

# Tracking the global spread of vaccine sentiments: The global response to Japan's suspension of its HPV vaccine recommendation

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**Keywords:** cervical cancer, HPV, Japan, social media, vaccine, vaccine hesitancy

**Abbreviations:** AEFI, Adverse Event Following Vaccination; BBC, British Broadcasting Corporation; CBCD, Center for the Biology of Chronic Disease; CDC, Centers for Disease Control and Prevention; CRPS, complex regional pain syndrome; FDA, Food and Drug Administration (US); GAVCS, Global Advisory Committee on Vaccine Safety; HPV, Human papillomavirus; MHLW, Ministry of Health, Labor and Welfare (Japan); MHRA, Medicines and Healthcare Products Regulatory Agency; NCNP, National Center of Neurology and Psychiatry (Japan); NIP, National Immunization Program; Q&A, Questions and Answers; VARRC, Vaccine Adverse Reactions Review Committee; WHO, World Health Organization.

In June 2013 the Japanese Ministry of Health, Labor, and Welfare (MHLW) suspended its HPV vaccination recommendation after a series of highly publicized alleged adverse events following immunization stoked public doubts about the vaccine's safety. This paper examines the global spread of the news of Japan's HPV vaccine suspension through online media, and takes a retrospective look at non-Japanese media sources that were used to support those claiming HPV vaccine injury in Japan. **Methods:** Two searches were conducted. One searched relevant content in an archive of Google Alerts on vaccines and vaccine preventable diseases. The second search was conducted using Google Search on January 6th 2014 and on July 18th 2014, using the keywords, "HPV vaccine Japan" and "cervical cancer vaccine Japan." Both searches were used as Google Searches render more (and some different) results than Google Alerts. **Results:** Online media collected and analyzed totalled 57. Sixty 3 percent were published in the USA, 23% in Japan, 5% in the UK, 2% in France, 2% in Switzerland, 2% in the Philippines, 2% in Kenya and 2% in Denmark. The majority took a negative view of the HPV vaccine, the primary concern being vaccine safety. **Discussion:** The news of Japan's suspension of the HPV vaccine recommendation has traveled globally through online media and social media networks, being applauded by anti-vaccination groups but not by the global scientific community. The longer the uncertainty around the Japanese HPV vaccine recommendation persists, the further the public concerns are likely to travel.

## Introduction

According to the World Health Organization (WHO), "cervical cancer is the second most common cancer in women in the world and the third greatest cause of death from cancer in women."<sup>1</sup> Every year, about 270,000 women die of cervical cancer, over 85% of whom are in developing countries.<sup>2</sup> Seventy percent of cervical cancers are caused by 2 strains of human papillomavirus: HPV 16 and 18. Currently, there are 2 vaccines that protect against both of these strains of HPV: Cervarix<sup>®</sup> and Gardasil<sup>®</sup>. HPV vaccines are currently licensed for use in 128 countries.<sup>3</sup> Despite its proven benefits, the HPV vaccine brings challenges. First, as it is given in adolescence, it needs

a different delivery mode than for childhood vaccines. In addition, as the vaccine prevents a sexually transmitted infection (STI), it evokes the moral judgments and religious and cultural taboos that come with discussing and addressing sexual behavior and there have been concerns about it increasing sexual promiscuity. Research, however, has confirmed that adolescents who have received the HPV vaccine are not more sexually active than their peers.<sup>4</sup>

In Japan, the HPV vaccine (Cervarix<sup>®</sup>) was licensed in October 2009 and 4 y later, in April 2013, the HPV vaccine was added to the government of Japan's list of recommended vaccinations. Yet, in June 2013, the Japanese Ministry of Health, Labor and Welfare (MHLW) suspended the pro-active

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**Table 1.** Major events in Japan related to the HPV vaccine

