Investigating Pandemic Immunity: Acquired, Therapeutic or Both
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Testimony
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Chairman Wenstrup, Ranking Member Ruiz and distinguished members of the Subcommittee, thank you for holding today's hearing to examine the role of COVID-19 vaccinations and immunity after infection (also called natural immunity) and inviting me to testify. As a pediatric infectious diseases (ID) physician, I have cared for many patients with serious illness due to COVID-19. I am committed to saving lives and providing my patients with the best possible care and medical advice, and it is for those reasons that I recommend that all eligible individuals stay up to date on their COVID-19 vaccination. COVID-19 boosters provide important protection against serious disease, hospitalization and death. I greatly appreciate your commitment to hearing from physicians like myself who have been on the front lines of this pandemic.

My testimony will cover:

- The benefits and risks associated with both immunity after infection (natural immunity) and COVID-19 vaccines, noting that while some studies indicate immunity after infection offers protection, it can be dangerous to rely solely on that to protect the population;
- The appropriate roles of physicians and the federal government in preventing COVID-19 infections, hospitalizations and deaths;
- Recommendations to improve public understanding of vaccines and boost vaccine confidence.

I must also underscore that when SARS-CoV-2 first emerged, it was a truly novel virus, so we knew very little about it during the early days of the pandemic. As our knowledge base has expanded, medical recommendations have changed accordingly. In addition, the emergence of new variants and subvariants of SARS-CoV-2 has continually changed the landscape, necessitating changes to medical guidance. Finally, as more people have developed immunity due to vaccination, prior infection or both, and as more tools have been made available to prevent and treat COVID-19, medical guidance has continued to evolve for these reasons. In short, science and medicine must keep pace with emerging knowledge and changes in disease patterns.

Immunity After Infection (Natural Immunity)

The term "natural immunity" to mean immunity after infection can be confusing. Immunity acquired from a COVID-19 infection and immunity after vaccination are both "natural immunity". While immunity after infection does provide protection against COVID-19 reinfection, hospitalization and death, it is also associated with the risks of getting infected in the first place. More recent data suggests that the best immunity comes from "hybrid immunity", the combination of vaccination and immunity after infection. So even when a person has been infected, receiving a single bivalent booster provides the individual the best possible protection.

Immunity after infection appears to provide protection against future severe disease from COVID-19 for a period of time. A January 2022 CDC report analyzed COVID-19 cases in California and New York from May 30 to November 20, 2021. This study compared the risk of new SARS-CoV-2 infection among four groups of people: those who were unvaccinated without a prior case of COVID-19; those vaccinated without prior COVID-19; those unvaccinated with prior COVID-19; and those vaccinated with prior COVID-19. This study found that prior to the emergence of the Delta variant of SARS-CoV-2, recent vaccination was more protective against new infection than immunity after infection. However, after Delta became prevalent, immunity after infection was more protective against infection than vaccination. Individuals with hybrid immunity (i.e., individuals with immunity from both vaccination and prior infection) had the most protection against infection and hospitalization.[1] The length of protection provided by immunity after infection may vary from person to person.

One study published in the *Lancet* in February 2023 found that immunity after infection cut the risk of hospitalization and death from a COVID-19 reinfection by 88% for at least 10 months.[2] This meta-analysis included 65 studies from 19 countries. People who had hybrid immunity, or immunity from both infection and vaccination, were excluded from this study. Omicron subvariants that emerged since late fall 2022 were not included in this study.

A study published in *Nature* in May 2022 found that Omicron infection enhances pre-existing immunity elicited by vaccines but, on its own, may not confer broad protection against non-Omicron variants in unvaccinated individuals.[3] A systematic review published in Nature in January 2023 found that hybrid immunity was more protective than immunity after infection alone against the Omicron variant. The effectiveness of previous infection against hospital admission or severe disease was 74% and against reinfection was 24% at 12 months. The effectiveness of hybrid immunity against hospital admission or severe disease was 97% and against reinfection was 41% at 12 months.[4] Several additional studies have shown that vaccinating previously infected individuals significantly enhances their immune response and effectively reduces the risk of subsequent infections, hospitalizations and death.[5,6]

These data are compelling and should be considered to inform federal policies, along with the substantial body of data supporting COVID-19 vaccination. However, we must also keep in mind that the body of evidence for immunity after infection is more limited than that for vaccine-induced immunity in terms of the quality of evidence and types of studies (e.g., observational cohort studies, mostly retrospective studies on immunity after infection versus a mix of randomized controlled trials, case-control studies, and cohort studies for vaccine-induced immunity). In addition, the emergence of new variants and subvariants may impact the level and durability of immunity after infection and vaccine induced immunity, as we saw in the shifts from Alpha to Delta to Omicron variants.

