

## LETTER TO THE EDITOR

## THE LINGERING CHALLENGE: ADDRESSING VACCINE HESITANCY IN A POST-PANDEMIC WORLD

Ethan Ayaan Mir

Centennial High School, Corona, California, United States

## SUMMARY

Last time the world faced a deadly pandemic was the H1N1 Spanish flu in 1918, which affected almost one-third of the world's population (500 million people). Since then, almost 100 years later, we are now facing another pandemic of the SARS-CoV2 virus (COVID-19), which is still endemic to this day. As the technology evolved during those 100 years, an effective vaccine for COVID-19 was produced within only a year, a huge feat. But, unfortunately, due to its fast development, another force would arise limiting the impact of the vaccine: vaccine hesitancy and anti-vaxxers, which John Hopkins and the World Health Organization call the biggest current threat to global health. From politics to social media, it is clear that there has been a rapid spread of misinformation, resulting in hesitancy, especially from sociopolitically motivated people popularly referred to as anti-vaxxers. However, a second group of vaccine-hesitant people have also emerged, who are uneducated and remain undecided about vaccination mostly due to safety concerns. They come under the massive influence of anti-vaxxers and anti-vaccine propaganda through social media and politicians, which often make bold claims and huge headlines. To combat vaccine hesitancy, it is crucial that we debunk these conspiracy theories and misinformation that so many believe in, with factual, data-based information. Actively spreading correct information about the vaccines, such as disclosing the rigorous developmental processes and validation of safety data by the Food and Drug Administration (FDA), assurance for the unlikelihood of getting a lethal side effect along with tremendous health benefits, will encourage people for safe vaccination against COVID-19 and other potential infectious diseases in the future. This article discusses the role of anti-vaxxers and vaccine-hesitant groups, electronic social media, and politics in vaccine hesitancy among people. It describes the strategies to combat the roadblocks in the vaccination programmes and health benefits, offered by recent advances in scientific and technological developments.

**Key words:** vaccine, vaccine hesitancy, anti-vaxxers, pandemic, COVID-19, social media, politics

**Address for correspondence:** Ethan Ayaan Mir, Centennial High School, 1820 Rimpau Avenue, 92881 Corona, California, United States. E-mail: ethanmir@gmail.com

<https://doi.org/10.21101/cejph.a7593>

## INTRODUCTION

Have we forgotten the history of infectious diseases and vaccines? Have we forgotten how vaccines prevented the assault of infectious diseases such as smallpox, polio, whooping cough, mumps, measles, rubella, rabies, and the flu on mankind? Massachusetts was the first state to have mandated the requirement of the smallpox vaccine in 1855 for children before going to school, which would save many lives. But despite the huge success of vaccines in preventing the loss of human and animal lives, vaccine hesitation has historically impeded the advantages of this novel scientific development to mankind. In 2019, John Hopkins and the World Health Organization (WHO) named vaccine hesitancy as the biggest threat to global health, suggesting that vaccines have become victims of their own success. A portion of the misinformed human population opposes vaccination and even influences parents to avoid childhood immunizations. This has led to the disturbing resurgence of measles, evident from nearly 50 confirmed cases in Washington, 200 cases in New York, 10,000 in Brazil, and nearly 60,000 cases in Europe. These infections could have been prevented by the measles vaccine (1). Measles

was a leading cause of childhood illness with an estimated 2.6 million deaths each year before the introduction of the vaccine in 1963. According to the WHO, the measles vaccine prevented 21.1 million deaths from 2000 to 2017. But despite the evident benefits of this highly efficacious vaccine, it is surprising how some people are convinced to take an anti-vaccine stance and reject something that has proven to be beneficial. The COVID-19 mRNA vaccine, which was rapidly developed using advanced biomedical technology to combat the deadly respiratory disease caused by the SARS-CoV-2 viral infection, is facing a similar challenge from anti-vaccine propaganda machinery. This has caused significant economic damage and loss of human life worldwide. Unfortunately, the speed of electronic communication and ease of internet access to everyone has helped facilitate the spread of misinformation discrediting vaccines. Surprisingly a high percentage of the population especially from non-scientific backgrounds believe such fabricated information and ultimately become a roadblock in the vaccination programme. The motivation behind the anti-vaccine sentiment and the weakness of countermeasures to combat the rapid dissemination of misinformation and misperceptions needs a careful examination to overcome

---

the vaccine hesitance in the population. The main questions are: “Who are anti-vaxxers or vaccine deniers? Why do they deny the vaccine without reasoning? How do they create a mass movement of like-minded people? And what measures should be taken to break the momentum of anti-vaccine propaganda?”

