

The Impact of the Wakefield Studies on MMR Vaccine Acceptance

Alexandra Hélène Gagnon

Department of Sociology, MacEwan University

Abstract

Vaccine hesitancy threatens the efficacy of immunization and public health. This paper provides an overview of the history and success of vaccine development, and the recent increase in vaccination conspiracies. Although vaccines have been proven effective, vaccine hesitancy is a complex phenomenon. The Wakefield studies are examples of how misinformation can cause lasting damage to public trust in vaccines and healthcare institutions. We can ensure that future generations remain protected from preventable diseases by approaching this issue with empathy and dispelling misinformation.

Introduction

The development of immunization has saved countless lives from preventable infectious diseases. Although vaccines have been proven effective, the World Health Organization listed vaccine hesitancy as one of the top 10 public health threats (Rutjen et al., 2021, p. 277). Despite the availability of vaccination services, the delay in accepting or refusing vaccines threatens public health. Vaccine hesitancy is a complex phenomenon stemming from various influences, including misinformation and distrust of medical institutions. This paper explores the history and success of vaccine development and the recent increase in vaccine hesitancy. Additionally, contributing factors of conspiracy theories, misinformation, and institutional distrust will be investigated to understand these issues better.

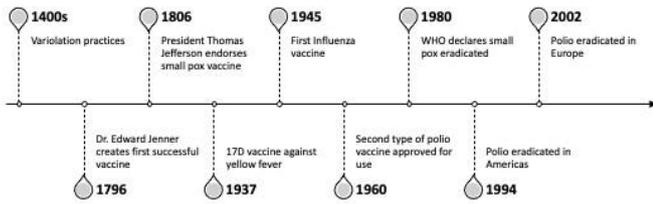
The History of Vaccines

People have attempted to prevent illness through intentional exposure since the 15th century through inoculation practices (World Health Organization, n.d.a). The World Health Organization (n.d.a) provides an overview of the significant historical milestones of vaccination.

In 1796, the world's first successful vaccine was created by Dr. Edward Jenner. President Thomas Jefferson endorsed Dr. Jenner's vaccine in 1806, a critical approval signifying the acceptance of vaccination by dominant social institutions in the United States. Influenza vaccination became a military priority in the United States in 1918, as the Spanish Flu pandemic killed 1 in 67 American soldiers and between 20-50 million people worldwide. The 1900s experienced an explosion in vaccine development. In 1937, the 17D vaccine was developed against yellow fever. In 1939, the efficacy of the whooping cough vaccine was demonstrated, and in 1960 a new polio vaccine was approved for use (World Health Organization, n.d.a).

Vaccine development proved to be instrumental in keeping world populations healthy. In 1980, the World Health Organization (n.d.a) declared smallpox eradicated, followed by polio in the Americas in 1994 and Europe in 2002. Vaccination techniques have existed throughout history, and immunization has become a safe and effective tool for combating deadly diseases across the globe.

Figure 1
Timeline of Major Historical Vaccine Milestones



Note. Information sourced from World Health Organization (n.d.a).

The Measles Vaccine

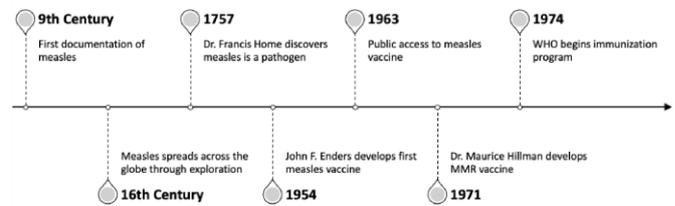
The World Health Organization (n.d.b) states that measles is one of the most contagious diseases faced by humanity and provides an outline of how we came to eradicate it. Measles was first documented as an infectious disease as early as the 9th century and spread across the globe through exploration in the 16th century. In 1757, Dr. Francis Home discovered that measles was an infectious disease that spread from an infected individual to a healthy one. The invention of antibiotics proved to aid some cases of measles. However, global mortality rates were over 2 million before the vaccine, and 30 million people were infected annually (World Health Organization, n.d.b).

