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FINAL REPORT AND REFLECTION

ANTI-VACCINE MESSAGES ON FACEBOOK: A PRELIMINARY AUDIT

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Background

The World Health Organization (WHO) has identified vaccine hesitancy as one of the top ten threats to global health (WHO, 2019). Social media has fueled the anti-vaccine movement. Facebook is the largest social media platform counting over 2 billion active monthly users (Statista, 2019). It has been identified as a key disseminator of misinformation surrounding the anti-vaccine campaign by the New York Times 2019 and there have been serious efforts to reduce misinformation on the social media site by lowering ranking of groups and pages making false claims. Social media administrators have been urged to remove these pages and groups altogether, however counterarguments cite violation of human rights to access to uncensored information. This paper exposes some messages of the anti-vaccine movement online and how individuals perceive vaccination through posted comments. We consider that individuals' responses to antivaccination preclude inaction to vaccinate. Lack of vaccination places the public at risk and decreases public health efforts to curb measles, polio, and outbreaks of influenza (flu).

Methods

In May of 2019, publicly available content on four Facebook Pages was analyzed following key words "antivax", "anti vaccine", "vaccine", "vaccine injury", and "stop vaccination" in the Facebook search bar. Once on the "results" page, the link to the "Pages" tab was followed. Pages were chosen for analysis if they had 2500 and 150,000 likes on the first results page. We started on January 1st to May 30, 2019 and analyzed posts, comments and shared links. This time period was justified as flu activity peaks between December and February and can last as late as May (Centers for Disease Control and Prevention [CDC], 2019a). The data from the Facebook posts were categorized into "Myths", "Truths", "Consequences". These lists helped to categorize the data found on Facebook Pages to determine falsehoods and the minimization of truths. A separate category - "Measles Outbreak Reactions" – was used to document reactions to the current outbreaks of measles happening in United States which were garnering attention in mainstream media, and on Facebook. Website and posts data reached saturation simultaneously, the point where no more new themes emerged.

The Social Media Audit Template adapted from the Harvard Business Review (2015) was used assisted to analyze messages of website authors. The "Who" category captured the type of website (blog post, news article, etc.) and the URL helped us determine the type of websites that were being shared. The "What" category was used to describe message/content detail. "When" noted the date of publication determining links were shared instantaneously or randomly. The "Why" category gave us the purpose of sharing the websites and what the page administrators hoped to achieve by sharing the links. "Opportunity" was a crucial category in helping us note the number of "reactions", "shares", and "comments." We were then able to show the links that received the most reactions and replies.

Results

Myths

The claims made by the authors on the Facebook pages ranged from questioning the ethics of vaccination administration to the disregard of the benefits of vaccination. Demographics of the administrators of the Facebook page or users cannot be known as pages can be accessed worldwide. However, given the posts about surrounding the CDC and posts regarding current events in the United States believe most administrators and commentators were from the United States. Claims under "Myths" numbered greater than that listed under "Truths". Claims are listed below of greatest number to least.

Claim 1 “Vaccinations fail.” Some users on all Facebook pages expressed concern that vaccinations are not 100% safe and people should not vaccinate. References were made to the recent outbreaks of measles in the United States and users claimed that most affected individuals were already vaccinated. The validity of these could not be ascertained however, the CDC (2019b) reported most of the measles affected individuals who were unvaccinated. Claims were made about the Measles Mumps Rubella vaccine as a failing vaccine. The need for the DTaP vaccine for tetanus was disregarded as tetanus is not a communicable disease.

Claim 2 “Vaccine schedules are overwhelming and spark autoimmunity.” Users expressed concerns with the number of vaccinations added to child schedules by the CDC, and multiple vaccinations given at one time. Parents were concerned about vaccinations overstimulating the immune system. Some parents claimed “alternative” vaccine schedules could be used and had their health care providers involved. This included giving fewer vaccines at once and omitting vaccines deemed “not important” by parents. Readers also expressed concerns about the differences in child vaccine schedules among countries and used it as reasons not to vaccinate against certain diseases.