### **Anti-vaxxers and Vaccine Hesitants**

Vaccine hesitancy is rooted as far back as its discovery. Fear about vaccines stemmed first from Edmund Massey’s sermon in London on July 8th, 1722, entitled “A sermon against the dangerous and sinful practice of inoculation.” The sermon appears to have objected to the inoculation of any form to prevent disease, as Massey stated in his sermon “Let us not sinfully attempt to alter the Course of Nature” (2, 3). The clearer anti-vaccine propaganda was observed when the smallpox vaccine was introduced. Some people worldwide felt it counterintuitive to infect a person with a dead/inactive virus and refused the vaccine, making anti-vaccine propaganda largely composed of arguments focused on the “denial of rights” and antisocialism (4). An anti-vaxxer or vaccine denier is a person who believes vaccines are not safe and do not work the way they are supposed to. They do not take vaccines and discourage others to take them. Anti-vaxxers are highly motivated to take an anti-vaccine stance and discredit evidence-based medicine. They appear to be politically, culturally, and/or socially motivated to participate in efforts that oppose widespread vaccination. For example, a recent study of more than 1,000 demographically representative participants found that about 22 percent of Americans self-identify themselves as anti-vaxxers, and tend to embrace the label as a form of “social identity” (5). This study suggested that some Americans may identify themselves with the “anti-vaccine” label in order to fulfil social goals (e.g., a sense of belonging in a broader community) (5). The main goal of such social profiling might be to influence the population for political gains. The high percentage of Americans identifying themselves as anti-vaxxers poses a significant challenge to the world health organizations in vaccinating the population against COVID-19 and other vaccine-preventable diseases. Additionally, the study revealed that self-identifying anti-vaxxers show increased opposition to childhood vaccine requirements (5).

“Vaccine hesitant” on the other hand show a very slow response in accepting a freely available vaccine. Their hesitancy primarily stems from the misinformation spread by the anti-vaxxers. Vaccine hesitant are mostly concerned about the safety of vaccines and refuse vaccines until any safety issues are clarified. It is important to determine what factors influence vaccine hesitant to not vaccinate. It was recently reported that distrust of doctors, distrust of government sources, and distrust of pharmaceutical companies play a major role in refusing the vaccine by vaccine-hesitant groups (6). These vaccine-hesitant people usually wait for certain time periods to confirm the safety of the vaccine by observing the vaccinated people for the emergence of potential unwanted side effects. In the COVID-19 pandemic the rapid development of an mRNA vaccine in only 12 months, the first time in history, was extremely helpful in controlling the pandemic. Unfortunately, the highly efficacious COVID-19 vaccine became the victim of its speedy development. Despite factual evidence by pharmaceutical companies and approval by the FDA, vaccine-hesitant people remained doubtful about its

safety, believing that corners were cut under political pressure for its speedy development. The slow response in accepting the vaccine culminated in the emergence of mutant strains of the SARS-CoV-2 virus, causing palpable anxiety, staggering death tolls, and global economic losses. It is important to determine why vaccine-hesitant groups do not trust doctors, government sources, and pharmaceutical companies despite factual evidence about vaccine efficacy and safety. Several studies worldwide have indicated that older individuals, females, those with higher incomes, and those with higher education levels were more likely to accept a vaccine (7). This suggests that age, gender, education, and income may likely play a role in vaccine hesitancy by the relatively milder vaccine hesitant groups.

### **Role of Electronic Social Media in Vaccine Hesitancy**

Easy access to the internet and electronic social media outlets such as Facebook and Twitter can be easily used to enhance community engagement in desired efforts of interest. These electronic resources have the unprecedented capacity to provide opportunities for the public to communicate. However, it has unfortunately been the active platform in the spread of misinformation during anti-vaccine movements, causing significant damage to the public health (8–10). A lack of review and unregulated publication of content, along with drastically reducing the communication costs allows these fringe groups to easily broadcast their messages on social media outlets. A fake news item spreading disinformation about vaccines is likely to make more rounds on the internet and trigger more discussions on social media groups than a reliable news source discussing factual evidence about vaccine efficacy. According to the WHO, the probability of adverse effects due to the measles vaccine is one in every million doses. At the same time, 21.1 million deaths were prevented by the same vaccine from 2000 to 2017. Yet still, a story on the internet about one adverse effect out of one million doses makes headways. It is rare to see a story about the millions of others whose lives were saved by the vaccine. In the COVID-19 pandemic, 70 cases of myocarditis were initially reported per one million doses of the BNT162b2 mRNA vaccine in adolescent males 12–15 years of age (11). According to the CDC most patients with myocarditis or pericarditis who received care responded well to the medicine and felt better quickly. They resumed work soon after the symptoms resolved. However, the news about myocarditis hit the social media like wildfire and fuelled further anti-vaccine sentiment, put a transient pause on the vaccination rate, while ignoring the 6 million deaths by the SARS-CoV-2 infection.

