Vaccines, Politics, and Logic: Why Science Failed to Quell the Antivaccination Movement

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The Clear Danger of Refusing to Vaccinate

Immunization through vaccination currently prevents 2-3 million deaths per year, and has saved millions of other lives since the invention of vaccines in 1796 (*Immunization coverage*, n.d.; Wolfe & Sharp, 2002). However, parents in the United States are refusing to vaccinate their children at an alarming rate, endangering those who are unable to be vaccinated for medical reasons, and threatening herd immunity for diseases such as measles and pertussis (Carrel & Bitterman, 2015). Herd immunity occurs when a population is sufficiently immune to a disease that the disease will not spread within the population. Two outbreaks, or sudden increases in occurrences, of pertussis and measles have already occurred in the United States within the past ten years, and studies showed that in both outbreaks, herd immunity was absent as a result of a lack of vaccinations, since most of those infected were not vaccinated for either disease (Atwell et al., 2013; Zipprich et al., 2015). Outbreaks may continue to occur unless resistance to vaccination is addressed. Parents have resisted vaccinating their children historically for many reasons, but most of the effort to address this resistance has been focused on disproving the alleged connection between the measles-mumps-rubella (MMR) vaccine and autism (DeStefano, 2007; Miller & Reynolds, 2009; Plotkin et al., 2009; Stehr-Green et al., 2003; Taylor et al., 2014). The alleged connection between the MMR vaccine and autism is not the only reason parents refuse to vaccinate their children, and may not even be the main reason. This paper explores other potential reasons why parents refuse to vaccinate their children, such as religious or political exemptions, persuasion by social media, and logical fallacies.

Analyzing Different Perspectives

This research paper investigates the extent to which the papers published claiming a link between the MMR vaccine and autism, and subsequent scientific papers contradicting that claim, affected the antivaccination movement as a whole. This analysis aims to demonstrate that the scientific papers refuting the connection between the MMR vaccine and autism may have not been the most effective method in persuading people of the safety of vaccines, since the majority of the population in the United States very rarely reads scientific literature. Documentary research and discourse analysis are employed throughout this research paper to accomplish this goal, as many of the opinions on vaccination have already been captured in prior work on the vaccination movement. The main key words used to search for the documents used in this research paper were "vaccine history," "vaccine outbreak," and "vaccine autism." The keyword "vaccine history" was used to find articles detailing the history of vaccine invention, and also the history of the antivaccination movement. A book about the history of vaccines and the antivaccination movement was found using this keyword (Durbach, 2004). The keywords "vaccine outbreak" were used to find articles about disease outbreaks that may have been caused by a lower amount of vaccinations in the area. Two articles detailing the pertussis outbreak in California in 2010, and the measles outbreak in California in 2015 were found using these keywords (Atwell et al., 2013; Zipprich et al., 2015). The keywords "vaccine autism" were used to find both journal articles connecting vaccinations to autism, and the plethora of papers that were written refute the connection between vaccination and autism. The articles found using these key words are organized throughout this paper by key word, with the articles found using the key words, "vaccine history," first, the articles found using key words, "vaccine outbreak," second, and the articles found using key words, "vaccine autism," third. Many more articles are

used in this paper using other key words, such as, "logical fallacy," and those articles are also organized by the logical fallacy they are about, in accordance with the arguments in this research paper.

Changing Perspectives: Past and Present

The rise of antivaccination viewpoints seen in present day is not the first. Parents have resisted vaccinating themselves and their children for many different reasons in the past. Initially, the antivaccination movement began as a political movement: when British Parliament passed the Vaccination Act in 1853, which required that all children be vaccinated against smallpox, a group of working-class people arose who opposed the compulsory nature of the act (Durbach, 2004). Antivaccinationism became so embedded in their culture that the stereotype of working-class people being the main antivaccinationist population remains today. Throughout history, resistance to being vaccinated has also been for religious reasons. Many people believed, and still believe, that vaccines confiscate control of human life from God and put it into human hands (Ruijs et al., 2013). However, in 1998, the antivaccination argument transitioned to a pseudo-scientific one when an article was published in *The Lancet* claiming the presence of a link between the MMR vaccine and autism (Wakefield et al., 1998). In 2010, another article was published claiming the presence of a link between the MMR vaccine and autism in young African American boys (Hooker, 2014). The results of people not vaccinating the children could clearly be seen when in February 2015, the CDC published a Morbidity and Mortality Weekly Report detailing a measles outbreak that occurred in California from December 2014 to February 2015 (Zipprich et al., 2015). The report claimed that 45% of cases were confirmed unvaccinated, while 43% had unknown or undocumented vaccination status.