October 2009	Cervarix® licensed in Japan.
March 2010	After HPV vaccination, 3 girls complain of CRPS and 9 from chronic pain.
April 2010	32 of 1,747 local governments were providing funding for the HPV vaccine.
October 2010	Central and all local governments launch a temporary funding program, with central governments providing 50% for those local governments paying 50%.
July 2011	Gardasil® licensed in Japan.
08 March 2013	Asahi newspaper press report of 50 girls suffering from CRPS and 100 absent from school after receiving the HPV vaccine.
10 March 2013	Adverse events reported on TV news.
25 March 2013	Press conference by “victim” group showing videos of girls suffering from walking disturbances and seizures, which was also posted on YouTube.
01 April 2013	HPV vaccine included in the National Immunisation Program (NIP). Optional and given for free to girls aged 12–16 y old.
13 April 2013	Suginami local government announces its budget for the next fiscal year. This included compensation claimed by the parents of a girl with suspected CRPS following HPV vaccination. Case reported at local assembly meeting.
19 May 2013	Another press conference by victim group.
13 June 2013	WHO Global Advisory Committee on Vaccine Safety report released stating HPV vaccine is safe. Not reported in Japanese media.
14 June 2014	Joint meeting of the Vaccine Adverse Reactions Review Committee (VARRC). MHLW decided to temporarily suspend recommendation of HPV vaccine.

recommendation of HPV vaccination after a series of highly publicised alleged adverse events following immunization (AEFI) stoked public doubts about the vaccine’s safety. The vaccine continued to be provided for free to girls aged 12–16 y when asked for. The MHLW has added a page on its website (last updated on June 21, 2013) with a Q&A about the HPV vaccine, including a section on the safety of the vaccine<sup>5</sup> and has issued guidance to health care professionals.<sup>6</sup> However, despite these efforts to create more positive awareness of the vaccine’s safety, the government’s decision to suspend the active recommendation while continuing to provide the HPV vaccine on demand has led to the spread of uncertainty and distrust.

#### Adverse events and media coverage

The local media reports of alleged adverse events and negative information available internationally on the internet have contributed to the Nationwide Cervical Cancer Victim Liaison Committee’s gaining considerable strength and public attention in Japan. The Committee is headed by a parent who tried to claim compensation for her daughter’s suspected complex regional pain syndrome (CRPS), claiming that her daughter lost the ability to walk after vaccination with Cervarix® and is now in a wheelchair.<sup>7</sup> The national government refused compensation because the vaccination was not yet in the National Immunization Program. The local government of Suginami, where the girl’s family lived, also initially refused to provide compensation, but after the case was reported at a local assembly meeting in April 2013, where the victims’ group criticized the local government, intense media scrutiny prompted Suginami to provide compensation.<sup>8</sup> (See Table 1). The public perceived this as an admission of guilt and the issue became a tipping point for current anti-HPV vaccine sentiment.

In suspending its recommendation, the MHLW declared that it would investigate the reported cases of AEFI but as of July 2014, the only conclusion that has been reached is that the AEFIs were not caused by the vaccine but were psychosomatic or psychogenic. Because of the government’s continued suspension of the HPV vaccine recommendation, despite the investigation

reporting no causal AEFI, other actors have filled the information void.

Politician Toshie Ikeda is secretary-general of the Nationwide Cervical Cancer Vaccine Victim Liaison Committee, which is a victim support group. She uses her Twitter account and Facebook page to promote the group’s concerns. The absence of any media watchdog in Japan and relatively lax libel laws mean that newspapers, news programs, social networks, and victim support groups are able to publish unverified stories and videos of girls who claim to suffer from adverse events following HPV vaccination, as well as discredit or make slanderous comments about health professionals and organizations promoting the HPV vaccine.