Due to mistrust in the government and vaccine manufacturing companies, some of the vaccine hesitant join discussion groups on social platforms out of curiosity to know the facts about vaccine efficacy and safety. However, they most often return with misguided negative feelings that vaccines are worse than diseases themselves. This amplifies the magnitude of anti-vaccine movements and facilitates the development of their alarming footprint on social media. Studies from 2000 to the present showed that the majority of messages on popular social media platforms are about anti-vaccine propaganda. Additional factors intensifying the anti-vaccine campaigns on social media is due to the misinformation originating from foreign countries. Research studies have shown that Russian bots and troll farms, in conjunction with Russia’s

---

foreign broadcast network RT, have pushed anti-vaccination messages on a large scale on Western social media (12–14). More recently Russian bots were engaged in the spread of coronavirus misinformation arguing that COVID-19 is an American weapon and is also caused by cellular 5G networks (15). Such social media campaigns serve Russian strategic and political interests without caring for the loss of human lives caused by the spread of misinformation.

### **Role of Politics in Vaccine Hesitancy**

The advice about vaccination should be provided by scientific experts and not by politicians, especially by those from non-scientific backgrounds. While vaccine hesitancy has a long old history, the hesitancy about the COVID-19 vaccine is deeply rooted to politics. The COVID-19 pandemic has shown that negative political views about vaccines overpowered the past proven success of vaccines in saving more human lives compared to any other medical technology (16). It is surprising how people trusted political views about vaccines while ignoring how vaccines eradicated deadly infectious disease in the past such as the bubonic plague, smallpox, polio, and measles that had caused unprecedented human suffering, loss of lives, economic damage, and palpable depression among people. In the fourteenth century, the bubonic plague killed perhaps 20 million people which was about one-third of the population of Europe at the time. The opposition to COVID-19 vaccine started at its developmental stage when people ignorantly started linking the shorter development period with the insufficient evaluation of safety parameters of the vaccine without crediting the use of modern, efficient and advanced technologies for its development. Numerous falsehoods appeared on social media posts such as “COVID vaccines will alter the human genomic DNA”, and that it will “negatively affect the fertility” or that “the government was injecting microchips into people to monitor their behaviours” (17). These conspiracy theories created a chaos and some people more susceptible to these theories refused to take the vaccine. The movement was greatly enhanced by the tweets from President Donald Trump (18). His tweets drastically impacted the vaccination rates with profound consequences worldwide. The politics got involved in the COVID-19 pandemic from the very beginning in the United States. It became a matter of Republicans vs. Democrats, and their respective stances on the situation. It no longer was about vaccinating the people, but about who could get the most votes. It was found that Republican far-right response to the COVID-19 pandemic, including the strong belief on unfounded conspiracy theories, resulted into more per capita cases and deaths in counties with higher proportion of Trump voters than counties with fewer Republican supporters (19, 20). Research has shown that political conservatives worldwide are more resistant to vaccination (21). This was evident when a politically conservative community in Moroni, rural Utah, organized an event named “The Night of Liberty” in which a large wooden syringe was burned, hundreds of people watched and cheered to the protest against “medical tyranny” (22).

The vaccine hesitancy in political conservatives primarily originates from science scepticism (23). In the United States the lenient approach to the pandemic started from upper administration when President Trump started mentioning how the virus would

disappear magically and claimed that the virus could be eliminated by the warm spring weather. President Trump organized rallies in which face masks, social distancing and other public health measures were completely ignored. In response to shutdown policies in different states, President Trump tweeted messages such as “liberate Michigan” (24). The past tweets from President Trump clearly demonstrate that conservative politicians believe in conspiracy theories that are linked to anti-vaccine propaganda. For example, in 2014 President Trump tweeted, “Healthy young child goes to doctor, gets many vaccines shots, doesn’t feel good and changes – AUTISM”. On 2 September 2015, President Trump tweeted, “I am being proven right about massive vaccinations about which the doctors lied. Save our children and their futures!” Research has found that these tweets encourage anti-vaxxers who openly started distrusting medical authorities and encouraged the people to believe conspiracy theories about the COVID-19 vaccine (18). With the help of right-wing media and support from conservative politicians, many anti-vaccine campaigns were held to oppose the use of face masks and closure of schools and businesses, arguing that these measures are unnecessary to combat the pandemic. In many communities, wearing a mask or taking the vaccine meant allegiance to a specific political ideology, while some considered the use of face masks as a violation of individual freedom. The main goal of this anti-vaccine political movement was to divide the people for political gains.

