# Disinformation on Vaccination in the Era of Social Media: A Review of Current Research

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## Abstract

In recent years, social media has emerged as a critical vector for the spread of health-related disinformation, significantly influencing public attitudes toward vaccination. This narrative review investigates how disinformation on platforms such as Facebook, X (formerly Twitter), Instagram, and TikTok contributes to vaccine hesitancy and declining immunization rates, particularly during and after the COVID-19 pandemic. The review analyzes studies from 2020 to 2025, highlighting the correlation between exposure to anti-vaccination content and reduced vaccine uptake, including the reemergence of preventable diseases like measles, pertussis, and polio. It also identifies the most prevalent vaccine-related myths - such as alleged links to autism and risky adolescent behavior - and presents scientific evidence that refutes them. Furthermore, the study evaluates the effectiveness of traditional and digital educational campaigns, emphasizing that while traditional methods can influence policy, social media-based initiatives offer greater reach and interactivity. The findings underscore the urgent need for targeted, trust-building communication strategies and cross-sector collaboration to combat misinformation and promote vaccine literacy in the digital age.

**Keywords:** Vaccination, Social Media, Disinformation, Public Health

## 1. Introduction

In recent years, there has been growing concern about health-related disinformation on social media platforms, particularly in relation to vaccinations. Platforms such as Facebook, X (formerly Twitter), Instagram, and TikTok, despite their informational potential, have become major channels for disseminating false or manipulated content about vaccine efficacy and safety [1–3]. This phenomenon intensified during the COVID-19 pandemic, when misinformation about mRNA vaccines and conspiracy theories fueled rising anti-vaccination sentiments in many countries.

Moreover, recommendation algorithms used by digital platforms such as X, Facebook, and YouTube tend to favor content that is controversial, emotional, and polarizing, as such material drives higher user engagement. As a result, users may be inadvertently steered toward anti-vaccine or pseudoscientific content, reinforcing the so-called information bubble effect. This mechanism not only amplifies the spread of disinformation but also hampers access to reliable, evidence-based information [4,5].

Vaccine hesitancy has been recognized by the World Health Organization as one of the top ten threats to global health [6]. Its origins are multifaceted, encompassing factors such as distrust in medical institutions, influence from peer groups and opinion leaders, and susceptibility to fake news [7,8]. Public opinion is significantly shaped

by pervasive myths about vaccinations—such as alleged links between vaccines and autism, infertility, or weakened immunity—which contribute to fear and misinformation [9,10]. A particularly harmful myth is the belief that vaccination against human papillomavirus (HPV) promotes risky sexual behavior among adolescents, a claim repeatedly debunked by scientific studies [11,12].

The decline in trust towards vaccinations has, in some countries, led to a resurgence of diseases previously considered nearly eradicated, such as measles, pertussis, and polio [13–15]. This situation underscores the tangible threat posed by disinformation and highlights the urgent need for effective educational interventions.

In response to this escalating issue, various informational campaigns have been implemented worldwide—both on social media and through healthcare professionals, educational institutions, and public health policies. However, their effectiveness remains variable [16–18].

This review aims to examine how disinformation on social media influences vaccination decisions and to identify the most effective educational strategies to counteract this phenomenon.

## 2. Materials and Methods

This study employs a narrative literature review methodology, focusing on the impact of vaccination-related disinformation on social media and the effectiveness of educational campaigns designed to combat it. Databases such as PubMed and Google Scholar were searched, alongside reports from international organizations (e.g., WHO, ECDC) and publications from public health and immunization institutions. The analysis includes review articles, original research, content analyses, and gray literature (e.g., reports, press releases, educational materials). Publications in English and Polish were considered, with an emphasis on recent studies from 2020 to 2025, reflecting the growing role of social media during the COVID-19 pandemic.

Inclusion criteria encompassed studies addressing vaccination disinformation, analyses of social media content, assessments of vaccination attitudes, or evaluations of online educational campaign effectiveness. Exclusion criteria included non-peer-reviewed publications, non-empirical works (e.g., commentaries, letters to the editor), and opinion pieces lacking data support.

