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Introduction

One year into the pandemic, we must recognize both how far we have come, and how far we have yet to go. There are better days ahead, but also good reason for continued caution now. The emergence of new variants of this virus demands that we continue to do what we know works to stop the spread, especially wearing masks, socially distancing, and ensuring rapid and equitable vaccine distribution. The actions we take now -- particularly to accelerate vaccinations here and around the globe -- are essential to saving lives and getting our global economy back on track.

For all this pandemic has revealed, among the most important is that we live in a deeply interconnected, interdependent world. No virus respects political boundaries, and the more people and goods move across borders, the farther and more quickly these viruses travel. As we work to understand and address the impact of this pandemic within our borders -- and to protect the health of the American people -- we must also understand the global impact and what that means for our country and the world. And, we must redouble our commitment to rebuilding American public health capacity and global health leadership.

I. COVID-19 Epidemiological Updates

While we target a return to relative normalcy in the fall, we will need effective and deliberate policies to bring the pandemic to an end around the world. In developing these policies, we need to consider our current position in this pandemic and address both domestic and global challenges. Three key trends will guide our response: 1) the emergence and spread of new variants of concern; 2) changing rates of transmission, deaths, and vaccinations; and 3) our ability to support and lead multilateral interventions to end this pandemic.

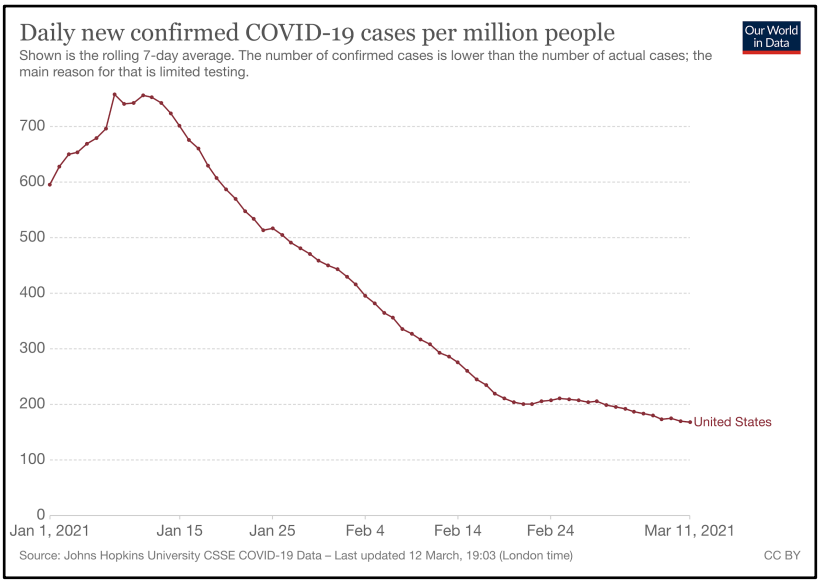
The emergence of new variants is generating widespread concern about the potential for accelerated disease transmission, increased severity of illness, and diminished vaccine efficacy. These are legitimate concerns. Scientists are working tirelessly to gather data on how these mutations differ from the original strain, how widely they have spread, whether these variants present higher risks of infection or death, and how effective vaccines remain against the new variants.

Within a year or so of this disease outbreak, we have seen the emergence of several variants -- potential strains of this virus -- that are at times more contagious, possibly more deadly, and possibly more difficult to counter with our vaccines. Although a number of homegrown variants have emerged across the United States, public health experts are primarily concerned with three variants of concern: B.1.1.7 from the U.K., B.1.351 from South Africa, and P1 from Brazil. Here in the United States, the B.1.1.7 variant is to date the most prevalent, with forecasts suggesting that it will become dominant by as early as the end of this month.

The relatively strong evidence on B.1.1.7 suggests that we should expect much higher rates of transmission, leading to more infections, hospitalizations, and deaths. Whether the variant is inherently more lethal remains unclear, but there is certainly some evidence to suggest that it is. We have less clarity on the B.1.351 and P1 variants, though they both appear to be more contagious than the wild-type virus that has largely circulated in the U.S. over the past year. Thankfully, existing vaccines remain effective at protecting against and reducing the transmission of these variants, especially in the case of B.1.1.7. And while the potential consequences of these variants are troubling, there is good news. The best way to combat variants like B.1.1.7 is through the same

public health measures that have shaped our response so far: promoting mask wearing and social distancing, ensuring rapid and equitable vaccine distribution, investing in advanced therapeutics and clinical trials, developing robust and representative data reporting, and prioritizing genomic sequencing and testing infrastructure. In the last few months, our willingness to invest in these pillars has paid off. Cases and deaths are down from the Winter (Figures I and II below), while vaccination rates have rapidly accelerated (Figure III on the following page).