The World Health Organization (n.d.b) further states that John F. Enders developed the first measles vaccine in 1954. The vaccine isolated the measles virus, and the theory behind its’ creation remains the foundation for many live-attenuated vaccines today. The vaccine underwent testing from 1958 to 1961 and was found to be 100% effective. Public access was granted to the vaccine in 1963, and many mass vaccination programs against measles began. In 1971, Dr. Maurice Hilleman combined three recent vaccines (measles, mumps, and rubella) into a single MMR vaccine (World Health Organization, n.d.b).

In 1974, the World Health Organization (n.d.b) stated that expansive immunization programs and childhood vaccination against measles drastically reduced disease rates. The World Health Organization (n.d.b) estimates that 95% of a given population must be vaccinated against measles to sustain herd immunity due to the highly contagious nature of the disease. Approximately

31.7 million deaths have been prevented by the measles vaccine between 2000 and 2020. However, in 2019 over 207, 000 measles deaths were reported globally, the highest number of deaths reported in 23 years. Although the vaccine is safe and cost-effective, global death rates and vaccine hesitancy rose before the COVID-19 pandemic (World Health Organization, n.d.b).

Figure 2
Timeline of Measles Vaccine



Note. Information sourced from World Health Organization (n.d.b).

The First Wakefield Study

Andrew Wakefield led two studies in 1998 and 2002, reporting a correlation between the measles, mumps, and rubella (MMR) vaccine and Autism (Offit & Handy, 2018). The first study performed by Wakefield and colleagues in 1998 hypothesized that the MMR vaccine caused intestinal inflammation, allowing harmful proteins to be transported to the brain via the bloodstream, and consequently resulted in the development of autism (Offit & Handy, 2018). The study focused on children (N=12) who experienced a developmental delay, eight of whom had autism (Offit & Handy, 2018). Each of these children was reported to have intestinal pain and was diagnosed with autism within one month of receiving the MMR vaccine (Offit & Handy,2018).

Offit and Handy (2018) highlight that the paper contained two critical flaws. The first flaw was that almost all the children's population received the MMR vaccine, which was administered when a child was expected to be diagnosed with autism. Therefore, it is expected that some children who have autism would have received the MMR vaccine. In order to determine if the MMR vaccine is the cause of autism in children,

research must be done studying the incidence of autism in both vaccinated and unvaccinated children, which was not the case in the 1998 Wakefield study (Offit & Handy, 2018).

The second flaw Offit and Handy (2018) outlined is that the Wakefield study observed intestinal symptoms *after* symptoms of autism in all eight cases. This contradicts their hypothesis, as they claimed that autism is a consequence of intestinal inflammation, and therefore intestinal symptoms should have been observed before the symptoms of autism. This 1998 study conducted by Wakefield and colleagues has been retracted as it was found to be based upon scientific misconduct, deemed fraudulent, and included misrepresented data (Offit & Handy, 2018).

The Second Wakefield Study

Wakefield and coworkers performed a second study in 2002 that examined the relationship between the measles virus and autism (Offit & Handy, 2018). Researchers tested intestinal biopsy samples in children with autism (N=91) and without autism (N=70) (Offit & Handy, 2018). They found that 82% of the children with autism had the measles virus in their biopsy sample compared to 0.07% of the children without autism (Offit & Handy, 2018).

Offit and Handy (2018) state that although these results appear concerning at a surface level, the second study performed in 2002 by Wakefield and coworkers had multiple critical flaws. The first flaw is that the researchers did not determine if the MMR vaccine is explicitly associated with children with autism. Children with and without autism were not matched for immunization status, nor were they matched for the length of time between receiving the MMR vaccine and collecting their biopsy sample. This was explicitly omitted from Wakefield and coworkers' findings. The second error is that the authors did not distinguish whether the measles virus found in the specimen samples was the vaccine or the natural measles virus. The third error was that an effort was not mentioned in the study on how the risk of false-positive test results (typical in laboratories that work with the natural measles virus) was mitigated. The final critical error was that no statement was made in the methods regarding whether the individual performing the test was aware if the sample was from a child with or

without autism. This is an integral part of the scientific research method as it ensures that the test results are unbiased and factual (Offit & Handy, 2018).

What is a Conspiracy Theory?