## 3. Results

### 3.1. Characteristics of Vaccination Disinformation on Social Media and Its Impact on Vaccination Rates

Analysis of selected publications confirms that social media are pivotal in spreading anti-vaccination content. Such messages often utilize emotive language, anecdotal evidence over scientific data, and conspiracy theories [1,2,5,6].

Research indicates that disinformation disseminated via social media significantly undermines trust in vaccinations and reduces immunization rates. For instance, a study by Wilson et al. demonstrated that disinformation campaigns on social media correlate with lower vaccination rates across various countries. Specifically, a one-point increase on a five-point disinformation scale was associated with a 2% year-over-year decline in average vaccination coverage [19].

Furthermore, studies conducted in Asian countries revealed that relying on social media as the primary source of vaccination information was linked to a three- to fourfold increase in the likelihood of delaying children's vaccinations. In China, individuals depending on social media for vaccine-related information were significantly more hesitant compared to those consulting official sources [20].

Similarly, Griffith et al. (2021), through content analysis of vaccination-related tweets in Canada, found that users exposed to disinformation were 2.7 times more likely to reject vaccination than those accessing credible sources [21].

Additionally, an analysis of over 636,000 English and French tweets indicated that 23.4% directly contributed to vaccine hesitancy, highlighting the extensive influence of social media disinformation on vaccination attitudes [1].

These quantitative data confirm that social media disinformation exerts a significant and measurable impact on vaccination decisions, leading to decreased immunization rates and heightened risk of preventable diseases.

### 3.2. Consequences of Declining Childhood Vaccination Rates – The Resurgence of Forgotten Diseases

The erosion of trust in vaccinations has directly resulted in decreased childhood immunization rates in numerous countries, including Poland. Data from WHO and UNICEF point to the alarming reemergence of infectious diseases that had been largely controlled through vaccination efforts [22].

In Poland, for example, there was a notable increase in measles cases—from 63 in 2017 to 1,492 in 2019 [23,24]. These surges correlate with vaccination rates falling below the herd immunity threshold. Similarly, Europe has witnessed concerning upticks in pertussis cases; in 2023, EU countries reported over 25,000 cases, with more than 32,000 cases in the first quarter of 2024. This rise is particularly alarming for infants and immunocompromised individuals. Reports from ECDC and research institutes like Institut Pasteur and the Robert Koch Institute indicate that the current pertussis wave is the most significant in over two decades, with the highest incidence among children under six months old [25]. Potential causes include diminished herd immunity due to vaccination and social interaction disruptions during the COVID-19 pandemic, as well as possible reduced efficacy of current acellular vaccines [26,27]. A study published in Eurosurveillance detailed a sharp increase in pertussis cases in France in early 2024. Analysis of 67 Bordetella pertussis isolates revealed a strain resistant to macrolides, raising concerns about antibiotic treatment effectiveness [27].

Experts warn that sustained vaccine skepticism could also lead to the resurgence of other infectious diseases, such as polio. In 2024, there was a significant increase in wild poliovirus type 1 (WPV1) cases in Afghanistan and Pakistan. Afghanistan reported 25 cases, a more than fourfold rise from six cases in 2023, while Pakistan's cases surged from six to 74, over a twelvefold increase [28]. This trend is attributed to factors like the Taliban's suspension of vaccination campaigns in Afghanistan and restricted vaccine access for women, hindering effective child immunization [29]. Moreover, in 2024, a case of poliomyelitis was confirmed in a 10-month-old child in the Gaza Strip, raising concerns about the disease's return to previously polio-free regions [30]. According to Alieda et al. (2023), low vaccination coverage combined with natural disasters (e.g., floods in Pakistan) significantly elevates the risk of epidemics of previously controlled diseases, including polio [28].

