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Measles is Just a Harbinger

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Prevention of morbidity and mortality by immunization was named by the Centers for Disease Control and Prevention (CDC) as one of the top ten public health achievements of the 20th century, and a recent World Health Organization (WHO) brief estimates that, globally, over 154 million lives have been saved by vaccines, of which 101 million lives saved were infants.[1] However, in the United States, routine vaccination among kindergarten students has continued to drop since 2019 from 95% in the 2019-2020 school year to below 93% for the 2023-24 school year, with 92.7% for MMR. The exemption rate increased 0.7 percentage points to 3.3%.[2]

This is not just a United States phenomenon. In 2023, global immunization coverage dropped to 89% with the first dose, 84% with the third dose of DTaP–containing vaccine, and 83% with the first dose of measles-containing vaccine. In 2023, over 14.5 million children under the age of one year did not receive basic vaccines, nearly 2.7 million more than at the start of the pandemic. From 2019 to 2023, the number of children globally missing any measles vaccination increased by 15% to 22.2 million.[3] These trends are due in part to a surge in anti-vaccine sentiments associated with the COVID-19 pandemic[4] and fueled by misinformation able to be rapidly spread on social and other media networks,[5] although vaccine hesitancy existed long before 2019.[6,7] Vaccine hesitancy has been named by WHO as one of the top threats to global health.[6]

While a small number of parents outright refuse vaccinations for their children, around 13% of parents have instead taken to altering vaccine schedules for their children.[7,8] This causes delays in routine childhood vaccinations, leading to an increased period of susceptibility to vaccine-preventable diseases. While there are many factors influencing these declines in routine childhood vaccination, I'm going to focus on recommendations to vaccine hesitancy linked to misinformation and loss of trust in public health, using measles as a portent of what we may see in the near future from other vaccine-preventable diseases.[9,10]

Measles is a disease many of today's physicians have never witnessed, but this may be changing. Currently, there is a large outbreak in West Texas that started in February 2025, with 541 cases and 2 deaths reported by April 11. Another 241 jurisdictions reported measles cases, at least three linked to the Texas outbreak, for at total of 712 confirmed cases. Measles exposures have taken place this year in large airports–LAX, Seattle, Dulles—leading to the potential of spread occurring. Two tragic deaths so far have occurred, the first in over a decade. We've already seen more measles cases in the US in 2025 than in all of 2023, and the most since 2019.[11] The US eliminated measles in 2000,[12] so why are we seeing these resurgences that threaten that status? And it's not just the US that has seen measles outbreaks. As of February 2025, 54 countries are reporting sustained measles transmission.[13,14]

Measles is one of the most transmissible vaccine-preventable diseases (R_0 of 15-18), resulting in a community immunity level of ~95% needed to prevent sustained transmission.[15] Decreases in MMR vaccination rates internationally prior to 2019 led to a 30% increase in measles cases.[16] This is particularly worrisome as international travel to or from areas with measles outbreaks

may threaten communities with low vaccination rates.[17] Outbreaks cannot occur without low MMR vaccination rates among those who are eligible for immunization.

There have, unfortunately, always been structural barriers to immunization [including transportation accessibility and distance to vaccination sites, the convenience of obtaining the immunization injection, cost of vaccine, community-level norms, systems and historic experiences, language barriers, maintaining vaccine cold chain and disruptions in public health infrastructure due to war and conflict].[18–20] However, personal reasons for not accepting vaccines have been increasing since the COVID-19 pandemic based on misinformation about the safety and necessity of immunizations.[21,22] These hesitancy promoters can include a) complacency, perhaps due to never having seen or experienced the childhood diseases that used to be ubiquitous, b) lack of knowledge about vaccines, c) mistrust in the healthcare industry, the pharmaceutical industry, public health authorities, and/or government in general; d) the legitimacy of science and what constitutes "evidence," and e) fear due to mis- and disinformation often due to social media spread and belief in conspiracy theories. For examples of these patterns, see, Rancher et al.[23]