Defining and distinguishing between a conspiracy versus a conspiracy theory is crucial. Barkun (2015) defines *conspiracies* as actual covert plots carried out by two or more people, such as criminal conspiracy, while *conspiracy theory* is defined as an intellectual construct (p. 114). Conspiracy theories aim to find an explanation for a single event or a wide range of phenomena, and conspiracy theorists believe they know the truth through possessing privileged knowledge (Barkun, 2015, pp. 114-115). People who believe in possessing privileged knowledge can identify themselves as not belonging to a herd-like ignorant public. This results in conspiracy theorists becoming shielded from the potentially disastrous impacts of contradictory evidence through their sense of knowing something others do not (Barkun, 2015, p.115).

Barkun (2015, p. 115) explains how conspiracy theories break from socially conventional knowledge by the general public and become viewed as unacceptable, resulting in mainstream society ignoring or rejecting conspiracy theories. It begins through contradicting some practice or belief. A conspiracy theory instead promotes stigmatized knowledge that dominant social institutions, such as the medical community, have ignored or disregarded. The knowledge claims made by conspiracy theorists become stigmatized by not being accepted and validated by institutions, resulting in conspiracy theorists often developing a sub-culture of their stigmatized knowledge. The belief in conspiracy theories and stigmatized knowledge can result in people developing the belief that only themselves and those within their group know a given truth (Barkun, 2015, p.115). This can pose a threat when the accuracy of accepted knowledge and the legitimacy of social institutions is questioned.

Aupers (2012, pp. 26-27) explains that the rise of the internet has enabled the growth of conspiracy culture. As the level of distrust in scientific authority has increased, many individuals have begun to seek alternative sources of information in pursuit of the "real truth." The internet has become viewed as an open source of information that can be trusted. At the same

time, mass media and traditional journalism have become viewed as manipulative. While the widespread availability of information on the internet has advantages, it can also lead to conflict as individuals may mistakenly accept misinformation as fact (Aupers, 2012, pp. 26-27). An example of this is the increasing acceptance of vaccine conspiracies.

Current MMR Vaccine Research

A meta-analysis of published epidemiology studies found no association between the MMR vaccine and an increased risk of autism (DeStefano & Shimabukuro, 2019, p. 592). Multiple research studies have been conducted and have consistently concluded that MMR vaccination does not increase the risk or trigger autism in susceptible children (Hviid et al., 2019, p. 519; Jain et al., 2015, p. 1539; Madsen et al., 2002, p. 1477; Smeet et al., 2004, p. 963; Taylor et al., 2014, p. 3628).

Although the literature is replete with studies demonstrating no link between the MMR vaccine and autism, some individuals distrust vaccination.

Vaccine Hesitancy

MacDonald (2015) defines vaccine hesitancy as "... to delay in acceptance or refusal of vaccination despite the availability of vaccination services. Vaccine hesitancy is complex and context-specific, varying across time, place, and vaccines. It is influenced by factors such as complacency, convenience and confidence" (p. 4163). This definition was created by investigating the various factors influencing vaccine hesitancy and is practical and allows for a standard term to cover many factors contributing to low vaccination uptake (MacDonald, 2015, p. 4163).

Vaccine Causes Autism Conspiracy Theory

The Wakefield studies were a catalyst for vaccine conspiracy theories. Individuals who believe in the conspiracy theory are convinced that vaccination (MMR vaccine or sometimes any form of immunization) increases the likelihood of an individual developing autism. This particular conspiracy theory aims to explain why people develop autism. Dominant social institutions, such as the medical community, do not support this conspiracy theory, and many research studies discredit it (DeStefano & Shimabukuro, 2019, p. 592; Hviid et al., 2019, p. 519; Jain et al., 2015, p. 1539; Madsen et al., 2002, p. 1477; Smeet et al., 2004,

p. 963; Taylor et al., 2014, p. 3628). The conspiracy theory that vaccines cause autism is hazardous, as it can threaten public health and collective immunity. For example, to have collective immunity against a highly contagious disease such as measles, 95% of a given population must be immunized (World Health Organization, n.d.b). The conspiracy theory that the MMR vaccine causes autism has acted as a proponent of vaccine hesitancy. Although the measles global death rate reached a 23-year high in 2019 (World Health Organization, n.d.b), illustrating the impact of vaccine refusal and hesitancy, some individuals still chose to believe the conspiracy theory over reports by our dominant social institutions.