### 3.3. Most Frequently Repeated Myths About Vaccines

Misinformation regarding vaccines not only influences attitudes towards immunization but also contributes to the proliferation of widespread myths, potentially leading to decreased vaccination uptake. Among the most frequently repeated misconceptions are the following:

**Myths Linking Vaccines to Autism.** One of the most pervasive myths concerns an alleged link between vaccines—particularly the MMR vaccine (measles, mumps, rubella)—and autism spectrum disorder in children. This misconception gained traction following a 1998 study by Andrew Wakefield, which was later discredited as fraudulent and unethical. The study suggested a potential connection between the MMR vaccine and autism, but it was subsequently retracted by *The Lancet* due to unethical practices, including data manipulation and violations of research ethics [31]. Despite the retraction and the existence of numerous studies disproving any such association, this myth continues to circulate widely among conspiracy theorists. In response, multiple studies have been conducted to definitively refute this claim. DeStefano et al. reviewed the available literature and concluded that no relationship exists between the MMR vaccine and autism [32]. A 2022 systematic review reaffirmed that all existing data do not support any increased risk of autism following MMR vaccination, attributing the perceived association to misunderstanding and misinformation [33]. Furthermore, a 2020 study involving a large cohort of children from the United States and Europe confirmed no association between MMR immunization and autism risk, despite the prior widespread dissemination of such theories on social media [34].

**Myths Concerning Harmful Chemicals in Vaccines.** Thimerosal, a preservative containing ethylmercury, was previously used in some vaccines. Due to public concerns about potential health risks, its use has been significantly reduced. A study published in 2024 once again confirmed the lack of association between thimerosal and developmental disorders in children, reinforcing earlier findings that it poses no health risk in vaccines [35].

Aluminum, used as an adjuvant to enhance immune response, is another commonly mentioned substance. Research conducted after 2019 indicates that the aluminum content in vaccines is too low to cause any adverse health effects. For instance, a 2022 study found no association between aluminum exposure from vaccines and the incidence of asthma in children [36].

Formaldehyde, used in vaccine production to inactivate viruses and bacteria, is present in vaccines at minimal levels that pose no health risk. A 2022 review demonstrated that the amount of formaldehyde in vaccines is significantly lower than levels naturally present in the human body and does not impact health outcomes [37].

**Myth That COVID-19 Vaccines Were Developed Too Quickly and Are Insufficiently Tested.** One of the most common myths related to COVID-19 vaccines stems from misconceptions about the accelerated development timeline. In reality, these vaccines underwent all required phases of clinical trials and were subject to rigorous safety monitoring, despite the expedited process. mRNA-based vaccines such as BNT162b2 (Pfizer-BioNTech) demonstrated 95% efficacy in preventing COVID-19 in phase III trials involving tens of thousands of participants [38]. These findings have been confirmed in systematic reviews and meta-analyses that found no significant difference in the frequency of serious adverse events compared to placebo [39].
Furthermore, vaccine safety has been continuously monitored through global surveillance systems such as the Global COVID Vaccine Safety (GCoVS) network, which aggregates data from multiple countries to detect early safety signals [40].
The rapid development was made possible by prior research into mRNA technologies, substantial financial investment, and unprecedented international collaboration, which enabled the parallel conduct of certain development stages without compromising safety protocols [41].

**Myth That HPV Vaccination Influences Adolescent Sexual Behavior.** A commonly encountered myth regarding the HPV vaccine is the belief that administering it to adolescents, particularly girls, may lead to increased sexual promiscuity or risky sexual behavior. Some parents fear that vaccinating their children against HPV might foster a false sense of protection, reduce the use of condoms, or even encourage earlier sexual activity [42].
This myth is based on the incorrect assumption that the HPV vaccine is solely intended to prevent sexually transmitted infections, whereas its primary purpose is to protect against cancers such as cervical, anal, oropharyngeal, and penile cancer.
Importantly, numerous studies have shown that the HPV vaccine does not influence adolescents' sexual decisions. Rather, it constitutes an essential component of preventative healthcare and is unrelated to sexual initiation or risky behaviors [43,44].
Research from countries with widespread HPV vaccination has found no increase in sexual activity among vaccinated youth; on the contrary, these programs may enhance sexual health awareness. For example, a large U.S. study revealed no rise in unprotected sex or earlier sexual debut following the introduction of school-based HPV immunization programs [45].
Other studies have shown that vaccinated individuals tend to have greater knowledge about sexually transmitted infections (STIs) and are more likely to adopt protective behaviors, such as condom use [46,47].