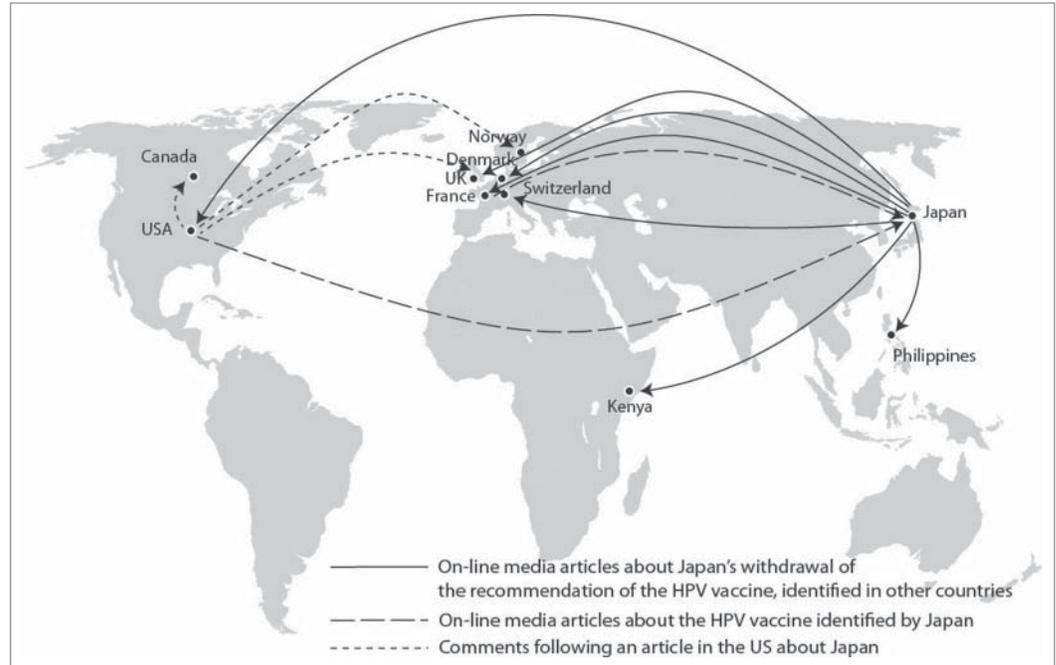
#### Media coverage and public perceptions

According to Marimoto et al. the media coverage of adverse events was most frequent around March 2013 and again after the government’s June 2013 announcement that it would be suspending its HPV vaccine recommendation while further investigating the reported adverse events. In 2013, the first dose vaccination rate of the HPV vaccine decreased by 97% compared with the same month in the previous year.<sup>9</sup> A study conducted by Marimoto et al.<sup>9</sup> found that the news of adverse events affected the attitude toward vaccination more strongly than the governmental announcement (91% and 68% respectively). Out of 2,777 study registrants, 80% had heard about the HPV vaccine’s adverse events and 68% were aware of the governmental decision to suspend pro-active recommendation of the vaccine. Twenty-9 percent discontinued vaccination after hearing negative news reports.

The decision of the Japanese Ministry of Health, Labor and Welfare to withdraw its recommendation of the HPV vaccine, together with the Japanese media’s often negative view of the vaccine, are reinforcing the confusion and uncertainty surrounding vaccination.

This paper examines the global spread of information and perceptions around Japan’s suspension of its HPV vaccine recommendation through an analysis of online media. It particularly

examines how Japanese online media refer to online reports in other countries which are critical of the HPV vaccine to substantiate their own concerns in Japan. Additionally, it examines how anti-HPV vaccine websites and online discussions outside of Japan use—and applaud—the Japanese government’s decision to suspend active recommendation of the HPV vaccine as support for their own concerns, contributing to the building of global networks of like-minded beliefs toward the HPV vaccine.



## Results

Total online media collected through the combined Google Alerts and Google Searches totalled 57 and included 40 (70%) website pages, 8 (14%) online newspaper articles, 3 (5%) social media pages, 2 (4%) technical reports, one (2%) government announcement, 2 (4%) online blog, and one (2%) YouTube video. There were 36 (63%) from the USA, 13 (23%) from Japan, 2 (4%) from the UK, one (2%) from France, one (2%) from Switzerland, one (2%) from the Philippines, one (2%) from Kenya, and one (2%) from Denmark.