Claim 3 “Vaccines contain harmful adjuvants.” Adjuvants used in vaccine were under scrutiny on all Facebook pages. Adjuvants are chemicals added to a vaccine to strengthen its ability to stimulate the immune system and are blamed for causing a variety of diseases: cancer, infertility, Alzheimer’s and autism. Each vaccine has been linked to its own set of mythical consequences from contained adjuvants (Figure 1). HPV was linked to infertility and Poly Cystic Ovarian Syndrome; MMR to autism and epilepsy; polio to cancer; and DTaP to sudden infant death syndrome (SIDS). Vaccines are accused of having fetal cells as adjuvants and claims are made that they influence the sexuality of teenagers leading to an increase in homosexuality.

Truths

“Truths” contained information that could be supported by some peer reviewed scientific evidence. Repeated concerns were raised over the efficiency of the flu vaccine. Flu vaccines are in production before the flu season begins (meetings in February for the northern hemisphere and in September for the south. Flu strains are predicted based on surveillance, laboratory, and clinical studies (CDC, 2019c). The flu vaccine’s effectiveness was questioned on all Facebook pages. The government of Canada (2019) states that the flu virus may change while the vaccine is in production. “Even when there is a less-than-ideal match or lower effectiveness against one virus, the seasonal flu shot can still provide protection against the remaining two or three viruses (Government of Canada, 2019).

Another concern raised was vaccinating against pertussis as the vaccine has seemed less effective as other vaccines protecting against infections. Schwartz et al. (2016) found that 4 years post vaccination immunity to pertussis declined significantly particularly with acellular vaccine compared to the whole cell vaccine. Booster shots during pregnancy or priming with whole cell vaccine are recommended to optimize pertussis control (Schwartz et al., 2016). A case-control study by Klien, Bartlett, Fireman, Rowhani-Rahbar, and Baxter (2013) found that teenagers who received vaccines with whole cell vaccine for pertussis at Kaiser Permanente Northern California were more protected in outbreaks than teenagers who received the acellular pertussis vaccine.

Consequences

Autism was the most widely known implicated vaccines as well as SIDS, asthma, epilepsy, cancer, Alzheimers, miscarriage, infertility, and death (Figure 1). Testimonies from parents sharing information about the death of their children and posting pictures was a popular practice on all the Pages. These had a profound effect on other viewers evidenced by their

responses. Mothers have shared their hesitancy of vaccinating their children after viewing these posts.

Figure 1. Vaccinations and Primary Posts

Diseases that prevented by vaccination	Effect of Diseases on unprotected people	Available Vaccines	Adjuvants allegedly causing adverse effects	Prevailing Myths
HPV	Genital warts, cancer ¹	Gardasil™, Gardasil 9™	Polysorbate 80, aluminum	Infertility, premature ovarian failure, paralysis
Measles(M), Mumps (MP), Rubella(R)	M: Ear infection, pneumonia, encephalitis ² MP: testicular atrophy, mastitis, pancreatitis ³ R: arthritis, brain infection, bleeding ⁴	MMR	Aluminum, fetal bovine serum, recombinant human albumin	M: Autism, seizures, measles shedding from vaccine, alzheimers, lupus, aseptic meningitis
Diphtheria(D), Pertussis (P), Tetanus(T)	D: Airway blockage, myocarditis ⁵ P: pneumonia, convulsions ⁶ T: fractures, pneumonia, tightening of vocal cords ⁷	Dtap™, Tdap™	Formaldehyde, polysorbate 80, bovine serum albumin	SIDS, autism, vaccine induced pertussis, neurodevelopmental problems, miscarriage, death
Polio	Muscle paralysis, meningitis, paresthesia ⁸	Inactivated polio virus	Simian Virus 40	Cancer, vaccine induced paralysis

¹<https://www.cdc.gov/hpv/parents/about-hpv.html>; <https://www.cdc.gov/measles/symptoms/complications.html>²; <https://www.cdc.gov/mumps/about/complications.html>³; <https://www.cdc.gov/rubella/about/complications.html>⁴ <https://www.cdc.gov/diphtheria/about/complications.html>⁵; <https://www.cdc.gov/pertussis/about/complications.html>⁶; <https://www.cdc.gov/tetanus/about/symptoms-complications.html>⁷; <https://www.cdc.gov/polio/about/index.htm>⁸