Relying on immunity after infection alone to prevent COVID-19 can be very risky. Unvaccinated individuals without prior COVID-19 infection have an increased risk of severe disease, hospitalization and even death. This is particularly true for older individuals and individuals with underlying health

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[1] https://www.cdc.gov/mmwr/volumes/71/wr/mm7104e1.htm
[2] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)02465-5/fulltext
[3] https://www.nature.com/articles/s41586-022-04865-0
[4] https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(22)00801-5/fulltext
[5] https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/vaccine-induced-immunity.html
[6] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9027152/

conditions. Prior to the availability of vaccines, patients with COVID-19 overwhelmed hospitals, which compromised our ability to provide high-quality care both for patients with COVID-19 and for patients with other health care needs. Widespread vaccination was critical to reducing the burden of COVID-19 on our population and on our health care system.

COVID-19 Vaccine Efficacy

COVID-19 vaccines provide substantial protection against severe disease, hospitalization and death. An April 28, 2023, *Morbidity and Mortality Weekly Report (MMWR)* found that monovalent mRNA vaccination was 76% effective in preventing COVID-19–associated mechanical ventilation and death up to 6 months after the last dose and remained 56% effective at 1–2 years.[7] The bivalent booster increases protection. According to a December 2022 *MMWR*, when compared with unvaccinated persons, vaccine effectiveness of a bivalent booster dose against COVID-19–associated hospitalization was 84%. Compared with persons who received monovalent mRNA vaccine, vaccine effectiveness of a bivalent booster dose against COVID hospitalization was 73%.[8] An April 2022 study published in the Lancet confirms the value of bivalent boosters. This study found the vaccine effectiveness of the bivalent mRNA vaccine booster dose was 72% for COVID-19-related hospitalization and 68% for COVID-19-related death.[9]

Several studies have also indicated that COVID-19 vaccination appears to reduce the risk of developing long COVID or persistent COVID-19 symptoms. A study published in March 2023 in *JAMA Internal Medicine* analyzed data from 41 studies, including more 860,000 people around the world. Of the four studies with vaccination information of nearly 250,000 people, those who had been vaccinated had less than half the risk of developing long COVID than people who weren't vaccinated.[10] This is likely in part due to vaccines preventing severe illness, though vaccination also appears to lower the risk of long COVID even in those with more severe COVID-19 disease.[11] In addition, some studies indicate that individuals with long COVID who receive a vaccine may experience symptom improvement, though more research is needed on this topic.[12]

The COVID-19 vaccines are also safe. Side effects after a COVID-19 vaccination tend to be mild and temporary, similar to those experienced after routine vaccinations. These may include pain where the shot was given, fever, headache, tiredness, muscle pain and chills. Adverse events following vaccination are rare but can occur. Individuals may report any adverse event following vaccination to the Vaccine Adverse Event Reporting System (VAERS). CDC has conducted extensive monitoring of adverse events and continues to find that the risks associated with COVID-19 infection are far greater than the risks associated with COVID-19 vaccination.

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[7] https://www.cdc.gov/mmwr/volumes/72/wr/mm7217a3.htm?s_cid=mm7217a3_x
[8] https://www.cdc.gov/mmwr/volumes/71/wr/mm715152e2.htm
[9] https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(23)00122-6/fulltext#:~:text=The%20relative%20vaccine%20effectiveness%20of,%25%20CI%2052%E2%80%9385).
[10] https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2802877
[11] https://www.nature.com/articles/s41598-023-28839-y
[12] https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(22)00354-6/fulltext

Societal Benefits of Vaccination

It is important to note that COVID-19 vaccination has had enormous societal benefits. Widespread availability of vaccines has been a key factor in allowing many individuals to resume normal daily activities that support our economy, including going to work, attending events, eating in restaurants and patronizing other local businesses.[13,14] By limiting severity of illness, vaccines also limit the number of days individuals miss work or school, helping our children regain ground academically, socially and developmentally.[15,16,17] When we consider that long COVID can keep individuals from work, school and other activities for a long period of time, the power of vaccines to decrease the risk of long COVID can also have significant economic impacts. COVID-19 vaccines decreased Americans' depression and anxiety, both by decreasing fear of COVID-19 hospitalization and death and by allowing us to safely interact with relatives and friends, decreasing feelings of loneliness and isolation.[18,19]

Role of Physicians in Vaccination

The American Medical Association (AMA) released a survey among practicing physicians in June 2021 that showed more than 96% of surveyed U.S. physicians had been fully vaccinated for COVID-19, with no significant difference in vaccination rates across regions. Of the physicians who were not yet vaccinated, an additional 45% planned to get vaccinated.[20] By getting vaccinated ourselves, physicians are leading by example, showing our patients and our communities that we have confidence in vaccines. We are also reducing the risk that we will spread COVID-19 to our patients, which is particularly important for physicians like me who routinely care for immunocompromised or other vulnerable patients.