Figure 3
Organizations Promoting Vaccine-Autism Conspiracy Information

Organization	Belief that Vaccines Cause Autism	Website Link
Learn The Risk	Yes	https://learnthetrisk.org/vaccines/
Vaccine Choice Canada	Yes	https://vaccinechoicecanada.com/
Children's Health Defense	Yes	https://childrenshealthdefense.org/
Health Freedom Idaho	Yes	https://healthfreedomidaho.com/
Informed Consent Action Network	Yes	https://icandecide.org/
National Vaccine Information Center	Yes	https://www.nvic.org/
New Jersey Coalition for Vaccination Choice	Yes	https://njvaccinechoice.com/
Stop Mandatory Vaccination	Yes	https://www.stopmandatoryvaccination.com/

Note. Information was gathered through publicly available data on the organizations' websites.

Rutjen et al. (2021, p. 279) reported that conspiratorial thinking was the most influential contributor to people who hold anti-vaccination beliefs. Approximately half of Americans believe in at least one conspiracy, and anti-science conspiracy content was found to be shared on social media three times more than science content. The report found that anti-science skepticism is shared more often, especially when factual scientific data threatens an individual's ideology. It often highlights the wrongdoings of institutions, elites, and authorities. The cause of science skepticism has been hypothesized to have emerged from the implications scientific data can have on public policy as opposed to the actual science itself (Rutjen et al., 2021, p. 279). The skepticism towards science and institutions may contribute to vaccine hesitancy, which MacDonald's (2015, p. 4163) vaccine determinants matrix addresses.

Vaccine Hesitance Determinants Matrix

MacDonald (2015, p. 4163) created the Vaccination Determinants Matrix. Although it was not intended to be utilized as a practical tool, the author notes that it is helpful for researchers to address vaccine hesitancy as a broad issue beyond confidence in vaccine efficacy.

Figure 4
Vaccine Hesitance Determinants Matrix

Contextual influences Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors	Communication and media environment Influential leaders, immunization program gatekeepers and anti- or pro-vaccination lobbies Historical influences Religion/culture/gender/socio-economic Politics/policies Geographic barriers Perception of the pharmaceutical industry
Individual and group influences Influences arising from personal perception of the vaccine or influences of the social/peer environment	Personal, family and/or community members' experience with vaccination, including pain Beliefs, attitudes about health and prevention Knowledge/awareness Health system and providers – trust and personal experience Risk/benefit (perceived, heuristic) Immunization as a social norm vs. not needed/harmful
Vaccine/vaccination – specific issues Directly related to vaccine or vaccination	Risk/benefit (epidemiological and scientific evidence) Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine Mode of administration Design of vaccination program/Mode of delivery (e.g., routine program or mass vaccination campaign) Reliability and/or source of supply of vaccine and/or vaccination equipment Vaccination schedule Costs The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals

Note. Reformatted from Vaccine hesitancy: Definition, scope, and determinants, by MacDonald N.E., 2015, *vaccine*, 33, 4161-4164.

MacDonald (2015, p. 4163) found that education and socio-economic status do not influence vaccine hesitancy in one direction, unlike the social determinants of health. Level of education was not found to be a determinant of higher levels of vaccine acceptance. Vaccine hesitancy is influenced by many different factors (see Figure 4). Vaccine hesitancy was a phenomenon that extended beyond educating the general population. Although an individual may have achieved higher education and access to studies that deem vaccines safe, they may still be hesitant to be vaccinated in some cases. Contextual and group influences, such as vaccine conspiracy theories and anti-vaccine lobbyists, can make a person hesitant about immunization

Understanding Conspiracy and Hesitancy: Manufactured Risks

Giddens (1999, p. 3-4) provides insight into the risk society. Risk is not defined as a hazard or danger. Instead, the notion of risk stems from the desire to control. When society becomes preoccupied with the notion of control and safety, a risk society can develop.

The risk society suggests that the world has become more dangerous when it is not necessarily the case. As society progresses, *manufactured risks* are created. Manufactured risks are marked by the progression of human development, particularly in science and technology. Manufactured risks can be interpreted as unpredictable as they do not have a historical reference. These manufactured risks are part of the modernization process and result from transitioning from external, natural risks. Instead, manufactured risks are created by humans and impact nature as a result. Manufactured risks can result in uncertainty which impacts both personal and social life.(Giddens, 1999, p. 3-4).

