to changes in Weibo narratives.

RQ4: On Weibo, how do presentations of HBM components prior to the HPV vaccine’s approval in China differ from those created after its approval?

RQ5: Has there been a percentage difference in the amount of Weibo posts by different groups of Weibo users before and after the approval of the HPV vaccine?

Vaccine-related conspiracy theories

The media discourse about health issues often goes beyond the scientific scope, and many media messages convey conspiracy theories. Conspiracy theories are not scientific theories but arise from suspicions about social events (Quinn, 2001). Conspiracists tend to argue that powerful and malevolent groups of a society, such as governmental institutions and major branches of industry (van Prooijen, 2017), ‘meet in secret agreement in order to pursue goals that are widely seen as malevolent’ (p.50).

In the past decade, vaccine-related conspiracy theories have been found to be prevalent on the Internet (e.g. Briones et al., 2012; Daily et al., 2015). For instance, vaccine-critical websites not only question the reliability of vaccines and link vaccinations with specific adverse reactions, but they also consistently make untruthful claims, such as that vaccines contain mercury and that vaccines provide only temporary protection (Zimmerman et al., 2005).

Conspiracy theories arise in communication for several reasons. Uncertainty is one primary factor. When people cannot find a satisfactory causal explanation for a phenomenon (Knight, 2001), conspiracy theories provide ‘oddly comforting way(s) to cope with the anxiety of living in an uncertain and often inexplicable universe’ (Ballaro & Goodwin, 2012, p. 19). Conspiracy theories can also grow from people’s paranoia (Issit, 2012), which is often irrational and anti-modern (Aupers, 2012). Accordingly, conspiracy theories are products of fiction rather than rational interpretations of the human world or scientific explanations of social events (Issit, 2012).

At the societal level, conspiracy theories derive from the public’s distrust of the government, the mass media, and large corporations (Aupers, 2012). Most conspiracy theories grow out of suspicions about corruption in the government, industry, science, and medicine (Kalichma, 2009).

Conspiracy theories about the HPV vaccine have spread across the United States, and the HPV vaccination mandate in more than 40 states has intensified beliefs about the possible corruption of the government and vaccine manufacturers (Daily et al., 2015). User-generated YouTube videos about the HPV vaccine further manifest these conspiracy theories: approximately 8.7% of the videos mentioned a possible conspiracy involving the government, pharmaceutical companies, or doctors (Briones et al., 2012).

Conspiracy theories may have permeated the social media discourse about the HPV vaccine in China because it is a vaccine newly introduced and people are unfamiliar with it. We explored the conspiracy-related themes that have emerged in the specific cultural context of China.

RQ6: What are the main themes of the conspiracy theories about the HPV vaccine on Weibo?

On July 31, 2017, *Cervarix* was officially launched in China (Zhao, 2017). Public responses to the vaccine were mixed. Chinese young adults demonstrated even stronger intentions to get vaccinated than American adults, but they were more skeptical about vaccine safety (Liu, Yang, Chu, Sun, & Li, 2018). In general, the nationwide vaccination rate remained low two years after its availability (e.g. Ma et al., 2019). A survey in western China also found that although more than half of the participants reported willingness to get vaccinated, their knowledge of the HPV vaccine was very limited (He & He, 2018). Before developing educational messages to change the status quo, it is worthwhile to examine what is emphasized and what is missing in the current social media narratives surrounding the HPV vaccine.

Methods

Sampling

The sampling of this project consisted of two stages. In the first stage, we chose five landmark events that were relevant to the launch of the HPV vaccine in China (See Table 1).

Table 1. Sampling.

Time period	Sampling time frame	Event	Number of original posts identified by Python	Number of 10% most re-tweeted posts	Number of posts included in the final dataset
Before	2014/5/8–2014/6/7	The <i>Southern Weekly</i> published an influential news story about the HPV vaccine, which introduced the HPV vaccine to the Chinese public.	625	63	63
	2016/7/18–2016/8/17	Cervarix 2 was approved by China Food and Drug Administration (CFDA).	5,046	505	396
Subtotal					459
After	2017/7/31–2017/8/30	Cervarix 2 was available.	7,112	711	515
	2018/1/26–2018/2/25	Gardasil 4 was available.	2,492	249	213
	2018/5/1–2018/5/30	Gardasil 9 was available.	12,736	1,273	707
Subtotal					1,435
Total			28,011	2,801	1,894

During pilot data collection, we identified a peak after each landmark event, such that the vast majority of Weibo posts about the HPV vaccine were published within the one month after each event. Weibo postings that were published within the one month after each identified landmark event were collected. In addition to the literal translation of the HPV vaccine ('HPV yimiao'), another term, 'cervical cancer vaccine' ('gongjingai yimiao'), is widely used. We used Python to identify Weibo posts that included either 'HPV yimiao' or 'gongjingai yimiao'.