Reactions to Current Measles Outbreaks

To achieve herd immunity for measles 95% of the population must be immune (WHO, 2017). Currently, the United States has experienced an all-time high of measles outbreaks since 1992 (CDC, 2019b). Outbreaks in New York communities that were unvaccinated cover over 75% of the cases, the majority affecting Orthodox Jewish Communities where vaccination rates are low. All Facebook Pages discussed the current coverage of measles outbreaks, but two of the four Pages frequently posted mainstream media coverage of the outbreaks. Reactions to outbreaks included denial of events; accusations of mainstream media falsifying reports, and the claim that communicated infections were from vaccinated individuals.

Website data

Website links shared on Facebook were followed. Website information was categorized into Who, What, When, Why, and Opportunity.

“Who.” Website links were predominately blog posts from anti-vaccine activists. The most popular website shared was Greenmedinfo.com by Sayer Ji, a self-proclaimed expert on vaccinations and keen supporter of naturopathic medicine. Robert Kennedy, a prominent

supporter of anti-vaccine sentiments featured on all Pages. Other websites included news articles, testimonials, and studies.

“What.” Stories of vaccinated individuals contracting the infection were testimonials from mothers whose children died post vaccination; accusations towards the government, and physicians promoting vaccinations to make money; condemnation of mandatory vaccination bills and laws; “expert” testimonies on the dangers of vaccination; promotion of naturopathic medicine, and denial of the harm of infectious diseases. Some websites claimed that childhood infection with measles conferred protection from adult cardiac disease and ovarian cancer.

“When.” Information most websites had been published in 2019, however others were published in the last decade. The “post” or “share” date on the Facebook Pages compared to the original publication date of the website was within one week for most posts on 3 of 4 Pages. One Facebook page shared website links published up to two years prior.

“Why.” Most website links were shared as a way of endorsing information on anti-vaccination. It is speculative if shared website links were vetted for scientific evidence. This included “new” studies and bizarre information such as the benefits of being infected.

“Opportunity.” The number of responses varied and could be attributed to the number of online users or personal interests. No definitive trend could be found. A news article shared on Pages from actress Kailyn Lowry had the highest number of “reactions” compared to any other website link shared. It was clear celebrities have the platform to influence across geographical areas simply by sharing their personal beliefs.

Discussion

Principal Findings

The discussion of the Facebook Pages led to emerging themes:

1. Formation of an online “community” of like-minded individuals sharing similar beliefs
2. The widespread reach of anti-vaccine messages
3. A debate on the ethics of mandatory vaccination and content moderation

Most online users varied in race and age. We noticed there was mutual appreciation of user posts, support and a sense of community. Criticisms prompted users to step up supportive posts. There was overwhelming support from mother to mother. A social media analysis conducted by Gruzd and Haythornthwaite (2013) analyzed a one-month sample of Twitter messages to trace interaction via social media and understand “how a community is formed and maintained online.” The study found that network analysis facilitated understanding of “what, and who compromises and sustains a network...” (Gruzd & Haythornthwaite, 2013). This study found that active participation and attention to others was a highly significant aspect of building an online community. This finding translates well to our analysis of Facebook as sharing of pictures and stories of children who were allegedly afflicted by vaccines was very popular and mothers tended articulate support for one another. Supporting one another in their “time of need” and defending their collective viewpoints helped foster a sense of community.

A significant finding was the fund raising for private autopsies of children who had died from SIDS. There was little to no follow up from parents who received money, little proof the autopsy was done, and no medical proof of linking vaccination to SIDS in these cases.