### **Preventing the Vaccine Hesitancy**

A multifaceted approach will be needed to prevent vaccine hesitancy among the people. Since vaccine hesitancy has multiple diverse origins, a specific approach corresponding to a specific origin will be required to overcome the vaccine hesitancy over time. Vaccine hesitant who delay the vaccination due to their concerns about the vaccine safety or efficacy, need counselling by the scientific experts to clarify these issues. Since people from non-scientific backgrounds get quickly impacted by misinformation about vaccines that keeps making rounds on television, the radio, and social media, their concerns can be easily palliated by scientific experts of public health. We know parents want to prevent their children from the harms caused by a vaccine preventable disease. They likely refuse child vaccination by thinking that they are doing good to their children without validating the false claims about the vaccines that have been debunked by the science. For example, parents always get confused by a false article published in 1998 that linked the measles, mumps and rubella (MMR) vaccine with autism. However, parents need to know that research reported in this article was faulty and was thus retracted in 2010. The doctors may need to lay out the complications and death rates of an infectious disease and the likeliness of the children contracting the disease, not simply informing the parents that their kids need to be vaccinated. The emphasis on how low the odds of having side effects are (almost 1 in every million shots) can go a long way in encouraging the parents to vaccinate their children.

While some hesitancy is expected for a new vaccine such as COVID-19, there is no time for confusion in the middle of a pandemic. At the momentous time when the FDA approved the Pfizer’s mRNA COVID-19 vaccine there was scepticism swirling around and 27 percent of Americans said they were not ready to

take the vaccine, which became a concern for global health. To avoid such scepticism the Food and Drug Administration (FDA) must disclose the stringent review policies for vaccine development and approval, factual data about vaccine safety and efficacy to public, and layout the supporting evidence for people that vaccine administration prevents lives. This will strengthen the trust among people for government organizations. This all boils down to communication, the messages emphasizing the urgent vaccine requirement needs to come from responsible local, state, and federal officials, the community leaders, and faith-based organizations, which can further help to promote the safety and efficacy of the vaccine. People, especially from non-scientific backgrounds need to understand the science about the vaccines, it is critical to explain how safety and regulatory guidelines are adhered in the development process. Only then can people shun the scepticism and confusion around autism that has already caused significant damage. The scepticism about shorter development time and safety issues for the mRNA vaccine needs to be confronted by the fact that mRNA vaccines have been studied since 1990 and the science has been tested before.

The anti-vaxxers on the other hand have mostly a different motive, they use anti-vaccine propaganda as an excuse to achieve a different goal. Today the information is sent or received by electronic media at the speed of light. The reader has very little time to judge whether the content is real or is loaded with misinformation or disinformation. However, it is critical to determine the credibility of the source or look for eye catching images or outrageous headers, which might suggest the information is likely false. Do not share doubtful content on social media. The strategy to combat the spread of disinformation by anti-vaxxers requires the establishment of appropriate policies on social media outlets to ensure only validated information about vaccines is published. This will require the development of algorithms that can not only identify and retract the vaccine disinformation from the social media websites but also block the anti-vaxxers to restrict the dissemination of fake anti-vaccine propaganda. However, reconciling the principles of free speech with the policing of social media to prevent the damage caused by freedom of expression on social media networks remains a conundrum for democracies. The establishment of new policies to limit the scientific communication by un-qualified politicians will be highly helpful in preventing the chaos in the middle of a pandemic.

#### Conflicts of Interest

None declared

#### REFERENCES

1. Krenn S. Have vaccines become victims of their success? The Baltimore Sun [Internet]. 2019 Feb 4 [cited 2022 Sep 15]. Available from: <https://www.baltimoresun.com/opinion/op-ed/bs-ed-op-0205-childhood-vaccinations-20190204-story.html>.