### 3.4 Types of Educational Campaigns and Assessment of Their Effectiveness: A Comparative Approach – Traditional vs. Digital (Social Media) Campaigns

Public health educational campaigns have evolved from traditional communication forms, such as television, radio, and posters, to modern digital tools, including social media. Each of these approaches has its unique advantages and limitations, and their effectiveness depends on various factors, including the target audience, message type, and methods of measuring outcomes.

**Traditional Campaigns.** Traditional educational campaigns utilizing media such as television, radio, or printed materials are characterized by their broad reach and ability to engage diverse social groups. The "Light for Riley" campaign is one of the most significant initiatives in promoting pertussis vaccination, especially among pregnant women. Initiated in 2015 by Catherine and Greg Hughes following the death of their newborn son, Riley, who succumbed to pertussis at 32 days old, the campaign's effectiveness is evident in specific public health policy changes in Australia. Just two days after Riley's death, the Western Australian government announced the introduction of a free pertussis vaccination program for women in the third trimester of pregnancy. Within months, this program was expanded to all states and territories in Australia. By 2020, the vaccination rate among pregnant women in Western Australia reached 89%, one of the highest levels globally [48,49]. Another example of a

successful traditional campaign was the polio vaccination campaign in the United States during the 1950s and 1960s. It employed posters, press announcements, radio broadcasts, television advertisements, and celebrity involvement, including Elvis Presley, who publicly received the vaccine on camera in 1956. Following the introduction of the vaccine and educational campaigns, the number of polio cases in the USA decreased from over 35,000 annually in 1953 to fewer than 100 cases in 1965 [50].

**Digital Campaigns (Social Media).** With the advancement of digital technologies, social media has become a popular tool in educational campaigns. Platforms such as Facebook, Instagram, and Twitter enable rapid dissemination of information, interaction with audiences, and content customization for specific target groups.

The "Stop HPV – Stop Cervical Cancer" campaign (Denmark, 2017–2019) is an example of effectively utilizing social media to promote vaccination. In response to declining trust in HPV vaccinations, a "heart-brain communication" strategy was employed, combining scientific facts with emotional stories. On the Facebook platform, the campaign reached over 8 million people, generating an average of 127 comments per post, an engagement rate (ER) of 6.07%, and a click-through rate (CTR) of 2.09%. Success is attributed to meticulous planning, data analysis, and active community management, which helped counter misinformation and rebuild trust in vaccinations. The campaign's effectiveness was further enhanced by using various content formats and collaborating with influencers [51].

In Indonesia, a nationwide Twitter experiment aimed at promoting child vaccinations involved 46 public figures with a combined total of 7.8 million followers. Results showed that tweets authored by celebrities were 72% more likely to be liked or retweeted compared to similar messages without their involvement. Interestingly, citing official health sources in tweets reduced their dissemination by 27%. Although the campaign did not directly influence vaccination decisions, it increased awareness and discussions about vaccinations within communities [52-54].

The international "This Is Our Shot" campaign (2021–2022), led by Save the Children on Facebook and Instagram, reached over 150 million people across 12 countries. Utilizing behavioral sciences, the campaign focused on identifying barriers to vaccine uptake, such as concerns about side effects and vaccine safety. As a result, trust in vaccinations increased, and 6.4 million people were encouraged to consider getting vaccinated [55].

Both traditional and digital campaigns play crucial roles in promoting vaccinations; however, they differ in reach and impact. Traditional campaigns effectively support public health policy changes, while digital campaigns, through interaction and personalization, rapidly build trust and counter misinformation. A key success factor is tailoring strategies to the audience and context.

# 4. Conclusions

Analysis of available studies clearly indicates that social media plays a significant role in disseminating vaccination misinformation, leading to decreased trust in medicine and lower vaccination rates. This phenomenon has tangible health consequences, including the resurgence of infectious diseases previously considered nearly eradicated. Despite scientific debunking of common myths, their persistence is due to strong emotional messages and lack of trust in institutions. Educational campaigns, both traditional and digital, can play a pivotal role in combating misinformation, especially when based on strategies that emphasize trust, empathy, and clear messaging. Moving forward, it is essential not only to monitor online content but also to develop health literacy within society and foster collaboration among experts, public institutions, and digital platforms.

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