Mistrust in science, public health, and medical practices continued to grow during and following the pandemic. For some, this is entrenched in their cultural and political identity.[24,25] In parts of the United States, vaccine hesitancy can happen in communal clusters. Those living in rural areas are more prone toward conspiratorial thinking, defined as an individual's predisposition to consider events as part of greater plans by powerful people.[26] Other factors may play a role in vaccine hesitancy or refusal, including religion.[27] Many Evangelical Christians associate vaccinations with diminishing bodily purity.[28,29] New parents often take to online forums for advice from other parents.[30] Confirmation bias leads to parents who may be fearful of potential reactions their babies may have to vaccines looking to other parents who can confirm their hesitation by stoking their fears with anecdotes.[31] Vaccine hesitancy has been found to be related to a general distrust of government, distrust in medicine, and distrust in pharmaceutical companies.[32]

With the growing trend of vaccine hesitancy and refusal, parents are finding ways to legally avoid required vaccinations, using loopholes or easy verification for religious and philosophical exemptions. While all fifty U.S. states and Washington D.C. require MMR vaccine for school entry, some states allow for various exemptions based on religion or philosophy. Only five U.S. states [Maine, New York, Connecticut, California, and West Virginia] do not permit non-medical exemptions (NME) for MMR and other vaccines required for school entry.[33] In an analysis of state laws for NME, three-fourths (77%) of US states have either some stringency (e.g., a notarized statement from parents or guardians) or very little stringency (e.g., only a signed letter) for NME.[34] In the current political climate in the US, there is an increasing effort to remove all requirements for school vaccinations, with bills being introduced into state legislatures to this end.[35,36] The current Republican administration and Secretary of Health and Human Services are contributing to the misinformation ecosphere, and there are major concerns that immunization rates will fall even lower due to this.

Efforts to decrease the gaps in childhood routine vaccines globally must be taken to protect the community at large, especially those who are too young to be immunized, are pregnant, immunocompromised, or in other ways more vulnerable. Particularly as global vaccination rates have decreased while international travel has increased following the pandemic, governments and other public health organizations should reexamine and revitalize policies to increase

immunization uptake by implementing evidence-based strategies to address the problem. As part of this campaign, public health needs to communicate vaccine catch-up schedules for those whose doses were delayed to the COVID-19 pandemic.

Improve Communication Regarding the Safety and Efficacy of Vaccinations[37,38]

- Public health needs to produce strategic social media and traditional media campaigns, to clearly communicate risk information and benefits of vaccination in a sensitive, respectful, and culturally and health literacy appropriate way. Epidemiologic terms and research protocols should be defined and summarized in plain language. One goal should be to normalize vaccine receipt.
- A key strategy to address misinformation is to strengthen efforts to manage the spread of misinformation on social media. As seen in the COVID-19 pandemic and previous historical events, misinformation and distrust tend to spread rapidly on social media.
- Working with local and federal governmental entities, particularly school boards, is essential to develop culturally appropriate language to disseminate vaccine information to parents and young people.

Work with Community Partners and Vaccine Champions[39,40]

- Studies have found that teaming up with faith leaders has shown to be effective in increasing trust and vaccine uptake among members. For example, religious leaders were found to have a positive effect on increasing human papillomavirus (HPV) vaccination among African American congregations in Atlanta, Georgia. Religious leaders in the U.S. hold a great influence, as 67% of U.S. residents identify as religious. Many credit their religion to be their strongest influence on their health decision-making.
- Similarly, bringing together other trusted community leaders to work within communities with low vaccination rates to disseminate information on vaccine safety and efficacy has been shown to be effective. This strategy combined with other forms of dialogue-based interventions such as social media and mass media campaigns, has shown a positive effect on vaccine uptake for both measles and polio.
- Dialogue-based interventions may also utilize communication-based training for community healthcare workers (CHW). Active listening techniques should be employed. This was shown to be the most effective for improving vaccination rates for the expanded program on immunizations (EPI) and receipt of the third dose of DTP.

Support Policy Work[41]

- Strengthen lenient guidelines for vaccine exemptions based on religious or philosophical objections to reduce vaccine rejection

- Promote bolstering of state immunization registries so that when outbreaks occur, public health will know where activities need to be focused

Measles killed 107,500 children globally in 2023, most un- or under-vaccinated children under 5 years.[42] Once the virus is introduced into an unprotected community, it is very difficult to control, placing more and more children at risk.[43] Due to the current outbreak, the US is at risk of losing its measles elimination status fought for 25 years ago. As international travel increases and global vaccine rates continue to decline, action must be taken to protect communities from further clusters of vaccine-preventable diseases.[44] Measles is just a harbinger of what may be to come.

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