

Trust, Truth, and Transparency - Vaccine Hesitancy in America

Kristen O'Meara, a teacher from Illinois, once firmly believed in anti-vaccination research. Despite her background in education, she chose not to vaccinate her three young daughters based on information she found online. She read blogs, watched videos, and engaged with online communities that reinforced her fears about vaccine safety. "I scoured everything I could possibly find about why vaccines might be harmful. I became pretty convinced," she later admitted (ABC News, 2016). However, this conviction was deeply challenged when her family contracted rotavirus, a severe and highly contagious illness that causes diarrhea, vomiting, fever, and dehydration. This illness, which is particularly dangerous for young children, could have been easily prevented by vaccination (ABC News, 2016).

The rotavirus outbreak in the O'Meara household took a serious toll. Her five-year-old daughter and three-year-old twins became violently ill, experiencing relentless stomach cramps, vomiting, and diarrhea. O'Meara and her husband also contracted the virus, leaving the entire family debilitated for days. "We were all just miserable. There was nothing we could do but wait it out, and I kept thinking, 'This didn't have to happen.' I could have protected them," she reflected (ABC News, 2016). Watching her children suffer, O'Meara was overwhelmed by guilt as she came to the painful realization that she had unnecessarily put them at risk.

Vaccine Hesitancy: A Global and National Concern

O'Meara's experience, unfortunately, reflects a broader challenge: vaccine hesitancy fueled by misinformation. A key challenge in public health communication is countering misinformation once it takes hold. To understand why vaccine hesitancy persists worldwide, it is important to examine how misinformation spreads and influences public attitudes toward vaccination. Research suggests that efforts to correct false beliefs can sometimes backfire, deepening skepticism instead of dispelling misinformation. This "backfire effect" occurs when individuals, especially those deeply invested in misinformation, react to encountering contradictory evidence by becoming more entrenched in their views. Within communities or ideological groups, widely accepted misinformation resists correction, even when scientific data overwhelmingly refutes it. The internet and social media have amplified the spread of such misinformation, allowing it to reach a wider audience and further entrench itself in certain communities.

Globally, vaccine hesitancy remains a significant challenge. One study conducted in June 2021 found that 75.2% of respondents accepted vaccines, meaning nearly a quarter of the population expressed some form of hesitancy (Lazarus et al., 2023). Surveying over 23,000 individuals across 23 countries, the study revealed significant variations in acceptance rates. Countries like China, Brazil, and South Africa had vaccine acceptance rates exceeding 80%, whereas the United States lagged behind at under 65% (Lazarus et al., 2023). Vaccine hesitancy, defined as the refusal or delayed acceptance of vaccines, was strongly linked to distrust in vaccine safety, skepticism about efficacy, and a lack of confidence in government and healthcare institutions.

Within the United States specifically, a systematic review of studies found individual vaccine acceptance rates ranging from 12% to 91.4%, highlighting a highly variable public opinion - especially regarding childhood vaccinations (Yasmin et al., 2021). Further research found that

43% of parents with young children believe that vaccines come with medium or high risk (Hefferon et al., 2017). Demographic factors, including race, age, education level, and income, also influenced attitudes toward vaccination. Hesitancy was notably high among African American communities, largely driven by historical medical injustices which have fostered lasting mistrust in healthcare institutions (Yasmin et al., 2021). This hesitancy is further exacerbated by targeted misinformation campaigns that spread false narratives about vaccine safety within these vulnerable communities.

The Science of Vaccination: Development, Safety, and Monitoring

Given the prevalence of vaccine hesitancy worldwide - and its roots in misinformation - it becomes crucial to understand how vaccines work and why they are safe. Vaccines have been an integral part of healthcare since Edward Jenner developed the first smallpox inoculation in 1796 (CDC, 2024c). This breakthrough laid the foundation for modern immunology and has since saved countless lives.