Weibo was chosen for two reasons. First, launched in 2009, Weibo has cumulated more than 462 million monthly active users ('Weibo Corporation', [n.d.](#)). Since Weibo is one of the most popular social media platforms in China (Han, 2018), media content on Weibo is far-reaching enough to demonstrate an important aspect of the social media discourses surrounding an issue of public concern. Second, unlike WeChat, a mobile application that creates a semiprivate networked space (Guo, 2017), Weibo primarily facilitates public communication practices, creating a networked public sphere (Benkler, 2006). More than 10 years after its initial launch, Weibo is 'celebrate(ing) content production of individual users, particularly the rise of "experts" in multiple fields of interest' (Han, 2018, p. 10). These facts demonstrate that Weibo is one of the most vibrant social media platforms that facilitate content creation in China.

During the second stage, we sorted original posts by the number of times each of them was re-posted. For the time period following each event, we collected the top 10% of the most re-tweeted posts. A high number of re-tweets means that the post has been received by and forwarded to a larger population, indicating a stronger influence. The posts with the strongest influence reflect a general picture of the social media discourse about the HPV vaccine. Duplicate and irrelevant posts were removed before and during the coding process.

A total of 1,894 valid original Weibo posts were used in this study. During the data analysis process, we grouped the five events into two time periods: before the launch of the HPV vaccine (*before*) and after the launch of HPV vaccine (*after*).

Measurement and data analysis

Both quantitative and qualitative approaches were applied to the dataset. A total of 350 posts outside of the final dataset were used to train coders till intercoder reliability scores rose to the desired level (Cohen's Kappa > .70). We content analyzed the presence of HBM components and other relevant variables in each of the 1,894 posts (Table 2). Both textual and visual components (e.g. images and infographics) of each Weibo post were coded.

We completed content analysis before proceeding to RQ6. One variable in content analysis was attitude. We coded whether the author was supportive of the promotion of the HPV vaccine. Posts conveying unsupportive attitudes (i.e. negative posts) were chosen as the sub-dataset ($n = 93$) for textual analysis. To answer RQ6, a qualitative textual analysis was conducted following the three steps recommended by Hesse-Biber and Leavy (2006): data preparation, data exploration, and data reduction. During the data preparation phase, posts that conveyed unsupportive attitudes were pasted into a separate document. During the data exploration phase, we used the constant-comparison method (Baxter & Babbie, 2004) of reading through data, identifying recurring categories,

Table 2. Primary variables.

Variable	Variable Operationalization
Author	Author of the post: (1) Media organizations (e.g. Global Times, West China Metropolis Daily, Hainan Daily, twenty-first Century Business Herald); (2) Health organizations (e.g. Cancer Encyclopedia, Health Wiki, MedSci, Women's Health, Lilac Garden); (3) Gender-related organizations (organizations that focus on gender-related issues only, such as Women's Voices, Women Need to Know, City Girls' Club); (4) Commercial groups (e.g. What's Trending, Hong Kong Travel Consult, Unilever); (5) Local governmental departments (governmental sources of local information, such as Nanjing Department of Public Affairs, Shunde District Public Health Bureau, Bureau of Industry and Commerce of Guangdong); (6) Self-identified doctors/scientists (e.g. Dr. Gu, Dr. Qi, Dr. Zhang Silai, OB Dr. Tian); (7) Ordinary users (all the users who cannot be categorized into the above groups are considered 'ordinary users'). Note: the first five author groups are later combined into organizational users, and the last two author groups are combined into individual users.
Labeling the HPV vaccine	How the 'HPV vaccine' is labeled/translated into Chinese: (1) 'HPV vaccine'; (2) 'Cervical cancer vaccine'; (3) Both. (4) Other (e.g. 'Human papillomavirus vaccine')
Attitude	Author's attitude towards the HPV vaccine: does the author appear to support the promotion of the HPV vaccine? (1) Supportive (e.g. 'ladies, good news, our life-saving vaccine is now available'); (2) Not supportive (e.g. 'don't try it'; 'the HPV vaccine is a hoax').
Diseases associated with HPV	The disease(s) that can be caused by HPV infections: (1) Cervical cancer; (2) Genital warts; (3) Head and neck cancers; (4) Anal and penile cancers; (5) Cancer in general; (6) STDs in general; (7) Other.
Susceptibility	Likelihood/probability of being infected by HPV, cervical cancer, and other HPV-related diseases.
Severity	Severe consequences of HPV infections (e.g. 'HPV infections can cause cervical cancer, a cancer that has resulted in a high death rate'.)
Benefits	Benefits of the HPV vaccine: What disease(s) does the HPV vaccine prevent? (1) Cervical cancer; (2) Genital warts; (3) Head and neck cancers; (4) Anal and penile cancers; (5) Cancer in general; (6) STDs in general; (7) Other.
Barriers	Difficulty(s) one might encounter in getting the HPV vaccine:

(Continued)

Table 2. Continued.

Variable	Variable Operationalization
	(1) Cannot afford the cost; (2) The vaccine is not available at local health clinics; (3) Other.
Efficacy information	Specific information about how to get the HPV vaccine: (1) Dosing (3 injections are required to complete the course); (2) Recommended age group; (3) Where to get the vaccine; (4) Cost; (5) Other.

and grouping data into coding categories. The universal themes were developed into coding categories. Finally, during the data reduction phase, we coded these posts again according to the themes and categories identified in the previous step.

Results

Quantitative results

The vast majority of the 1,894 posts in the final dataset conveyed supportive attitudes toward the HPV vaccine, and only 93 (4.9%) were unsupportive of the new vaccine. Ordinary users contributed 86.0% ($n = 80$) of the negative posts, while the rest of the author groups contributed the remaining 14.0% ($n = 13$) of the negative posts.

Authors of the sampled posts included ordinary social media users ($n = 634$, 33.5%), local governmental departments ($n = 479$, 25.3%), media organizations ($n = 462$, 24.4%), health organizations ($n = 212$, 11.2%), self-identified doctors/scientists ($n = 50$, 2.6%), commercial organizations ($n = 44$, 2.3%), and gender-related organizations ($n = 13$, 0.7%).

RQ1 asked how Weibo users translated the HPV vaccine into Chinese. A frequency count showed that rather than literally translating ‘HPV vaccine’ into Chinese, social media users were more likely to refer to the HPV vaccine as the ‘cervical cancer vaccine’. Only 2.2% of the posts used ‘HPV vaccine’ consistently. ‘Cervical cancer vaccine’ was used in 60.3% of the posts, and ‘HPV vaccine’ and ‘cervical cancer vaccine’ were used interchangeably in 36.3% of the posts. Other translations were used in 1.2% of the posts. This phenomenon suggests that Weibo users explicitly linked the HPV vaccine to cervical cancer prevention and placed a much stronger emphasis on the effects of the HPV vaccine on preventing cervical cancer than on avoiding HPV infections.

We then combined all the organizational authors into one group ($n = 1,210$) and individual authors ($n = 684$) into another group. The cross-tabulation test suggested that in comparison to individual users (24.9%), organizational users (42.7%) more often used ‘cervical cancer vaccine’ and ‘HPV vaccine’ interchangeably in one single post [$\chi^2(3, N = 1,894) = 70.38, p < 0.01, V = .19$].

A frequency count showed that the prevention of cervical cancer was much more often associated with the benefits of the HPV vaccine than the prevention of other HPV-related

STDs. Cervical cancer was explicitly linked with the HPV vaccine in 10% of the posts, while other STDs were mentioned much less frequently: 1% mentioned genital warts, 0.3% mentioned cancer in general, 0.3% mentioned penile cancer, and 0.4% mentioned STDs in general.

RQ2 asked about the presentation of HBM components. Efficacy information was mentioned most frequently (39.8%), followed by barriers to getting the HPV vaccine (15.8%), benefits of the HPV vaccine (10.4%), and susceptibility to (7.8%) and severity of (5.1%) HPV-related infections. Correlation tests were conducted to answer RQ2a. Table 3.1–3.3 display the correlation results before and after the launch of the HPV vaccine, as well as the overall correlations trends. Barriers were found to be negatively correlated with susceptibility, severity, and benefits. Posts talking about the risks associated with HPV infections and the benefits of the HPV vaccine were less likely to mention barriers to getting the HPV vaccine (e.g. cost, affordability), and vice versa. In addition, low to moderate correlations (r scores range from .11 to .70) are found among susceptibility, severity, and benefits, which means these components often occurred together in social media posts. Finally, efficacy information was negatively correlated with barriers, and was not correlated with any of the other HBM components. In general, the official launch of the HPV vaccine did not result in prominent changes in correlations. However, after the official launch of the HPV vaccine, the negative correlation between efficacy information and barriers increased from $-.09$ to $-.26$, resulting in a medium correlation.