Aupers (2012, pp. 30-31) argues that the emergence and appeal of conspiracy culture is linked to modernity. Conspiracy theorists seek to believe and construct narratives about reality to derive ultimate meaning, similar to contemporary spiritual seekers. However, unlike spiritual seekers who locate mysterious forces in the natural world, conspiracy theorists relocate such forces to modern society. (Aupers, 2012, pp. 30-31). Vaccine innovation has saved millions of lives; however, it can be framed as humans impacting nature. Vaccine hesitancy can be theorized to result from manufactured risks associated with modernization.

Although immunization has historical roots (see Figure 1), it can be understood as a manufactured risk. Believers of the vaccine-autism conspiracy are concerned about human agency in producing vaccines and mitigating their associated risks. Vaccines like the MMR vaccine are less historically established (see Figure 2) and are more likely to be labelled as a risk. Modernization has seen the advancement of technology at a rapid rate. Historical influences, perception of the pharmaceutical industry knowledge, immunization as a social norm versus harmful, and risk versus benefit (epidemiological and scientific evidence) have all been found to influence vaccine hesitancy (MacDonald, 2015).

Institutional Distrust

van Proijen et al. (2002, p. 65) outline how social institutions, such as the medical community, are designed to organize society to promote collective goals. One of the core functions of social institutions is to protect citizens against harm and promote a sense of safety. When individuals begin to distrust

institutions, they lose the sense that they are protected from exploitation and, consequentially, experience a decreased level of trust between strangers. Conspiracy theories have been linked to interpersonal distrust and social stigma, undermining interpersonal trust (van Proijen et al., 2022, pp. 65-66).

Institutions are authorities which shape the norms and values of society. van Proijen et al. (2022, p. 66) explain that when people perceive institutions as honest and reliable, they perceive themselves as respected group members. Conversely, if individuals perceive institutions as dishonest and unreliable, they will likely perceive themselves as powerless and marginalized group members. Suspicion of institutions via conspiracy theories can make people feel less protected, decrease trust between strangers, and increase feelings of prejudice, polarization, and conflict between opposing ideological groups. As our institutions are agents which define social codes, suspicion of them can promote the idea that individuals' perception of themselves and their community is of low value, resulting in a decrease in commitment, cooperation, and prosocial behaviour. The suspicion of institutions weakens society by damaging people's interpersonal, within-group, and between-group connections (van Proijen et al., 2022, p. 66).

Aupers (2012, pp. 27-28) argues that ontological insecurity is impacted by conspiracy culture through the rise of digital technology and suspicions of powerful entities (such as the state or mass-media). Unlike traditional societies which provide a stable sense of reality, modern societies threaten this sense of security with abstract, rationalized social systems. Karl Marx, Emile Durkheim, and Max Weber noted how modern society created a sense of alienation, anomie, and institutional autonomy (respectively), leading individuals to experience these systems as independent external forces. Conspiracy theories emerge as a cultural response to these developments, explaining seemingly inexplicable forces and rationalizing anxieties (Aupers, 2012, pp. 27-28).

Communication, media environment, politics and policies have all been found to influence vaccine hesitancy (MacDonland, 2015). If an individual loses trust in the medical community, they may interpret themselves as susceptible to exploitation. Furthermore,

suppose that an individual develops a belief in the autism-vaccine conspiracy theory and is told their belief is false by a stranger (such as a doctor). In that case, believers may feel ostracised due to low interpersonal and institutional trust.

Conclusion

Although vaccines have been developed over centuries of scientific research, they are associated with contemporary controversies and challenges. The Wakefield studies catalyzed subsequent conspiracy theories surrounding the safety of the MMR vaccine, resulting in lasting effects on public trust in vaccines and healthcare institutions. Although any medical intervention poses a potential for health complications, research overwhelmingly supports the safety and efficacy of the MMR vaccine. Manufactured risks associated with the MMR vaccine stem from misinformation, such as the Wakefield Studies, and institutional distrust. We must approach vaccine hesitancy with empathy and understanding. Many of the concerns associated with vaccination result from individuals wanting to protect themselves and their loved ones. In order to create change, educational platforms and policies must address public concerns to rebuild trust in healthcare systems. It is essential to continue educating the public on vaccine safety and efficiency to ensure future generations remain protected from preventable diseases.

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