Physicians are widely considered one of the most trusted messengers with information on vaccines. My colleagues and I have spent countless hours speaking with our patients, our colleagues and other members of our communities about COVID-19 vaccines, answering their questions and providing factual information, without judgment. As an ID specialist, I was often relied upon to educate other physicians and healthcare personnel about COVID-19 vaccines.

We must better leverage the role of physicians to increase vaccine uptake for COVID-19 and other vaccine-preventable diseases. To do this, we must provide clear information for physicians to use when communicating with their patients and their communities.

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[13] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9946727/#b1
[14] https://sjes.springeropen.com/articles/10.1186/s41937-021-00082-0
[15] https://www.gov.uk/government/publications/impact-on-school-absence-from-covid-19-vaccination-of-healthy-12-to-15-year-old-children/impact-on-school-absence-from-covid-19-vaccination-of-healthy-12-to-15-year-old-children
[16] https://www.commonwealthfund.org/blog/2022/how-covid-booster-campaign-could-keep-kids-out-of-hospital-in-school
[17] https://www.healthychildren.org/English/ages-stages/gradeschool/school/Pages/School-Attendance-Truancy-Chronic-Absenteeism.aspx
[18] https://www.economist.com/graphic-detail/2022/01/20/covid-19-vaccines-have-made-americans-less-anxious-and-depressed
[19] https://www.nber.org/papers/w29593
[20] https://www.ama-assn.org/press-center/press-releases/ama-survey-shows-over-96-doctors-fully-vaccinated-against-covid-19

In addition, we must expand our physician workforce so that there are enough physicians to reach individuals and families in every community. As I noted, adult and pediatric ID physicians often play a unique role in educating other physicians about vaccines, given our specific training and expertise. Unfortunately, we are facing severe workforce shortages and we are struggling to recruit physicians to the ID specialty. Nearly 80% of counties in the U.S. do not have a single ID physician.[21] In the graduate medical education match at the end of 2022, in which medical residents are matched with specialty fellowship training programs, only 56% of adult ID training programs and only 46% percent of pediatric ID training programs filled, compared to most other specialties, which saw all or nearly all of their programs fill. Many medical students and residents consistently report interest in ID, but high medical student debt draws many physicians to more lucrative specialties. ID physicians are among the lowest compensated medical specialists, earning less than general internal medicine physicians despite the additional 2-3 years of training. Accordingly, Congress should take steps to improve ID physician reimbursement and fully fund the Bio-Preparedness Workforce Pilot Program in the FY24 Appropriations process, which will reduce the financial barriers to ID recruitment and retention to help ensure we have the workforce necessary to help educate the public about vaccination and, more broadly, to address the diverse array of ID needs.

Role of Federal Government in Vaccination

The federal government has important roles to play in COVID-19 vaccination, and those roles have evolved over time as the pandemic itself has changed (due to the emergence of variants, expansion of immunity, etc.) and as more has become known about COVID-19, vaccination and immunity after infection.

As vaccines became available, the federal government provided critical resources to support rapid, equitable vaccine administration. Importantly, CDC published information about the safety and efficacy of the vaccines. Transparent communication about the data underlying the vaccines' authorization is critical to build confidence in the vaccines among health care personnel — many of whom were among the first to be vaccinated — and among the general public. The federal government also supported partnerships with trusted community-based organizations, churches and other religious entities, and other local institutions to boost vaccine access and uptake.