Fifty-two (91%) articles were published in English, 4 (7%) in Japanese, and one (2%) in French. Some articles (e.g. on a US website) included comments from various other countries (Canada, Norway and the UK). Japan media reported on the HPV vaccine situations in the USA and France (Fig. 1). The majority—46 (81%) took a negative view of the HPV vaccine. Only 7 (12%) portrayed positive sentiment and 4 (7%), neutral sentiment. The concern of all the negative articles were the safety of the HPV vaccine. Most of the articles concerned HPV and females—52 (91%). Four concerned both males and females (7%) and one (2%) did not mention a gender. Forty-three articles (75%) were published in 2013, 12 (21%) in 2014. (Two articles—4% had no date).

Six of the articles were identified through Google Alerts using the search term “HPV Japan” and all 6 were website pages. There were 5 from the USA and one from the UK. All articles were published in English. Five (83%) took a negative view of the vaccine against HPV. Only one (17%) portrayed positive sentiment. All 6 of the negative articles expressed concerns about the safety of the HPV vaccine. All of the articles focused on HPV and females.

**Figure 1.** Map showing global transmission of: 1) Information about other countries’ HPV situation reported in the Japanese media; and 2) reporting and discussion on the Japanese suspension of the HPV vaccine recommendation outside of Japan. (January 2014-July 2014).

Through the Google Search, using the terms “HPV Japan” and “cancer vaccine Japan,” 51 reports were collected and analyzed and included 35 (69%) website pages, 8 (16%) online newspaper articles, 3 (6%) social media pages, 2 (4%) technical reports, one (2%) government announcement, one (2%) online blog and one (2%) YouTube video. There were 31 (61%) from the USA, 13 (25%) from Japan, 2 (4%) from the UK, one (2%) from France, one (2%) from Switzerland, one (2%) from the Philippines, one (2%) from Kenya and one (2%) from Denmark.

Forty-six (90%) articles were published in English, 4 (8%) in Japanese and one (2%) in French. The majority—41 (80%) took a negative view of the vaccine against HPV. Only 6 (12%) portrayed positive sentiment and 4 (2%) neutral sentiment. The concern of all the negative articles was the safety of the HPV vaccine. Ninety percent of the articles (46) concerned HPV and females. Four concerned both males and females (8%) and one (2%) did not mention a gender. Forty-three articles (84%) were published in 2013, 6 (12%) in 2014. (Two articles—4% had no date).

## Tag cloud

A word frequency tag cloud was created for all online media articles collected (see Fig. 2). As illustrated, given that the key search terms for the articles featured “HPV,” “vaccine,” and “Japan,” it is not surprising that the highest frequency words are HPV (which appeared 1605 times within the articles), vaccine (1531 times) and Japan (780). Additional words frequently occurring are Gardasil (634), health (572), cancer (541), 2013



article did not mention a date. Several anti-vaccine websites, such as *Age of Autism*, quote a report written by Dr. Sataro Sato, a Japanese internist and cardiologist, which details numbers and types of adverse events following vaccination (AEFI), including brain damage.<sup>15</sup> Many websites refer to the number of adverse events reported in Japan, citing that nearly 2,000 adverse events were reported, of which 385 were evaluated as serious. Some claim that the vaccine has caused numerous deaths.<sup>16</sup> Articles also provide petitions urging the abolition of the vaccine for readers to sign, to be handed to the Japanese Minister of Health, Norishita Tamura. Authors inaccurately describe “the virtually non-existent risk posed by being infected with ‘so-called’ carcinogenic HPV”<sup>17</sup> and provide links to the 2013 Japanese press conference that shows videos of girls suffering from walking disturbances and seizures.<sup>18</sup> An article in *ChildHealthSafety*<sup>19</sup> which reported on the suspension of the vaccine recommendation also suggested gender inequality as a reason that some health professionals are not listening to women who claim to suffer AEFIs.