Because the antivaccination movement has been present since the inception of vaccines themselves, the reasons for vaccine opposition have also changed over time, from political to religious to pseudo-scientific. In order to fully understand the antivaccination movement, reasons to not vaccinate must be thoroughly investigated.

Political Technologies, Technological Fixes, and Vaccines

Two frameworks are used in this research paper to accomplish its goal: the Political Technologies Framework, and the Technological Fix Framework. The Political Technologies Framework was constructed by Langdon Winner in his MIT Press Journal article, *Do Artifacts Have Politics?*. It categorizes how pieces of technology give different entities, such as people, groups, or governments, power, either explicitly or unintentionally. One of the main critiques of the Political Technologies Framework is that Winner's claim, that technology requires particular social constructs to go with them, is too strong. Instead, technologies may in fact be more compatible with some social constructs than others, but technologies never require particular social constructs ("Do artifacts (still) have politics?," 2019; MacKenzie & Wajcman, 1999). For example, an automobile logically should only have a single driver to guide its course, but automobiles could potentially be designed to accommodate two drivers. The Political Technologies Framework is used in this research paper to show that vaccines are able to provide power to governments or other institutions in some instances, which may be a reason that some people refuse to vaccinate their children.

The Technological Fix Framework was constructed by Byron Newberry in his entry in the *Encyclopedia of Science, Technology, and Ethics.* The term "*technological fix"* was coined in 1966 by Alvin M. Weinberg to describe the use of technology to fix problems that are normally solved via political, social, or other means. One of the main critiques of the Technological Fix

Framework was by Linda L. Layne, in her journal article *The Cultural Fix* (Layne, 2000). In her journal article, Layne asserts that the term "fix" ignores the fact that people may not agree on what problem needs fixing, and it is reliant on a mechanical model of life to be valid. However, since the technological fix has endured as a widely used framework throughout STS, she finds it necessary to highlight how "cultural fixes," rather than technological fixes, can be used to solve problems of a more cultural nature. The Technological Fix Framework is used in this research paper to show that the many papers published showing that vaccines do not cause autism may have not been the most effective method in persuading people of the safety of vaccines.

Current Perspectives: Politics, Religion, and Logical Fallacies

After extensive research and analysis, scientific papers refuting the connection between the MMR vaccine and autism were not the most effective method in persuading the general public of the safety of vaccines. The inability of scientific papers to persuade the general public is due to a number of factors, such as the fact that people have other reasons for avoiding vaccines, and logical fallacies such as omission bias, the anecdotal fallacy, and confirmation bias. By viewing each of these factors through Political Technologies, it is found that many of the reasons people oppose vaccination reduce to either wanting more power over their child's health, or having less power and therefore less responsibility over their child's health. By viewing the entire issue through the lens of the Technological Fix, it is found that the scientists who attempted to convince others that vaccines do not cause autism purely through scientific literature did not consider all of the possible reasons for vaccine opposition, as well as possible logical fallacies people use to oppose vaccines.

In general, there are two categories of reasons why people are against vaccination. The first is that they are opposed not to the formulations or effects of vaccines themselves, but to the

political aspects of vaccines, such as the potential for them to provide power to governments or hospitals. The second is that people are opposed to aspects of vaccines that they believe to be true, but in fact are not true, i.e. vaccines cause autism. The discussion below details many of the reasons within the first category. Since there are too many reasons in the second category to discuss in this research paper, a subsequent discussion details why people tend to trust the anecdotal evidence they receive from others, the sources of the lies about vaccines, rather than scientific evidence. Both of these discussions are then used to show why the scientific literature disproving the connection between vaccines and autism was not the most effective way to oppose the antivaccination movement.

The first opposition to vaccines appeared shortly after their invention. The first vaccine was formulated in 1796 by Edward Jenner, and provided immunization against the smallpox disease (Wolfe & Sharp, 2002). However, fierce resistance to the vaccine did not appear until 1853, when the British government passed the Vaccination Act, which required that all children younger than three months be vaccinated for the smallpox disease (Durbach, 2004). Most of the resistance to the vaccine was not against the vaccine itself, but against the government mandate. When this resistance is viewed through the lens of Political Technologies, it is clear that the British people believed that the government mandate would give the government power over their rights, their bodies, and their children's bodies. The British people themselves wanted power over their children's health, not wanting to give that power to a foreign entity.