Modern vaccines are built around an antigen - the key component that stimulates an immune response - which may be a weakened or inactivated pathogen or a specific protein from it. mRNA vaccines, a newer technology, contain genetic material that instructs cells to produce the antigen themselves, triggering an immune response without introducing the actual pathogen. This technology has shown remarkable efficacy in recent vaccines against COVID-19 (CDC, 2024c). Beyond the antigen, vaccines include other carefully selected ingredients that help deliver it effectively to the immune system. Adjuvants, such as aluminum salts, enhance the immune response and ensure stronger and longer-lasting protection (CDC, 2024c). Preservatives prevent contamination in multi-dose vials, maintaining the vaccine's safety and efficacy. Thimerosal - a mercury-based preservative - was widely used but has been phased out of most vaccines due to public concern, despite a lack of evidence showing harm at the doses used (CDC, 2024c). Stabilizers, including sugars, amino acids, and gelatin, help maintain vaccine potency during storage and transport. Diluents, typically sterile water or saline, are used to prepare freeze-dried vaccines for administration.

Vaccine safety is ensured through rigorous development, testing, and continuous monitoring. Before approval, vaccines undergo extensive clinical trials to evaluate their safety and efficacy (CDC, 2024a). These trials occur in three phases. Phase I trials test a small group (20–100 participants) to assess safety and immune response. Phase II trials expand to several hundred participants, further evaluating safety and efficacy with a larger sample size. Phase III trials involve thousands of participants, providing critical data on effectiveness and potential side effects. Even after approval, vaccines undergo continuous safety monitoring through surveillance systems. The Vaccine Adverse Event Reporting System (VAERS) allows healthcare providers and the public to report potential adverse effects, serving as an early warning system (CDC, 2024a). Additionally, the CDC and FDA utilize the Vaccine Safety Datalink (VSD) and the Clinical Immunization Safety Assessment (CISA) Project to rapidly detect and investigate safety concerns, ensuring continued public health protection (CDC, 2024a). These systems are crucial for identifying and addressing any rare but potential adverse events associated with vaccines.

Vaccine side effects are usually mild and temporary, indicating a normal immune response. Common reactions include soreness, redness, or swelling at the injection site, along with fatigue, headache, muscle pain, fever, and chills (CDC, 2024b). These symptoms usually resolve within a few days and indicate that the body is building immunity. Serious adverse reactions are extremely rare; anaphylaxis, a severe allergic reaction, occurs in roughly one in one million vaccine doses (CDC, 2024b). While concerns about vaccine safety are understandable, severe side effects are often exaggerated in public discourse. Most serious reactions stem from underlying health conditions or individual susceptibilities rather than the vaccine itself. For the vast majority, the benefits of vaccination in preventing life-threatening diseases far outweigh the minimal risks of adverse effects (CDC, 2024b).

Combating Declining Vaccination Rates

Vaccines have had a transformative impact on public health, leading to the eradication of smallpox and the near-elimination of polio worldwide (Rodewalde, 2020). Declared eradicated by the World Health Organization in 1980, smallpox had killed an estimated 300 million people in the 20th century alone. Similarly, polio - once a feared disease causing paralysis and death - has declined by 99% since the launch of the Global Polio Eradication Initiative in 1988. In 2022, only 30 cases of wild poliovirus were reported globally, compared to an estimated 350,000 in 1988 (Global Polio Eradication Initiative, 2023). The success of vaccination programs is undeniable, with these efforts dramatically reducing the burden of infectious diseases worldwide. Conversely, declining vaccination rates have led to the resurgence of preventable diseases. In 2019, global measles cases surged past 869,000 - the highest recorded since 1996 - primarily due to gaps in vaccination coverage (Rodewalde, 2020).

Despite overwhelming evidence confirming vaccine safety and efficacy, hesitancy lingers, suggesting this issue extends beyond a lack of information or education. Psychological, social, and cultural influences all play a role in shaping individuals' decisions. Many, like O'Meara, reconsider their stance only after personal experiences with preventable diseases. People who have not witnessed these illnesses may underestimate their risks while overestimating vaccine risks based on rare or unverified anecdotes, emphasizing the importance of personal narratives in shaping perceptions and attitudes toward vaccination.