One US article surmised that because Japan suffers from “the lowest fertility rates in the world,” officials are “being extremely cautious in implementing any long term health initiatives which affect women’s reproductive organs.”<sup>20</sup>

Of the US articles, 14 specifically contrasted Japan’s decision to withdraw the recommendation of the HPV vaccine to the situation in the USA. Thirteen articles applaud Japan for setting a good example: “finally the truth arrives from Japan”<sup>21</sup> “health authorities around the globe could learn from Japan’s demonstration of genuine concern for the health and well-being of their citizens,”<sup>22</sup> “the Japanese government would make common sense decisions based on evidence and stop allowing administration of an obviously dangerous vaccine without warning, while stateside our FDA is still dutifully telling Americans not to worry, go ahead and take the shot- it is ‘safe and effective’<sup>23</sup> and “Why are our government officials not doing the same thing?”<sup>24</sup> The articles express suspicion and question why the USA is pushing a vaccine which allegedly causes severe adverse effects. Some articles state that the “US government has taken the opposite approach amid equally alarming cases of serious side effects.”<sup>25,26</sup> Erickson<sup>27</sup> also questions how the US health and government officials are dealing with the situation of severe adverse events due to HPV vaccination. In the comments section to this article there are people from Norway, Canada, the USA and the UK applauding the Japanese government’s decision and questioning or critiquing their own countries’ policy. One person notes “This (Japanese) press release . . . should certainly be widely spread. . . it is also extremely important because it will surely be an inspiration and encouragement for anti-vaccine advocates in other countries.” A few articles are neutral and merely report the MHLW’s decision to halt recommendation of HPV vaccination. Only one of the US articles comparing the Japan situation with the situation in the US focused on the positive sentiment of the HPV vaccine within the US medical community. The article compared the MHLW’s decision to halt recommendation of HPV vaccination with the positive results from a study conducted in the US showing that HPV types that commonly cause cervical cancer has dropped by 56 percent in teenage

girls since Gardasil was introduced in 2006.<sup>28</sup> Some American websites also compare other countries’ decisions regarding the HPV vaccine, with that of Japan. *PRweb.com* compares Japan, Israel, and Italy, (where health officials are re-evaluating the safety of the HPV vaccine), to the USA, which is still promoting the vaccine. The article quotes Greg Bennet, Center for the Biology of Chronic Disease (CBCD), as saying “We wonder why the CDC and FDA are pushing Gardasil so strongly when health ministries in other countries are expressing concern.”<sup>29</sup>

### Other international media

We collected 7 relevant online media articles from outside of Japan and the USA, referring to events concerning the government decision on HPV vaccination in Japan. There were 2 articles from the UK, one in June 2013<sup>30</sup> and one in May 2014.<sup>31</sup> In July 2013 there was one article from Denmark,<sup>32</sup> one from Kenya,<sup>33</sup> one from the Philippines,<sup>34</sup> and one from Switzerland.<sup>35</sup> In November 2013 there was one additional article collected from France.<sup>36</sup>

Of these 7 articles, 4 articles correctly state that the Japanese Ministry of Health suspended proactive recommendation of the HPV vaccine,<sup>31-33,36</sup> 2 misstated that it withdrew administration of HPV vaccines.<sup>34,35</sup>