The federal government also instituted requirements for certain populations to be vaccinated, including health care personnel and federal workers. The concept of vaccine requirements is not new and has been effective at increasing vaccine uptake. For example, prior to the pandemic, seasonal influenza requirements for health care personnel had already been in place for several years. Influenza vaccines help ensure health care personnel remain healthy and able to perform our essential jobs, and they help prevent us from transmitting influenza to our patients. From 2013-2017, the percentage of hospitals requiring influenza vaccination for health care personnel rose from 37% to 61%. In hospitals with a requirement, vaccination coverage rates of health care personnel have consistently been greater than 95%.[22]

Prior to the Delta variant, COVID-19 vaccination offered incredibly powerful protection against infection, which meant that the vaccine could be a strong tool in preventing COVID-19 transmission. Reducing

[21] https://www.acpjournals.org/doi/10.7326/m20-2684
[22] https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2682876

transmission could limit the development of more dangerous variants, ease pressure on extremely overwhelmed health care facilities and save lives. Because most of the population did not yet have any immunity to COVID-19 at that time, we remained very vulnerable to infection, severe disease and surges in cases. These were powerful motivations to boost vaccination rates quickly, which caused many health care professional societies to support policies requiring vaccination. In fact, many health care professional societies began by first calling for required vaccination of health care personnel — we wanted to lead by example, protect ourselves and protect our patients and loved ones.

As we know, the trajectory of the pandemic has changed. While our vaccines thankfully remain highly effective at preventing severe disease, hospitalization and death, they are no longer as effective in preventing infection and transmission due to the emergence of new variants. In addition, most people in the U.S. now have some level of immunity thanks to a combination of vaccination and prior infection. Policies should evolve based upon the latest data, and the data do not support mandatory COVID-19 vaccination requirements at this time.

Boosting Vaccine Confidence, Access and Uptake

I am deeply concerned that most eligible individuals have not yet received a bivalent COVID-19 booster. In addition, routine childhood vaccination rates significantly dropped during the pandemic and still remain below pre-pandemic levels. We experienced very worrisome declines in routine childhood vaccinations early in the pandemic when many children were staying home, but these rates have not rebounded, despite widespread return to in-person learning. Among kindergarten students in the 2021-2022 school year, national vaccination coverage rates for the DTaP, MMR, polio and varicella vaccines were 93.1%, 93.5%, 93.5% and 92.8%, respectively — all decreases from the previous school year.[23]

Declining vaccination rates are driving outbreaks of infectious diseases like measles, pertussis (whooping cough) and polio. In a November 2022 measles outbreak in Columbus, Ohio, 85 children contracted measles, and 35 of those were hospitalized.[24] In 2022, a case of polio was identified in New York as local immunity dropped enough to allow the virus to circulate.[25]

In addition to health consequences, outbreaks of vaccine-preventable diseases also have economic costs. A 2018-2019 measles outbreak in Washington state involving 72 confirmed cases was estimated to cost nearly half a million dollars including public health response costs, direct medical costs and productivity losses of affected individuals.[26]

Increasing vaccine confidence and uptake will improve our nation's health. Before the next outbreak or pandemic, we must restore trust in vaccines to strengthen our preparedness and ensure that our population is able to leverage the life-saving power of vaccines. There are several steps the federal government can take to help boost vaccine confidence, access and uptake for routine vaccines, COVID-19 vaccines, and future vaccines to combat new threats:

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[23] https://www.cdc.gov/mmwr/volumes/72/wr/mm7202a2.htm

[24] https://www.dispatch.com/story/news/healthcare/2023/03/01/columbus-measles-outbreak-was-largest-in-us-in-2022-what-about-now/69943824007/

[25] https://www.cdc.gov/media/releases/2022/s0913-polio.html

[26] https://publications.aap.org/pediatrics/article/147/4/e2020027037/180774/Societal-Costs-of-a-Measles-Outbreak?autologincheck=redirected

- Increase funding for U.S. vaccine infrastructure, led by CDC, to increase vaccine rates among uninsured and underinsured adults and children, respond to outbreaks, educate the public and target hard-to-reach populations, improve vaccine communications, establish partnerships and improve vaccine information systems that help track vaccination.
- Strengthen recruitment of physicians in all communities — particularly ID physicians with expertise on vaccines and vaccine-preventable diseases — and provide transparent data on vaccines and communications tools to further empower physicians to talk with their patients and communities about vaccination.
- Fund research on vaccine hesitancy and vaccine communications strategies. Invest in evidence-based vaccine communications to increase public awareness about vaccination and combat misinformation and disinformation.
- Ensure first-dollar coverage of all medically recommended vaccines under Medicaid, Medicare, and commercial insurance to minimize financial barriers to vaccination.

Once again, I greatly appreciate the Subcommittee's attention to the important issue of vaccination, and I thank you for the opportunity to testify. IDSA welcomes the opportunity to work with you to help prevent serious disease, hospitalization and death due to COVID-19 and other infectious diseases.