Figure I[1]



[1] Our World in Data & Johns Hopkins University CSSE (Domestic Cases)

Figure II[2]

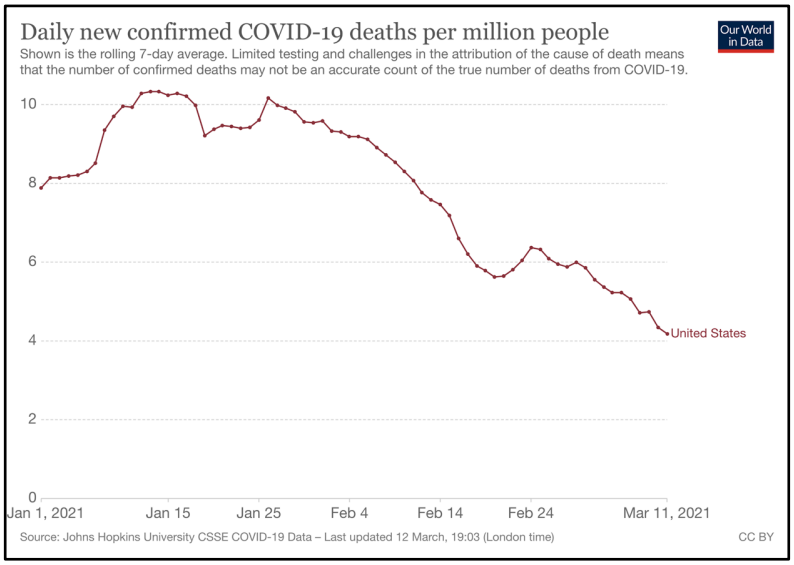
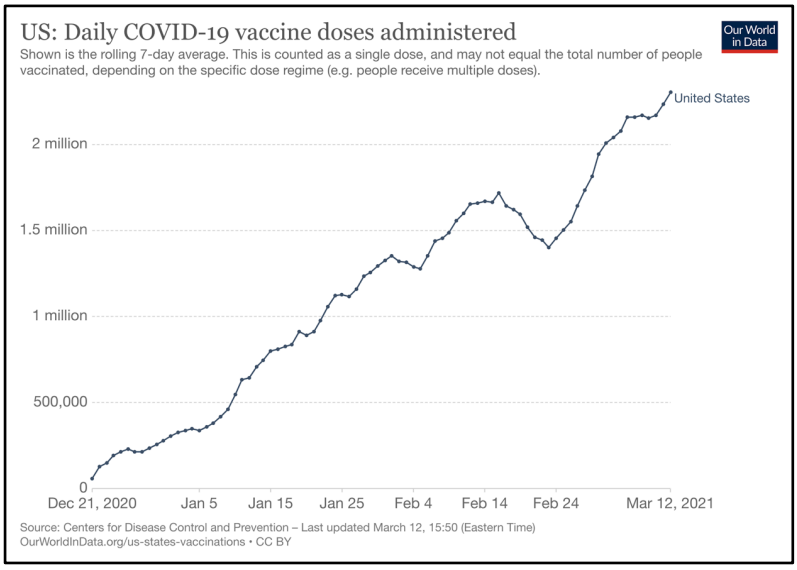


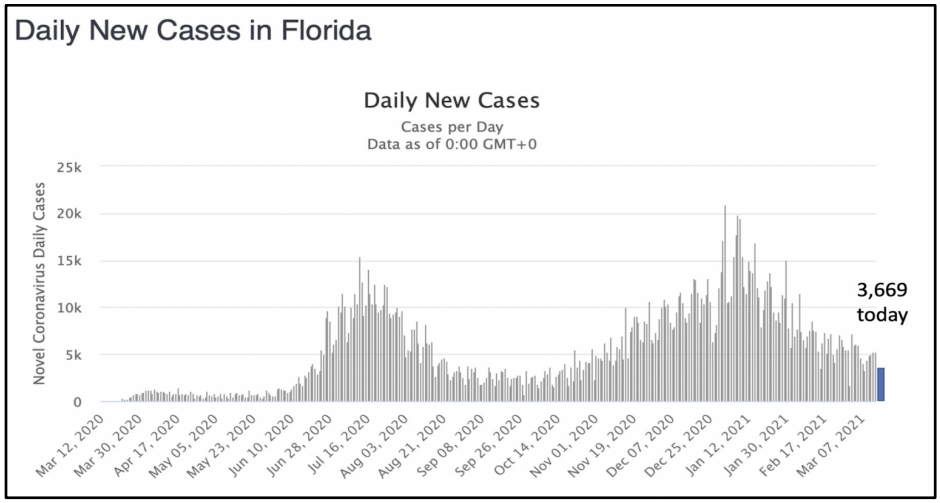
Figure III[3]



