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Editorial: Global Health Concerns as Vaccine-Preventable Infections Including SARS-CoV-2 (JN.1), Influenza, Respiratory Syncytial Virus (RSV), and Measles Continue to Rise

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None declared

Abstract

In December 2023, the US Centers for Disease Control and Prevention (CDC) published the updated 2024 Advisory Committee on Immunization Practices (ACIP) Adult Immunization Schedule, which is available online for access by the public and healthcare professionals. These new guidelines come at a time when the incidence of vaccine-preventable viral infections from SARS-CoV-2 (JN.1), respiratory syncytial virus (RSV), influenza, and measles are increasing in adults and children due to vaccine hesitancy, or non-compliance. This editorial aims to highlight the ongoing global health concerns for the consequences of increasing reports of vaccine-preventable infections, including SARS-CoV-2 (JN.1), influenza, RSV, and measles, to understand the causes of vaccine hesitancy, and introduce some public health measures that could improve vaccine uptake.

Keywords:

Vaccine Hesitancy • Influenza • COVID-19 • RSV • Measles • Editorial

The cover of the January 2024 edition of the journal *Emerging Infectious Diseases*, published by the US Centers for Disease Control and Prevention (CDC), shows an image of a portrait of the zoologist and philosopher Anthonie van Leeuwenhoek (born 1632 in Delft), painted by Jan Verkolje (1650-1693) [1]. A study by the Global Burden of Disease 2019 Antimicrobial Resistance Collaborators reported the status of global mortality associated with bacterial infection [2]. In 2019, five bacteria were identified that caused between 50-75% of deaths from three types of disease: lower respiratory tract infections, bloodstream infections, and peritoneal and intraabdominal infections [2]. The main bacterial infections in 2019 included *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa* [2]. Also, in 2019, bacterial infections of all types caused 7.7 million global deaths, being the second most common cause of mortality after ischemic heart disease (IHD) [2].

The COVID-19 pandemic, due to SARS-CoV-2, began in China in late 2019, more than three centuries after van Leeuwenhoek described the microscopy of bacteria [1,2]. On 30 January 2020, the World Health Organization (WHO) declared COVID-19 due to SARS-CoV-2 infection as a Public Health Emergency of International Concern (PHEIC) [3]. By 31 December 2020, the official global death toll from COVID-19 was 1,813,188, which is now considered an underestimation by up to 1.2 million [4]. These data illustrate that in 2020, the first year of the COVID-19 pandemic, SARS-CoV-2 infection resulted in at least 3 million deaths worldwide [4].

In December 2023, the CDC published the updated 2024 Advisory Committee on Immunization Practices (ACIP) Adult Immunization Schedule [5]. These new guidelines come at a time when the incidence of vaccine-preventable viral infections from SARS-CoV-2 (JN.1), respiratory syncytial virus (RSV), influenza, and measles are increasing in adults and children due to vaccine hesitancy, or non-compliance [5]. The updated 2024 ACIP Adult Immunization Schedule includes an addendum that enables US Affordable Care Act (ACA) compliant insurance plans to cover ACIP-recommended immunizations, new recommendations, and new vaccine schedule tables [5]. The latest vaccine additions to the ACIP schedule include respiratory syncytial virus (RSV) vaccines and the new 2023/24 formulations of the updated mRNA and protein-based adjuvanted COVID-19 vaccines [5]. The vaccination recommendation tables include, in alphabetical order: vaccines by name, abbreviation, and trade name; vaccinations by age; and vaccinations by medical conditions or other indications [5]. The ACIP notes and tables have been edited for clarity to provide information for patients and healthcare professionals are available online and to download [5].

Editorials published in this journal have followed the rapid development and implementation of vaccines to prevent COVID-19, and initial vaccine uptake appeared to be high [6,7]. Although influenza vaccines are available and guided by disease surveillance, there was a reduction in cases of influenza during the COVID-19 pandemic [8]. Reduced reports of influenza

between 2020 and 2022 could explain why complacency developed regarding the need for influenza vaccination in advance of the influenza seasons in the Northern and Southern Hemispheres [9]. During the COVID-19 pandemic, children's respiratory infections were reduced, including respiratory syncytial virus (RSV) [9-11]. Since the 1990s, misinformation has existed regarding developmental complications, including autism, from the use of the measles, mumps, and rubella (MMR) vaccine, which may continue to reduce vaccine uptake [9,12,13].

As of 19 January 2024, the CDC reports that visits to hospital emergency departments and positive tests for COVID-19, influenza, and RSV are increasing at the same rates and with similar levels [14]. The WHO COVID-19 epidemiological update of 22 December 2023 identified that during the 28 days from 20 November to 17 December 2023, there were 105 countries with reported COVID-19 cases, and mortality due to COVID-19 was reported in 50 countries [15]. In the 28 days between 20 November and 17 December 2023, the number of reported cases of COVID-19 increased by 52% (>850,000 new cases), while mortality was reduced by 8% (>3,000 new reported deaths) when compared with the previous 28 days [15]. These recent trends should be cautiously reported due to reduced viral sequencing and case reporting delays.