Some people in present day have an anti-vaccine sentiment for religious reasons. According to a 2013 study on the role of religious leaders in promoting or opposing vaccination, researchers found that all of the religious leaders interviewed who refused to be vaccinated did so for religious reasons (Ruijs et al., 2013). Many of the leaders felt that "the Lord takes care of

[them]," therefore vaccination is not needed, or may even be disobedient or distrustful of God. All of the leaders interviewed believed that vaccination should remain voluntary. The study also mentions how church leaders are appointed: they are chosen by their congregations, and therefore have views and opinions that are similar to the majority of their church. Therefore, the views of the religious leaders in this study can be interpreted as the views of a majority of people in the congregation.

Religious opposition to vaccination can also be viewed through the lens of Political Technologies. The people who oppose vaccines for religious reasons do so for a similar "root reason" as the people who refused to vaccinate because of government mandates. Both of these groups have a preference for who should have power over their children's health. The first group of people did not want to relinquish the power over their rights, their bodies, and their children's bodies to the British government, but wanted to keep it for themselves. The second group of people preferred to relinquish the power over their bodies and their children's bodies to God, rather than keep it for themselves.

Much of the opposition to vaccines is not the result of power distributions in different groups of people, but because of the power of logical fallacies and anecdotal evidence. One such fallacy that may cause people to oppose vaccination is "omission bias." Omission bias is the tendency to favor omission, or inactivity, to commission, or activity. In the case of vaccination, omission would be the tendency to not vaccinate, while commission would be the tendency to vaccinate. A study published in the *Journal of Behavioral Decision Making* in 1990 found that when subjects had reservations about vaccinating a hypothetical child for a lethal disease when the vaccine could cause the death itself, even though death from the vaccine is much less likely than death from the disease (Ritov & Baron, 1990). If this experiment is viewed through the lens

of Political Technologies, it is revealed that the subjects of this study are also concerned with who has power over the fate of their children. The author of the study argues that the subjects tended towards omission because of who would be responsible for the death of the child if the child were to die in each scenario. If the child were to die as a result of the vaccination, even though that likelihood miniscule, the subject would most likely feel a much larger sense of responsibility, since the subject was more actively responsible for the death of the child. However, if the child were to die as a result of the disease, the subject would most likely feel a smaller sense of responsibility since it was not their action that directly caused the child's death, even though the child's death could have easily been prevented if the subject had taken action. Through Political Technologies, it is seen that vaccines give people more responsibility and more power over the well-being of their children. According to the study, people would rather not have that power and are therefore in favor of leaving the well-being of their children to chance, so that in the case of harm coming to the child, the moral responsibility would not fall on them. Obviously, the responsibility over the child's health would still fall to the parent in either case; the logical fallacy comes from differentiating between active responsibility and passive responsibility when no differentiation should be made.

Another logical fallacy that may cause people to oppose vaccination is the anecdotal fallacy. The anecdotal fallacy is the tendency to trust evidence based on personal accounts rather than peer reviewed scientific evidence. According to Michael Shermer in his Scientific American article *How Anecdotal Evidence Can Undermine Scientific Results*, humans evolved to pay attention to anecdotes because generally, false positives are harmless, while false negatives can be dangerous (Shermer, 2008). Humanity developed science in order to ensure that both false positives and negatives are avoided; however, humans are conditioned to believe in tales told by

neighbors and testimonials from friends, since false positives are rarely harmful, rather than peer reviewed literature. Humans are also conditioned to be storytellers, and anecdotal evidence caters more to humans' taste for a good story more than scientific literature (Shermer, 2008). This is one reason why scientific literature is an ineffective way to convince people that vaccines do not cause autism. Many people are much more inclined to believe their neighbor's story than literature written by a faceless person at an unnamed university. Individuals who believe vaccines cause autism often hear about it from people they know personally, and have seen or have a relationship with the child who allegedly has autism as a result of a vaccination. Generally, it is harder for humans to trust evidence presented by an entity that is not known rather than evidence presented by someone who is known and maintains a friendship with them.