Cross-tabulation tests were conducted to answer RQ3 (Table 4). Most prominent differences were found in the presentations of barriers and efficacy information: 52.4% of posts published by organizational users included efficacy information, while barriers were mentioned by 20.8% of the posts published by individual users.

RQ4 was concerned with the change in media presentations of the HBM components before and after the approval of the HPV vaccine in China. Cross-tabulation results are shown in Table 5. After the official launch of the HPV vaccine in China, the percentage

Table 3. Correlations among HBM components.

Variables	1	2	3	4
Table 3.1: All time periods:				
1. Susceptibility	–			
2. Severity	.68**	–		
3. Benefits	.18**	.14**	–	
4. Barriers	-.07**	-.07**	-.08**	–
5. Efficacy information	.02	.00	-.03	-.23**
Table 3.2: Before the official launch:				
1. Susceptibility	–			
2. Severity	.65**	–		
3. Benefits	.11*	.12**	–	
4. Barriers	-.13**	-.10**	-.15**	–
5. Efficacy information	.02	-.03	.10	-.09*
Table 3.3: After the official launch:				
1. Susceptibility	–			
2. Severity	.70**	–		
3. Benefits	.19**	.13**	–	
4. Barriers	-.06*	-.05	-.05**	–
5. Efficacy information	.03	.06	-.03	-.26**

* $p < .05$.

** $p < .01$.

Table 4. Presentation of the HBM components by author group.

HBM components	Author group			Chi-square results
	Organizational authors	Individual authors	Total	
Susceptibility	109 (9.0%)	39 (5.7%)	148 (7.8%)	$\chi^2 (1, N = 1,894) = 6.63, p = .01, V = .06$
Severity	76 (6.3%)	21 (3.1%)	97 (5.1%)	$\chi^2 (1, N = 1,894) = 9.27, p < .05, V = .07$
Benefits	147 (11.7%)	60 (8.8%)	197 (10.4%)	$\chi^2 (1, N = 1,894) = 3.05, p < .05, V = .04$
Barriers	157 (13.0%)	142 (20.8%)	299 (15.8%)	$\chi^2 (1, N = 1,894) = 19.92, p < .01, V = .10$
Efficacy information	634 (52.4%)	120 (17.5%)	754 (39.8%)	$\chi^2 (1, N = 1,894) = 221.52, p < .01, V = .34$
Total	1,210	684	1,894	

Table 5. Presentation of HBM components by time frame.

HBM components	Time frame			Chi-square results
	Before	After	Total	
Susceptibility	68 (14.8%)	80 (5.6%)	148 (7.8%)	$\chi^2 (1, N = 1,894) = 41.22, p < 0.1, V = .15$
Severity	45 (9.8%)	52 (3.6%)	97 (5.1%)	$\chi^2 (1, N = 1,894) = 27.34, p < 0.1, V = .12$
Benefits	87 (19.0%)	110 (7.7%)	179 (10.4%)	$\chi^2 (1, N = 1,894) = 47.56, p < 0.1, V = .16$
Barriers	89 (19.4%)	210 (14.6%)	299 (15.8%)	$\chi^2 (1, N = 1,894) = 5.92, p < 0.5, V = .06$
Efficacy information	85 (18.5%)	669 (46.6%)	754 (39.8%)	$\chi^2 (1, N = 1,894) = 114.61, p < 0.1, V = .25$

of posts mentioning efficacy information increased a lot, while the percentage of posts including susceptibility, severity, and benefits dropped dramatically.

RQ5 asked about differences in the percentage of content contributed by different groups of users before and after the approval of the HPV vaccine. Table 6 shows cross-tabulation results. The percentage of posts published by local governmental departments increased sharply after the HPV vaccine was approved, while the percentage of posts written by ordinary users and health organizations dropped considerably.