2. Benoit SL, Mauldin RF. The "anti-vax" movement: a quantitative report on vaccine beliefs and knowledge across social media. *BMC Public Health*. 2021;21(1):2106. doi: 10.1186/s12889-021-12114-8.
3. Massey E. A sermon against the dangerous and sinful practice of inoculation. 2nd ed. London: William Meadows; 1722.
4. Durbach N. Bodily Matters: the anti-vaccination movement in England, 1853–1907. Durham: Duke University Press; 2004.
5. Motta M, Callaghan T, Sylvester S, Lunz-Trujillo K. Identifying the prevalence, correlates, and policy consequences of anti-vaccine social identity. *Polit Groups Identities*. 2023;11(1):108-22.
6. Yaqub O, Castle-Clarke S, Sevdalis N, Chataway J. Attitudes to vaccination: a critical review. *Soc Sci Med*. 2014;112:1-11.
7. Soares P, Rocha JV, Moniz M, Gama A, Laires PA, Pedro AR, et al. Factors associated with COVID-19 vaccine hesitancy. *Vaccines (Basel)*. 2021;9(3):300. doi: 10.3390/vaccines9030300.
8. Davies P, Chapman S, Leask J. Antivaccination activists on the world wide web. *Arch Dis Child*. 2002;87(1):22-5.
9. Evrony A, Caplan A. The overlooked dangers of anti-vaccination groups' social media presence. *Hum Vaccin Immunother*. 2017;13(6):1-2.
10. Hoffman BL, Felter EM, Chu KH, Shensa A, Hermann C, Wolynn T, et al. It's not all about autism: The emerging landscape of anti-vaccination sentiment on Facebook. *Vaccine*. 2019;37(16):2216-23.
11. Oster ME, Shay DK, Su JR, Gee J, Creech CB, Broder KR, et al. Myocarditis cases reported after mRNA-based COVID-19 vaccination in the US from December 2020 to August 2021. *JAMA*. 2022;327(4):331-40.
12. Broniatowski DA, Jamison AM, Qi S, AlKulaib L, Chen T, Benton A, et al. Weaponized health communication: Twitter bots and Russian trolls amplify the vaccine debate. *Am J Public Health*. 2018;108(10):1378-84.
13. Kirk K. How Russia sows confusion in the U.S. vaccine debate. *Foreign Policy [Internet]*. 2019 Apr 9 [cited 2022 Sep 15]. Available from: <https://foreignpolicy.com/2019/04/09/in-the-united-states-russian-trolls-are-peddling-measles-disinformation-on-twitter/>.
14. Wilson SL, Wiysonge C. Social media and vaccine hesitancy. *BMJ Glob Health*. 2020;5(10):e004206. doi: 10.1136/bmjgh-2020-004206.
15. MacKinnon A. Russian disinformation takes on coronavirus, pointing a finger at the United States. *Foreign Policy [Internet]*. 2020 [cited 2022 Sep 15]. Available from: <https://foreignpolicy.com/2020/02/14/russia-blame-america-coronavirus-conspiracy-theories-disinformation/> Google Scholar.
16. Offit PA. The Cutter incident, 50 years later. *N Engl J Med*. 2005;352(14):1411-2.
17. Romer D, Jamieson KH. Conspiracy theories as barriers to controlling the spread of COVID-19 in the U.S. *Soc Sci Med*. 2020;263:113356. doi: 10.1016/j.socscimed.2020.113356.
18. Hornsey MJ, Finlayson M, Chatwood G, Begeny CT. Donald Trump and vaccination: the effect of political identity, conspiracist ideation and presidential tweets on vaccine hesitancy. *J Exp Soc Psychol*. 2020;88:103947. doi: 10.1016/j.jesp.2019.103947.
19. Albrecht D. Vaccination, politics and COVID-19 impacts. *BMC Public Health*. 2022;22(1):96. doi: 10.1186/s12889-021-12432-x.
20. Hill T, Gonzalez KE, Davis A. The nastiest question: does population mobility vary by state political ideology during the novel coronavirus (COVID-19) pandemic? *Sociol Perspect*. 2021;64(5):786-803.
21. Viswanath K, Bekalu M, Dhawan D, Pinnamaneni R, Lang J, McLoud R. Individual and social determinants of COVID-19 vaccine uptake. *BMC Public Health*. 2021;21(1):818. doi: 10.1186/s12889-021-10862-1.
22. Utah protest against 'medical tyranny' includes burning a giant effigy of a vaccine syringe. *Salt Lake Tribune*. 2021 May 6.
23. Rutjens BT, van der Linden S, van der Lee R. Science skepticism in times of COVID-19. *Group Process Intergroup Relat*. 2021;24(2):276–83.
24. Paz C. All the president's lies about the coronavirus. *The Atlantic*. 2020 Nov 2.

Received September 15, 2022

Accepted in revised form November 15, 2023