The WHO *Weekly Epidemiological Record* reported on the recommendations of the Global Advisory Committee on Vaccine Safety (GACVS) with regard to the Japanese situation. Although the Committee met before the Japanese government decision and stated no reason to suspend the vaccine nor vaccination recommendation, their advice did not deter the Japan decision to temporarily suspend the HPV vaccination recommendation. The Global Vaccine Safety Committee reviewed updated information about the safety of HPV vaccines since their last review in June 2009. The article states that “data from all sources continue to be reassuring about the safety of both vaccines” however it also states that “risk of syncope and anaphylaxis have been added to the label to warn of these potential events, the former being also possibly related to conditions around the vaccination experience itself.”<sup>36</sup> The committee discussed the cases from Japan initially resembling complex regional pain syndrome and that these have received media attention. It notes that while these cases are under investigation, “Japan has continued to provide HPV vaccine in their national program.” Recognizing the public concerns voiced, the Committee urges careful documentation of each case and a thorough search for a definitive diagnosis by medical specialists in order to best guide treatment. A timely clinical assessment and diagnosis of each case followed by appropriate treatment is therefore essential.<sup>36</sup>

Of the international articles collected that correctly state that the recommendation was withdrawn, reasons for doing so overstate “hundreds of complaints from Japanese citizens about possible side effects such as long-term pain, numbness and even paralysis,”<sup>31</sup> in combination with “in an attempt to avoid completely alienating the World Health Organization, which recommends the HPV vaccine used by many developed nations, the Ministry of Health, Labor and Welfare insisted that it is not

suspending the use of the vaccine, but simply instructed local Japanese governments not to promote it until more study is conducted on its safety.<sup>31</sup>

*Nsnbc international*, an alternative news site, reported on the Japanese health authorities' decision to withdraw their recommendation for HPV vaccine due to high levels of serious adverse reactions. It refers to an article from the USA by *Sanevax Inc.* claiming the rate of serious adverse reactions which Japanese women experienced after Cervarix as 52 times the rate of those reported after annual influenza vaccines.<sup>33</sup>

Concerns in all 7 articles ranged from a perceived lack of need for an HPV vaccine,<sup>31,33</sup> a lack of effectiveness<sup>34</sup> and concerns about potential adverse events following immunization.<sup>31-36</sup> Cervical cancer is an "extremely rare disease . . . the risk is normally zero up to age 20 . . . by the time there is any risk . . . any effect from the vaccine [if there ever was one] would have worn off."<sup>33</sup> "Critics argue the vaccines have not been in the market long enough to provide conclusive proof they can prevent cervical cancer."<sup>34</sup> Comments posted below *theukcolumn.com* article question the importance of the HPV vaccine due to a belief that HPV does not cause cancer, and that HPV "goes away by itself."<sup>31</sup> Reported concerns of adverse events following immunization include syncope, anaphylaxis, sterilization, death, precancerous lesions, convulsions, seizures, severe headaches, partial paralysis deafness, blindness, head banging, and foaming at mouth.<sup>31-36</sup>

The *Catholic Philippines* article states that the Japanese government withdrew administration of HPV vaccines, "citing adverse effects including infertility, long-term pain, numbness and paralysis."<sup>35</sup> The *Kenyan* article also refers to concerns over fertility suggesting that since the Japanese have a low fertility rate, "anything that poses any threat to their fertility is likely to cause alarm bells to ring."<sup>34</sup> "While Kenya's fertility rate is one of the highest in the world, such potential threats to fertility should not be overlooked."<sup>34</sup> The *theukcolumn.com* article reiterates that Japan is suffering from one of the lowest fertility rates in the world and notes that Japan is "being extremely cautious in implementing any long-term health initiatives which affect women's reproductive organs."<sup>31</sup> It also cites a US article in *The Wall Street Journal* about "a Japanese program that pays new parents \$3,300 per year for every new child until age 15," among other less direct incentives to increase birth rate. The *ukcolumn* article also suggests that vaccinations may be deadly, stating "in 1975, Japan eliminated all vaccines for children under the age of 2. The country's infant mortality rate subsequently plummeted to the lowest level in the world."<sup>31</sup> Comments posted below the UK June article refer to concerns about side effects, including HPV vaccination causing an increase in the risk of precancerous lesions.