Qualitative results

RQ6 asked about the main themes of the conspiracy theories about the HPV vaccine. In most of the negative posts, 84 out of 93 (90.3%) authors gave reasons for opposing the HPV vaccine. These reasons showed typical features of conspiracy theories: that the vaccine was highly dangerous and poisonous, and the promotion of the vaccine was nothing more than a profit-making tool.

Previous literature suggests that paranoia resulting from uncertainty is a crucial contributing factor to the formation of conspiracy theories and that distrust is often a main attribute of these theories. Both elements were reflected by our dataset. Paranoia can be seen in assertions that the HPV vaccine has deadly side effects. Regarding mistrust, conspiracy theorists claimed that the promotion of the HPV vaccine was a conspiracy between the

Table 6. Author group by time frame.

Author group	Time frame		Total
	Before	After	
Media organizations	111 (24.2%)	351 (24.5%)	462 (24.4%)
Health organizations	70 (15.3%)	142 (9.9%)	212 (11.2%)
Gender organizations	5 (1.1%)	8 (0.6%)	13 (0.7%)
Commercial organizations	9 (2.0%)	35 (2.4%)	44 (2.3%)
Doctors/scientists	7 (1.5%)	43 (3.0%)	50 (2.6%)
Local governmental departments	55 (12.0%)	424 (29.5%)	479 (25.3%)
Ordinary users	202 (44.0%)	432 (30.1%)	634 (33.5%)
Total	459 (100.0%)	1435 (100.0%)	1,894 (100.0%)

χ^2 (6, $N = 1,894$) = 76.06, $p < 0.1$, $V = .20$.

government and the pharmaceutical industry. In addition, Chinese conspiracy theorists introduced a new component into their arguments, namely ‘foreigners’ (‘waiguoren’). This new component of conspiracy theory was more of a kind of suspicion grounded in a growing sense of nationalism that drove the public to doubt the vaccine as an insidious scheme manipulated by ‘foreigners’.

Some users cautiously questioned the reliability of the HPV vaccine. The most common concern was that few Asian women were involved in the clinical trials because they were conducted primarily in North America and Europe. Due to differences in ethnicity and life styles, it was thought that the data from other ethnic groups would not be applicable to the Chinese population. These users criticized the Chinese Center for Disease Control for ‘unconditionally accepting clinical trial results from international pharmaceutical companies’ and warned the public of the potential risks associated with the HPV vaccine.

A larger percentage (52 out of 93) of the authors of negative posts criticized the HPV vaccine in fierce and emotionally charged arguments, asserting that the vaccine was useless and even poisonous. Typical statements included the following: ‘the HPV vaccine is a poisonous vaccine’, ‘the occurrence of “the HPV vaccine disaster” is not rare’, ‘the HPV vaccine is internationally notorious, why introduce it to us?’, ‘the HPV vaccine is a joke/hoax’, ‘I urge that all Chinese women stay away from the HPV vaccine’, ‘one injection ruins your whole life’, ‘the HPV vaccine is blackmail for both money and life’, ‘more people have been killed by the HPV vaccine than the Ebola virus’.

A considerable portion (31 out of 93) of posts attempted to support such arguments by inventing stories about victims of the HPV vaccine. For example, a ‘news’ story about Juliana and Catherine, two HPV vaccine victims who suffered from severe adverse effects, widely spread on Weibo.¹ However, the story could not be found on credible news sites but they mainly circulated within anti-vaccine circles on online forums, such as *kdnet.net*² and *pfchina.org*.³ The story was most likely made up by conspiracy theorists. Another popular story was about HPV vaccine victims in Japan, but that story was later proven to be fake by multiple reliable sources.

To make the above arguments more plausible, conspiracy theorists made up sources that seemed to be professional, authoritative, and real but were actually not. For example, one post included an external link to an article titled ‘Medical Doctor Uncovering the HPV Vaccine Hoax: the Risk of the HPV Vaccine Side Effects is Higher than the Risk of Getting Cervical Cancer’. The primary source in this post was an American doctor named ‘Kyle’ whose identity was vague and unverifiable: ‘a retired physician who practiced holistic, non-drug, mental health care’.⁴ Another post wrote that ‘the chief investigator of the HPV vaccine has admitted that the HPV vaccine is dangerous because it has never been truly tested’. In fact, ‘the chief investigator of the HPV vaccine’ never made such a statement. Other quoted sources in these posts included ‘HPV vaccine victims in Japan’, ‘the American Cancer Association’, ‘the Japanese Women’s Union’, ‘the Minnesota Department of Public Health’, etc. Conspiracy theorists either invented organization names or intentionally misquoted information from real organizations.