Widespread Reach of anti-vaccine messages

Anti-vaccine sentiments have global implications. Measles outbreaks have risen globally increasing to 30% from 2016 to 2017 (British Broadcasting Corporation [BBC], 2019a) France is currently experiencing outbreaks with 1 in 3 of their citizens believing that vaccines are not safe (BBC, 2019a) The spread of vaccine misinformation through the availability of smart phones and

social media is encouraging a public health threat in vulnerable nations of the world (Cable News Network [CNN], 2019a). Pakistan is one of three countries that have failed to eradicate polio transmission (CNN, 2019a). Mistrust of vaccines, a product of Western medicine confronts Nigeria, where Islamic militant groups state that immunization is a ploy to sterilise Muslims (BBC, 2019b).

Debating the ethics of mandatory vaccination and content moderation

The ethics of mandatory vaccination laws in North America featured as a focal point on Facebook posts, website shares, and comments. Anti-vaccine groups are heavily against the passing of any bill supporting mandatory vaccination. Vaccine Choice Canada – one of Canada’s largest anti-vaccination organizations claims they are prepared to fight New Brunswick’s proposed bill that will not allow children to attend public school without proof of immunization (Global News, 2019). In California there were calls to action against the governments that propose mandatory vaccination. Users on Facebook urged others to join protests, sign petitions, and call government offices to discourage vaccination. Users frequently cited the Constitution of the United States and claimed their rights have been violated through these bills and laws.

Facebook has pledged to remove content from groups, and rank posts with misinformation lower on the newsfeed (CNN, 2019b). YouTube has stopped serving anti-vaccine promoting videos and render content on the benefits of vaccination easier to find (BBC, 2019c). The WHO has applauded Pinterest for being a leader in removing vaccine misinformation from their website. Pinterest has one of the most rigorous restrictions on posting of vaccine misinformation, going as far as to block any searches with the terms “anti-vaccination” or “anti-vaxx” (CNN, 2019c).

Conclusion

The anti-vaccination campaign has used social media to spread misinformation to users – especially parents. As vaccine hesitancy increases, we put ourselves at the risk of a public health crisis rises. There are local and global implications of preventable diseases making a comeback. Limitations of this study include the ever- dynamic nature of the internet with the freedom to remove posts as desired by the administrators, and time constraints in which we studied the Facebook Pages. Fake news travels faster than truths, building momentum (Shu, Silva, Wang, Tang, & Liu, 2017) and therefore targeted promotion of vaccines addressing specific claims on the internet is warranted.

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Running head: Anti-vaccine messages on Facebook

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Reflection

The two skills that I have best developed throughout my experience in research over the summer are “Be responsible” and “Communicate”.

As a single researcher along with my faculty mentor, I was heavily responsible for most of the work that had to be done. Over the summer, I worked two part time jobs, and this meant I had to balance my work, and research responsibilities accordingly. I was the main researcher on this project, and since my social media audit could be performed from the comfort of my home, I was responsible for setting my own hours. This was an advantage for me as I could balance my work and personal life accordingly. Along with myself, I had to be responsible to my faculty mentor. For our weekly meetings, it was my responsibility to ensure that the work was done and ready to present to her. The only way to move forward with the work was to meet my own deadlines so I could be able to receive feedback in a timely manner. It was crucial to ensure that I was honoring my commitments to my mentor as this was the only way that our teamwork would show results. This skill is very important to obtain because there will be instances in life where you are responsible for setting your own deadlines and managing time wisely to ensure that goals are being met.

Communication was vital to completing this research project. Had I not been able to keep in touch with my faculty mentor through email and personal meetings, this project would never had been successful. To set us up for success, it was vital that arising problems along with progress was effectively communicated. Communication is a tool that is widely used no matter where you go. Even though there was only the two of us for this project, in the future if I am working with a research team, I will be able to utilize this skill to interact with team members.

PURE research has given me such a great opportunity to explore an area that is crucial to nursing practice. Research is a big part of nursing practice as it informs our practice as registered nurses. PURE has helped me become more familiar with the process of scientific research and the different forms it can take. I had never thought that research could cover such broad areas such as a social media audit.

A future goal for me would be to apply the findings from my research into my nursing practice. In my final focus in Winter 2020, I hope to be placed in a public health setting where I can utilize the knowledge I have gained from my research and help parents make informed decisions for their children.