The challenge, then, is not just to provide more information but to make the benefits of vaccination and the dangers of preventable diseases more tangible. Strategies may include sharing personal stories, like O'Meara's, or using models to simulate disease outbreaks. Addressing vaccine hesitancy requires more than education - it demands trust-building within healthcare systems, responsiveness to community concerns, and engagement with trusted leaders to promote vaccination.

O'Meara's Transformation

Returning to Kristen O'Meara's story, her experience led to a complete reversal of her anti-vaccination stance. After her children recovered from rotavirus, she embarked on an aggressive catch-up vaccination regimen to bring them up to date. This decision was not easy, as it required her to confront her previous beliefs and acknowledge her mistake. "I put my kids at

risk," she said. "I wish that I had taken more time to research from both sides before my children were born" (ABC News, 2016).

O'Meara's transformation from vaccine skeptic to advocate highlights the impact of personal experience and reliable information in shifting perspectives. Her story illustrates a difficult but hopeful truth: minds can change. The challenge we face is not just about providing more facts but about making those facts resonate. As new vaccines emerge to combat evolving health threats, public health efforts must prioritize proactive communication, trust-building, and culturally sensitive education. The reality is clear: vaccines are among the most powerful tools in modern medicine and their benefits far outweigh the risks. In the fight against misinformation, science alone is not enough - education, empathy, and storytelling must work in tandem to bridge the gap between evidence and belief.

References

- ABC News. (2016). Anti-Vaxxer Mom Changes Mind After Her Three Kids Fall Ill. ABC News. Retrieved January 27, 2025, from <https://abcnews.go.com/Health/anti-vaxxer-mom-mind-kids-fall-ill/story?id=42351543>
- CDC. (2024a, October 2). How Vaccines are Developed and Approved for Use. Vaccines & Immunizations. <https://www.cdc.gov/vaccines/basics/how-developed-approved.html>
- CDC. (2024b, October 2). Possible Side Effects from Vaccines. Vaccines & Immunizations. <https://www.cdc.gov/vaccines/basics/possible-side-effects.html>
- CDC. (2024c, October 2). Vaccine Basics. Vaccines & Immunizations. <https://www.cdc.gov/vaccines/basics/index.html>
- Global Polio Eradication Initiative Annual Report 2023 - World | ReliefWeb. (2024, October 18). <https://reliefweb.int/report/world/global-polio-eradication-initiative-annual-report-2023>
- Hefferon, C. F., Brian Kennedy and Meg. (2017, February 2). Vast Majority of Americans Say Benefits of Childhood Vaccines Outweigh Risks. Pew Research Center. <https://www.pewresearch.org/science/2017/02/02/vast-majority-of-americans-say-benefits-of-childhood-vaccines-outweigh-risks/>
- Lazarus, J. V., Wyka, K., White, T. M., Picchio, C. A., Gostin, L. O., Larson, H. J., Rabin, K., Ratzan, S. C., Kamarulzaman, A., & El-Mohandes, A. (2023). A survey of COVID-19 vaccine acceptance across 23 countries in 2022. *Nature Medicine*, 29(2), 366–375. <https://doi.org/10.1038/s41591-022-02185-4>
- Rao, T. S. S., & Andrade, C. (2011). The MMR vaccine and autism: Sensation, refutation, retraction, and fraud. *Indian Journal of Psychiatry*, 53(2), 95–96. <https://doi.org/10.4103/0019-5545.82529>
- Rodewald, L. E. (2020). Forty and Twenty Years Ago and Now — Virus Elimination Successes and New Challenges. *China CDC Weekly*, 2(50), 953–954. <https://doi.org/10.46234/ccdcw2020.259>
- Yasmin, F., Najeeb, H., Moeed, A., Naeem, U., Asghar, M. S., Chughtai, N. U., Yousaf, Z., Seboka, B. T., Ullah, I., Lin, C.-Y., & Pakpour, A. H. (2021). COVID-19 Vaccine Hesitancy in the United States: A Systematic Review. *Frontiers in Public Health*, 9, 770985. <https://doi.org/10.3389/fpubh.2021.770985>