Like many American conspiracy theorists who have argued that the government and the pharmaceutical industry mandated the HPV vaccine for profit, Chinese conspiracy theorists also demonstrated a high level of distrust in the government. They have similarly argued that the promotion of the HPV vaccine is nothing more than a profit-making tool for the government and large pharmaceutical companies. Many (26 out of 93) posts calculated the amount of money that pharmaceutical companies could make if ‘all female college students in Beijing got the HPV vaccine’. Others openly stated that the promotion of the HPV vaccine was solely profit-driven and that the ‘family members of top officials were deeply involved in this business deal’.

In addition to demonstrating a high level of distrust in the government, Chinese conspiracy theorists accused ‘foreigners’ of attempting to ruin the Chinese ethnic group (‘zhonghua minzu’) with the HPV vaccine. This theme is grounded in the nationalist framework, which has rarely been addressed by previous literature.

The theme of ‘foreigners’ was often manifested in such phrases as ‘foreign forces’, ‘the West’, ‘American companies’, ‘Americans’, ‘Capitalism’, and ‘the Freemasonry’. Although worded differently, posts of this kind consistently argued that ‘foreigners’ were using the HPV vaccine for evil purposes. The following quotes were most representative of this:

American companies are using the HPV vaccine to kill Chinese women. It is almost an ‘implanted genetic Trojan horse’ (zhiru yijin muma). We are at a critical moment!

To our fellow citizens: the HPV vaccine is damaging Chinese women! HPV is a common STD, named genital warts, and STDs are not cancer. As long as you don’t have sex with people who have genital warts, you won’t be affected at all. Don’t be afraid of cancer. Americans are playing word games to destroy the reproductive capacities of Chinese people, which is identical to using GMOs to make Chinese people get cancer.

Using extreme and highly provocative rhetoric, nationalist conspiracy theorists asserted that the HPV vaccine was a threat to all Chinese people. Accordingly, whether to accept the HPV vaccine was no longer a choice about health. Rather, it was framed as a political decision that would affect the fortune of the whole nation. For example, one author argued that getting the HPV vaccine created by American companies was a symbol of low self-esteem and that ‘if women had low self-esteem, the whole nation would have low self-esteem, too’. Also, the term ‘fellow citizens’ (‘tongbao’) was widely used in these posts, reinforcing a sense of nationalism and the need for collective

action. These conspiracy narratives manifest intergroup conflicts (van Prooijen & Douglas, 2018) between the Chinese ethnic group and Western countries.

Discussion

This project has three primary findings. First, the content of Weibo posts created a direct and causal link between the HPV vaccine and cervical cancer. Second, both positive and negative correlations were identified among the five HBM components. The official launch of the HPV vaccine has resulted in two small but statistically significant changes in social media narratives: (1) local governmental departments have replaced health organizations and ordinary users as the most active contributors; (2) the percentage of social media posts covering efficacy information increased dramatically, while three of the other HBM components no longer received extensive public attention. Finally, a small percentage of posts delivered conspiracy beliefs. These negative posts presented typical features of conspiracy theories: paranoia about adverse side effects, distrust in the government and the pharmaceutical industry, and a hostile attitude toward the West.

Relabeling and mislabeling the HPV vaccine

In the Western media landscape, although the mass media have always been a prominent source of health information, media do not always deliver health information in a reliable manner (e.g. Johnson & Case, 2012). In terms of media presentations of the HPV vaccine, scholars have noticed that Western news stories often solely reinforced the association between the HPV vaccine and cervical cancer, while ignoring other STDs (e.g. Calloway et al., 2006; Robbins et al., 2012). In China's cyberspace, following the behavior of offline media (Li et al., 2018), 'cervical cancer vaccine' is more often used than 'HPV vaccine'. Especially on Weibo, a considerable portion of posts use both terms interchangeably. This shows that the most active users in building the mainstream discourse about the HPV vaccine in China have largely overlooked other HPV infections.