Mutations in the SARS-CoV-2 spike protein have occurred rapidly, with the Omicron variant (B.1.1.529) and its subvariants, Kraken (XBB.1.5), Eris (EG.5), and Pirola (BA.2.86) being successively dominant in the past two years [16-18]. The predominant Omicron variant of SARS-CoV-2 is JN.1, a separate lineage of the Pirola (BA.2.86) subvariant [16]. Following a risk evaluation on 18 December 2023, the WHO designated JN.1 as a separate variant of interest (VOI) from the parent lineage BA.2.86, due to its rapidly increasing spread [16,19].

In the winter season of 2023/24, in the Northern Hemisphere, there has been an increase in the incidence of influenza, RSV, and SARS-CoV-2 (JN.1) infections [14,15,20,21]. There have been warning signs and predictions from the 2022/23 winter season in the Northern Hemisphere and the April to September season in the Southern Hemisphere [22]. In the winter of 2022/23 in the US, pediatric hospitals experienced what some have called the 'triple demic,' of respiratory syncytial virus (RSV), influenza, and SARS-CoV-2 infections in children [23]. Australia experienced its worst influenza season in five years during the 2022/23 season, with increases also seen in Honduras, Panama, Guatemala, Nicaragua, and El Salvador [22]. In the 2023 Southern Hemisphere influenza outbreaks, Central and South American countries have shown activity of influenza A (H1N1) or a mix of influenza A (H3N2) and influenza A (H1N1) [22]. This winter, the US and Northern Europe have experienced a similar increase in RSV, influenza, and SARS-CoV-2 infections in children and adults [24]. However, all these

infections are preventable, or currently available vaccines may reduce their severity.

The re-emergence of measles virus infections, previously considered to be controlled in Western countries by the measles, mumps, and rubella (MMR) vaccine, highlights the dangers of public health failures to reassure parents of the importance of vaccination compliance [9,25]. Measles is a serious and highly infectious viral disease that can result in debilitating symptoms, including encephalitis, with pneumonia up to 5% of cases [26]. In response to increasing outbreaks of measles infection, Novilla and colleagues conducted a systematic review of the literature and reported their findings in 2023 [25]. Novilla and colleagues identified geographic and social clustering of MMR vaccine hesitancy, which supports the view that social pressures may affect parental perceptions and decisions on immunization [25]. Lack of trust regarding vaccine information given to them, a lack of knowledge of the potential sequelae of measles infection, and continued fear of autism were the most common reasons given for MMR vaccine hesitancy [25]. Middle-income and high-income mothers with college-level higher education who preferred obtaining healthcare advice from the internet or social media were more commonly MMR vaccine adverse [25]. Therefore, drivers for improved vaccine uptake should include social and public health strategies [25].

In January 2024, Marks and Califf identified ongoing successes and challenges to current vaccination programs in an opinion article [9]. They have also highlighted the major public health concerns regarding the consequences of disillusionment with vaccination, which may result in increasingly frequent outbreaks and epidemics of preventable infections [9]. Controlled clinical trials support the safety and effectiveness of all authorized vaccines, and their use is evidence-based [9]. Vaccine safety is continually monitored by safety surveillance systems [9]. In the US, the Vaccine Adverse Event Reporting System (VAERS), the Vaccine Safety Datalink, and the Center for Biologics Evaluation and Research (CBER) Biologics Effectiveness and Safety (BEST) Sentinel Initiative have been developed and implemented by the Food and Drug Administration (FDA) [9]. The declining vaccination uptake in the US may have reached the stage where population immunity is now at a level that puts the population at increased risk of illness, hospitalization, and mortality from vaccine-preventable infectious diseases [9].

The medical history of infectious disease identification and prevention may provide public health lessons. For example, the successful implementation of smallpox and polio vaccines and their eradication was supported by public health initiatives that provided health information that was clear and accessible [9]. The MMR vaccine eliminated measles in the US and some European countries until relatively recently [25].

Clearly, from the increasing incidence of COVID-19, RSV, and influenza during the winter season in the Northern Hemisphere, there is an urgent need to improve vaccination rates and protect adults from these respiratory pathogens, particularly those who are elderly or immunocompromised [9]. Public awareness that vaccination for COVID-19 reduces mortality and protects from long COVID needs improvement [27,28]. Understanding the cause of vaccine hesitancy in different countries and societies has highlighted some major problems. For example, in the US, uptake of the updated COVID-19 vaccine (XBB.1.5 monovalent) is <35% in adults >65 years, which is about half the rate in this age group in the UK [9]. History has shown that the most effective source of information that leads to beneficial health behaviors comes from clinicians and healthcare professionals, including pharmacists, with evidence-based information regarding the importance of vaccination to counteract

the misinformation presented on the internet and social media [9]. The updated 2024 ACIP immunization schedule, now available online to patients and healthcare professionals, could be a major advance in understanding current vaccination requirements and preventing vaccine hesitancy and the escalating incidence of vaccine-preventable infectious disease [5].

Conclusions

The ongoing global health concerns for the consequences of increasing reports of vaccine-preventable infections, including SARS-CoV-2 (JN.1), influenza, RSV, and measles, have begun to drive public health measures that improve vaccine uptake, but these require urgent implementation.

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