The final logical fallacy that may cause people to believe that vaccination causes autism is "confirmation bias." Confirmation bias is the tendency to seek new evidence or interpret existing evidence in manners that are partial to already held beliefs or expectations. Raymond S. Nickerson, in his article published in the *Review of General Psychology,* asserts that confirmation bias is one of the most problematic aspects of human reasoning (Nickerson, n.d.). According to Nickerson, there is much empirical evidence that supports how pervasive confirmation bias is throughout science and people's lives. There are many forms of confirmation bias, such as restriction of attention to a favored hypothesis, preferential treatment of evidence supporting beliefs, looking only or primarily for positive cases, overweighting positive confirmatory circumstances, among others. Much of the modern opposition to vaccines is due to this logical fallacy, confirmation bias, in particular. A majority of the confirmation bias is perpetuated by face-to-face interaction of people presenting anecdotal evidence to each other because, as mentioned previously, evidence provided by someone who is known is easier to

believe. It is very difficult to not overweight the evidence presented by a friend, or an acquaintance who has a child with autism allegedly caused by their vaccination. However, much of the confirmation bias is also perpetuated by the social media presence of antivaccinationists. Many antivaccination groups have a strong social media presence, and have contributed to falling national vaccination rates. The websites created by these groups almost always promotes misleading information about vaccines including their ingredients, links to cancer, seizure, and peanut allergy, and both sides of the vaccine debate (Evrony & Caplan, 2017). Although there is a copious amount of scientific literature debunking the connections between vaccines and many ailments, including autism, parents who are looking for answers regarding why their child has autism may happen upon one of the antivaccination websites and believe their content. These parents restrict their search for answers to their favored hypothesis, that vaccines caused their child's ailment, without considering other reasons.

Why did scientists believe that debunking the connection between vaccines and autism scientifically, and then publishing their findings, would convince parents that vaccines do not cause autism? Perhaps they thought that because two scientific papers perpetuated this theory, publishing other scientific papers would convince people otherwise. If this issue is analyzed through the lens of the Technological Fix, the multifaceted nature of this issue can be seen. The way information is distributed and disseminated is often both a very technological and social experience. Humans often obtain new information from newspaper articles, text messages from loved ones, and from personal conversations, among other ways. Why humans believe the information they receive, or how they treat that information, is a different issue altogether, one that is outside the scope of this research paper. However, the scientists who attempted to fix the issue by publishing a plethora of scientific articles debunking the connection between vaccines

and autism did not think about how the issue related to the social aspect of information. They attempted to use a technological fix to remedy the issue, avoiding the social issue altogether. The scientists did not think about all of the reasons, detailed above, why people may not be convinced by scientific literature. In order to convince people that vaccines are healthy and do not cause autism, all of the possible reasons why they are against vaccines must be considered, as well as possible logical fallacies affecting those people.

This study has a couple of limitations. The first is total reliance on scientific literature for finding reasons why people are opposed to vaccines. Interviewing people who oppose vaccines or finding antivaccination websites may have provided other, better perspectives on why parents oppose vaccination. The second is that the majority of the research used in this research paper is from the United States. Many other regions, such as Europe and Australia, also have a large population of antivaccinationists, and research conducted in those regions could also have provided alternative perspectives on the antivaccination movement.

If this research were to be continued, one consideration would be to investigate ways to convince people of vaccines' efficacy while considering all of the reasons they may be opposed to vaccines. Another consideration would be to investigate how scientific literature fits into the life of an average person. If scientific literature is the main way new information and findings are disseminated throughout the world, understanding how it affects average people would help scientists find better ways to reach the world outside their niche scientific communities.

Science Is Not Persuasive – To Most

This research paper investigated the extent to which the papers published claiming a link between the MMR vaccine and autism, and subsequent scientific literature contradicting that claim, affected the antivaccination movement as a whole. The scientific literature contradicting

the connection between vaccines and autism did not have a large effect on the antivaccination movement because of factors such as the fact that people have other reasons for avoiding vaccines, and logical fallacies such as omission bias, the anecdotal fallacy, and confirmation bias. The people who oppose vaccination are concerned with who has power, and therefore responsibility, over the their and their children's health. At the start of the antivaccination movement, people opposed the governmental vaccination mandate because they wanted to be responsible for their children's health, rather than the government. However, as the antivaccination movement progressed, some people wanted the power over their and their children's health to be with entities other than themselves, such as God or luck, regardless of what the scientific literature says. Others trusted the anecdotal evidence of neighbors and social media websites rather than the scientific literature. The antivaccination movement will not end by scientists repeating what they have been doing for the past ten years, publishing more literature. The movement will end by considering all of the reasons people oppose vaccines, and taking action accordingly.

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