The relabeling of the HPV vaccine in China's cyberspace may have been derived from misleading information in offline media. Before being introduced to China, the HPV vaccine had been discussed in a wide variety of global and local media, and news stories emphasized the effectiveness of the HPV vaccine in preventing cervical cancer (e.g. Calloway et al., 2006; Kelly et al., 2009; Robbins et al., 2012). With the introduction of the HPV vaccine, Chinese users adopted this information from previous news stories. In the global landscape, unreliable health information spreads along with innovative medical interventions. Our study shows that opening up a new local market does not appear to improve the quality of the media discourse. Instead, the newly developed media discourse perpetuates the mislabeling. The phenomenon further exemplifies the prolonged influence of misinformation in the media discourse, reinforcing the importance of correcting unreliable media narratives during their early stages.

The consequences of translating 'HPV vaccine' into 'cervical cancer vaccine' may be two-fold. The use of 'cervical cancer vaccine' could raise public awareness of cervical cancer and the necessity of getting vaccinated. In English, there is no literal association between 'HPV' and 'cervical cancer'. When translated into Chinese, though, a direct link between HPV and cervical cancer was created: readers could conclude from its

name that the ‘cervical cancer vaccine’ could be used to prevent cervical cancer. This is particularly important in a developing country like China where public awareness of cervical cancer prevention is low (Agosti & Goldie, 2007).

On the other hand, however, renaming the HPV vaccine as the ‘cervical cancer vaccine’ might result in individuals ignoring other STDs caused by HPV, as is implied in previous research (e.g. Calloway et al., 2006; Kelly et al., 2009; Robbins et al., 2012). A major implication of such ignorance is the absence of men/boys from the discourse surrounding the vaccine. Due to medical and cultural reasons, it is hard to convince males to receive the HPV vaccine (Mehta, Sharma, & Lee, 2013). The misleading social media discourse could have made the situation worse in China: health educators would find it even harder to explain to males why they should get the so-called ‘cervical cancer vaccine’.

A fragmented presentation of HBM components

HBM identifies five components that predict one’s intentions to perform a health behavior (Glanz, Rimer, & Viswanath, 2015; Skinner et al., 2015). When applying the model to media content research, scholars often measure how the HBM components are presented in the media. The current study suggests that all five components of HBM are present in the social media discourse about HPV vaccine. One unique finding is that the five components are fragmented, meaning they usually do not show up in one single post.

Severity, susceptibility, and benefits are positively correlated with each other, while efficacy information is negatively associated with barriers and is not correlated with any other HBM components. The correlations show that HBM components are divided into two groups. The first group includes severity, susceptibility, and benefits, and it explains the health risks associated with HPV as well as the benefits of the HPV vaccine. This group primarily introduces health knowledge to the public. The other group, including barriers and efficacy information, addresses the issues people might encounter when they take action. These two groups are somewhat fragmented in the social media discourse about the HPV vaccine. Unless individuals read a large number of social media posts about the HPV vaccine, they are not very likely to encounter all five components in one single post.

In addition, the launch of the HPV vaccine on July 31, 2017, has changed the presentation of HBM components. After July 31, 2017, the percentage of social media posts covering efficacy information increased dramatically, while the three HBM components addressing health problems no longer received adequate public attention. The change may partially result from the fact that, with the official launch of the vaccine, local governmental departments rushed into the public arena and published a large number of posts about where and how to get the vaccine. Previous research has shown that, while social media has enabled a wide variety of users other than media organizations to contribute content (van Dijck & Poell, 2013), different social groups play different roles in social media conversations (e.g. Chen et al., 2017; Mou, 2014). Resonating with these findings, this study further illustrates the division in media content created by different users: organizational users, including health organizations, media outlets, and local governments played a more prominent role in providing scientific knowledge and efficacy information, while individual users tended to share information about barriers, which might be triggered by the difficulties they had encountered in getting the HPV vaccine.

Conspiracy theories rooted in nationalism

Overall, Weibo users demonstrated supportive attitudes toward the promotion of the HPV vaccine. Nevertheless, negative posts developed conspiracy theories about the introduction of the HPV vaccine in China. These posts are equally worth exploring because they are among the top 10% of the most re-tweeted social media posts, and thus they have the potential to influence a large population. Conspiracy theories in China's cyberspace about the HPV vaccine reflect two features that have often been discussed by previous literature: paranoia and distrust. One new and unique component of conspiracy theories rooted in the Chinese context is an antagonism against Western culture and foreign companies.

Conspiracy theories often involve intergroup conflicts, where conspiracists intend to develop a strong in-group identity and a sense of outgroup threat (van Prooijen & Douglas, 2018). Conspiracy Weibo posts about the HPV vaccine resonate with the above trend: by addressing ordinary users as 'fellow citizens', conspiracy theorists have created an in-group identity with their target audience while treating the West as an out-group threat.