The *nsnbc international* site states "it is obvious that anyone proposing to have this vaccine needs to be screened for (1) pre-existing medical conditions putting them at risk and (2) risk of adverse reactions based on prior clinical history. That is not being done."<sup>33</sup> One comment agrees with the report and states "the entire vaccination racket is run by a bunch of psychopathic

maniacs who will do everything they can to disguise the systematic poisoning of babies and children for profit as immunization."<sup>33</sup>

Other topics discussed in the articles were distrust of HPV vaccines by the Japanese government,<sup>31,34</sup> questions of motives of WHO and FDA,<sup>34,35</sup> motives of UK's BBC,<sup>33</sup> distrust of MHRA,<sup>33</sup> business motives,<sup>31,35</sup> and political motives.<sup>31</sup> Some applauded Japan, while criticizing their own government's decisions, such as an online article in the French newspaper, *Le Monde*, which questioned why the French government is not being as sensibly cautious as the Japanese government.<sup>37</sup>

The Kenyan article states "in effect, the Japanese Ministry of Health is saying quite categorically that it has no faith in Gardasil and Cervarix"<sup>34</sup> and the UK June article states that "the Japanese health ministry doesn't trust the HPV vaccines Gardasil or Cervarix."<sup>31</sup> The Kenyan article questions motives of the WHO and the FDA, stating that "the World Health Organization faces stinging criticism" and that "critics have accused the WHO of promoting the vaccines to benefit the manufacturers. The same criticism has been levelled against the United States Food and Drug Administration."<sup>34</sup> The *Catholic Philippines* article, citing an article from the US and one article from Kenya, 'Catholic Philippines', a community with over 1,000 likes on social media site Facebook, re-posted and provided a link to an article in the US-based Examiner.com stating that "World Health Organization accused of promoting vaccines to benefit manufacturers," and citing an article in *Standard Digital* from Kenya, "critics have accused the WHO of promoting the vaccines to benefit the manufacturers and that the same criticism has been levelled against the United States Food and Drug Administration."<sup>35</sup> Comments posted below the UK June article refer to concerns business motives, political motives of Texas governor Rick Perry making Gardasil vaccinations mandatory while having "heavy connections with the pharmaceutical industry."<sup>31</sup>

*Nsnbc international* wrote about the UK drug safety agency falsifying vaccine safety data and claiming that the MHRA encouraged health professionals not to report adverse reactions. "Chief Executive Professor Sir Kent Woods telling health professionals that reactions can be "psychogenic"—or in simpler terms a figment of 12 y old schoolgirls' imaginations" and states "Professor Woods then advised medical professionals not to report an adverse reaction if it 'may' be psychogenic."<sup>33</sup> The article accuses the MHRA of systematically altering data from the suspected adverse reactions, by separating out the symptoms, and declaring the vaccine safe when it was not, and fixing the figures "to make the rate of adverse reactions appear lower by substituting the number of doses given for the number of children receiving the vaccine, . . . if all children received all 3 doses then the crucial figure was not the number of doses but the number of children who suffered reactions compared to the total number of children."<sup>33</sup> The UK July article also stated that "the UK's BBC has become the British Government's press office" illustrating a distrust in the BBC.<sup>33</sup>

In analyzing the issue of vaccine hesitancy perpetuated or caused by postings on online media, it is important to acknowledge the potentially corrosive effects of rumors and their impact

on public trust. According to experts in rumor psychology, the content of rumor can be innocent but often deals with a set of social concerns or public dissension. Rosnow asserts that rumor generation is mediated by personal anxiety and general uncertainty. This can refer to tangibly dangerous situations like health-endangering contexts. This is certainly evident regarding public confusion around the Japanese government's decision to suspend proactive recommendation of the HPV vaccine recommendation. Drawing on rumor theory we can conclude that the ambiguous and potentially threatening context generated by adverse events following HPV vaccination, whether deemed causal or not, accelerate an information-seeking process, often seeking to reinforce pre-existing beliefs and concerns.

As with other vaccines, anxieties surrounding the HPV vaccine must be addressed promptly, including a system that allows the public to express concerns and receive swift, evidence-based answers.