The mistrust of foreign companies and the hostility towards the West, especially the United States, can be explained by the formation of Chinese nationalism. Chinese nationalism emerged in the context of anti-imperialism, and it was closely associated with nationalistic warnings about the danger of national annihilation due to external invasion (Zheng, 1999). Modern Chinese history evolved from a variety of crises caused by international forces. With the intrusion of Western forces in the late 1800s, China became increasingly semi-peripheralized, or semi-colonized. Scholars argue that 'Chinese nationalism was a reaction to the humiliation that China suffered at the hands of Western imperialism' (Zheng, 1999, p. 154). Therefore, resisting the West has always been a crucial element of Chinese nationalism. The Chinese considered the rejection of the West to be central to the construction of their national identity: to a certain extent, the West has become China's alter ego (Gries, 2004).

Prolonged and deep-rooted nationalist thoughts have resulted in a high level of skepticism, and even hostility, towards scientific inventions introduced by developed countries. Thus, our study shows that the introduction of the HPV vaccine to China is perceived as a form of 'Western influence' and even 'Western imperialism' that nationalists oppose (Zheng, 1999). Built upon a strong sense of nationalism against the West, conspiracy theorists have framed the HPV vaccine as a tool used by the West to damage Chinese nationalities, with greatly malicious intentions. These beliefs have also redefined the adoption of the HPV vaccine as a political issue rather than a typical health decision-making issue, imposing new challenges on health educators and advocates.

Conclusion

Applying mixed research methods, this study examines the diverse Weibo voices on the HPV vaccine. The Weibo discourse surrounding the HPV vaccine is positive in general, but it is somewhat misleading, which is evidenced by two facts: 'cervical cancer vaccine' has been widely adopted and most STDs caused by HPV are ignored. The HBM components were presented inconsistently over time and across author groups. Besides

these neutral and positive voices, conspiracy theories surrounding the HPV vaccine have emerged on Weibo. These narratives are rooted in nationalism and demonstrate a hostile attitude towards the West.

Some findings are consistent with existing research on media coverage of the HPV vaccine, in particular, the effectiveness of the HPV vaccine in reducing cervical cancer. Two issues have rarely been fully addressed in previous literature. First, the study examined the change in presentation of HBM components over time. Second, the textual analysis thoroughly discussed characteristics of conspiracy theories and analyzed the rhetoric contributing to such theories.

The Weibo posts about the HPV vaccine indicates that health advocates need to take into consideration the impact of cultural contexts. The HPV vaccine has been used in Europe and North America for more than ten years, significantly decreasing the occurrence of cervical cancer (Agosti & Goldie, 2007; World Health Organization, n.d.). When introduced to developing countries, however, the HPV vaccine's success in developed countries has not fully eliminated public concern. Instead, the vaccine's being invented and produced by 'foreigners' has raised public doubt. A deeply rooted notion that is not relevant to health, nationalism, was found to be a primary theme of Chinese conspiracy theories. Health advocates need to be aware of the influence of public resistance stemming from nationalism on the acceptance of medical knowledge in countries with strong historical legacies, such as China.

This study has several limitations. The research findings are more descriptive than analytical. We did not investigate the changes in mislabeling over time or across user groups either. In addition, we examined the content of original social media posts, but we did not examine the comments, number of re-tweets, or number of 'likes' each post received. Without the above variables, we are not able to predict how these posts were received by the public. It is also worthwhile to note that certain types of Weibo posts, such as those published by health organizations and nationwide media outlets are more likely to go viral than the ones published by ordinary media users. Failing to sample posts of various influence could have weakened the generalizability of our research findings. Finally, we examined the social media discourse about the HPV vaccine purely from its public health and media aspects. But, the introduction of the HPV vaccine is also a gender-related subject. Future research could study the topic's gender aspects, further enriching scholarly understandings of the interplay between media, health, and gender.

Notes

1. https://weibo.com/1269923485/E27uhuhDN?refer_flag=1001030103_&type=comment.
2. <http://club.kdnet.net/dispbbs.asp?id=10732847&boardid=1>.
3. <https://www.pfcchina.org/qtjl/13203.html>.
4. <https://weibo.com/p/2304184bb17e9d0102wp0z>.

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No potential conflict of interest was reported by the author(s).

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