Like all vaccines and medicines, the HPV vaccine carries some risks of adverse events, but they are generally minor and rare; and most reported AEFIs are ultimately found to lack a causal connection. Nonetheless, whether the reported AEFIs are minor or serious, real or perceived, they can prompt public anxieties, as well as affect political confidence, and appropriate responses are critical to sustaining and rebuilding the public's trust in the vaccine.

### Conclusion

Japan's suspension of the HPV vaccine recommendation has been largely applauded by the anti-vaccination groups but not by the global scientific community. Although anti-HPV vaccine sentiment is not widely spread on global mainstream media, it has spread and been reinforced through social networks in Japan and globally, especially as other countries have faced similar challenges with HPV vaccine uptake. This has been additionally fueled by rapid changes in communication technologies allowing for fast, multi-user and non-hierarchical diffusion of information.<sup>37</sup>

News of the Japanese government's withdrawal of its active recommendation for the HPV vaccine has reached a global audience—often with the facts misrepresented yet replicated word-for-word across multiple media in multiple countries. The ambiguity in the decision to suspend “active recommendation” of the vaccine—but not the “administration” of the vaccine—has further allowed for multiple interpretations and misinterpretations. To give just one example, a story posted on the US-based Examiner.com reporting that the Japanese government has “withdrawn administration” of vaccines against HPV was reposted on a Kenyan news site, *Lifestyle*, the *Catholic Philippines* Facebook page, and the *New Illuminati* Facebook page. Many websites reporting on the issue are copied from one source (often Sanevax), amplifying and re-affirming perceptions of risk in what Salathé and Khandelwal<sup>38</sup> refer to as the “echo chamber” effect.

News reports with social media “share” functions also enable propagation of misinformation and quick formation of affinity groups around opinions and the limited length of tweets (the name of messages posted on Twitter) requires people to express

opinions very concisely. This is evident when, considering that the media coverage of the HPV vaccine issue in Japan is largely in Japanese, the debates have still traveled quickly and influenced discussions on HPV vaccine globally.

### Limitations

As our search terms were in English, the results may be biased toward English websites. The amount of articles found was also limited in the Google Alerts search as we only searched emails from 1st January 2014. As the search was conducted manually, articles were deemed relevant by authors, thus potentially leading to subjectivity. This was also true for the sentiment analysis.

### Methods

#### Data collection

The Vaccine Confidence Project has been archiving and monitoring Google Alerts with search terms on all vaccines and vaccine preventable diseases since March 2010. For this paper, we searched for all alerts on “HPV Japan” for relevant content between January 1st 2014 and July 25th 2014. Articles were considered relevant if they discussed the Japanese government decision regarding the HPV vaccine recommendation.

An additional search was conducted using the Google Search engine to identify relevant articles missed by the Google Alert. The search was first run on January 6th 2014 using the keywords, “HPV vaccine Japan” and “cervical cancer vaccine Japan.” There were no date, language, or country limits to the data we were searching for. A snowballing technique was used and relevant links to the Japanese suspension of the recommendation of the HPV vaccine or the misinterpreted suspension of the vaccine were followed. Additional relevant links in Japanese were also identified. An extra Google Search was conducted on July 18th 2014 using the same keywords.

#### Data analysis

The online media data was imported into Microsoft Excel and NVivo 10. In Microsoft Excel, the online reports were coded by country of origin, country referred to, language of original report, report tone (either positive/negative/neutral), and at which gender the vaccine was aimed. The coding was conducted by RW, PP, and AP and discrepancies were discussed, additional information collected for clarification as needed, and all discrepancies were resolved.

The report content was coded negative if it contained any indication of concerns about the vaccine or vaccination program, positive if it supported vaccination and neutral if it just stated facts regarding the suspension of proactive recommendation of HPV vaccine. In NVivo 10, text frequency was analyzed for words greater and equal to 3 letters and a word cloud created.

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