[2] Our World in Data & Johns Hopkins University CSSE (Domestic Deaths)
[3] Our World in Data & Johns Hopkins University CSSE (Domestic Vaccinations)

We are at an inflection point in this pandemic. COVID-19 variants threaten the crucial progress we have made to control the virus within our borders and jeopardize our ability to end the global pandemic. To track variants of concern, we can examine states where we believe that they are most widespread. Currently, we think that more than 50% of all new infections in Florida are from the B.1.1.7 variant. So far, the state has not seen a spike in cases. In fact, Florida's declining case numbers reflect steady decreases in infections around the country. A number of factors likely contribute to this decline. We know that increasing adoption of public health measures like masking slows transmission. In some communities, high levels of acquired immunity may be slowing infection rates. The seasonal nature of the virus likely plays a role, as well. And our rapid vaccination strategy is helping. But the high prevalence of B.1.1.7 in Florida is what makes the next month so risky -- large numbers of young people are visiting for spring break, which has the potential to spread B.1.1.7 more widely across the United States.

Figure IV[4]

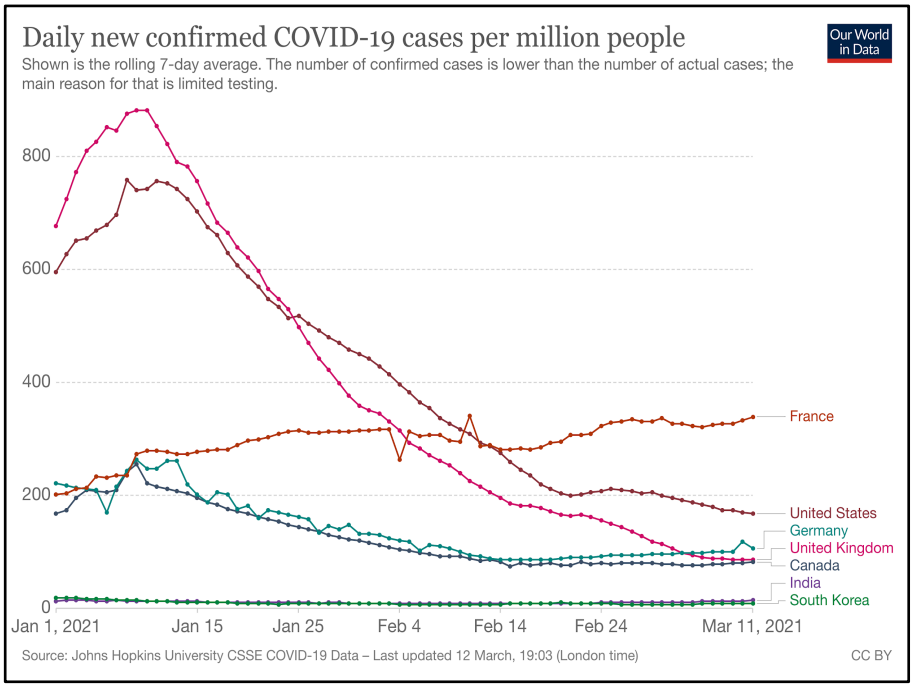


[4] From Dr. Eric Topol

Nationally, cases have plateaued, but we must remain vigilant for a very simple reason: a majority of high-risk individuals in the U.S. have yet to be vaccinated. Prematurely lifting key public health measures, like mask mandates, could allow spikes in infection, leading to unnecessary infections, hospitalizations, and deaths. And the longer the SARS-CoV-2 virus circulates in our nation and around the world, the more it will mutate. As more mutations are generated, new strains of the virus could pose a serious threat to our recovery. It is imperative that our domestic efforts be focused on vaccinating as many Americans as we can, as quickly and equitably as possible. But we also need a deeply global response if the goal is to safeguard the health and safety of the American people.

Figure V (on the following page) traces U.S. infections relative to a few of our key global allies. Despite a steep decline in cases, our case rate remains significantly higher than that of some of our peers. Throughout the pandemic, politicization, misinformation, and miscommunication in the U.S. hampered our efforts to contain the virus. Too often, the federal government, under the prior Administration, failed to treat this as the national, global emergency that it was, leaving states to make decisions without adequate resources or information. In contrast, many other countries quickly embraced evidence-based public health measures, with policies reflecting the pandemic's urgency and severity. Countries like Germany and South Korea were able to avoid sharp spikes in case rates more successfully than the U.S. through clear, consistent messaging on the risks of COVID-19, mandated and enforced standard public health measures, investment in testing and vaccination infrastructure, and prioritizing vulnerable subgroups in relief efforts. These life-saving efforts should inform U.S. current policy and future pandemic preparedness.

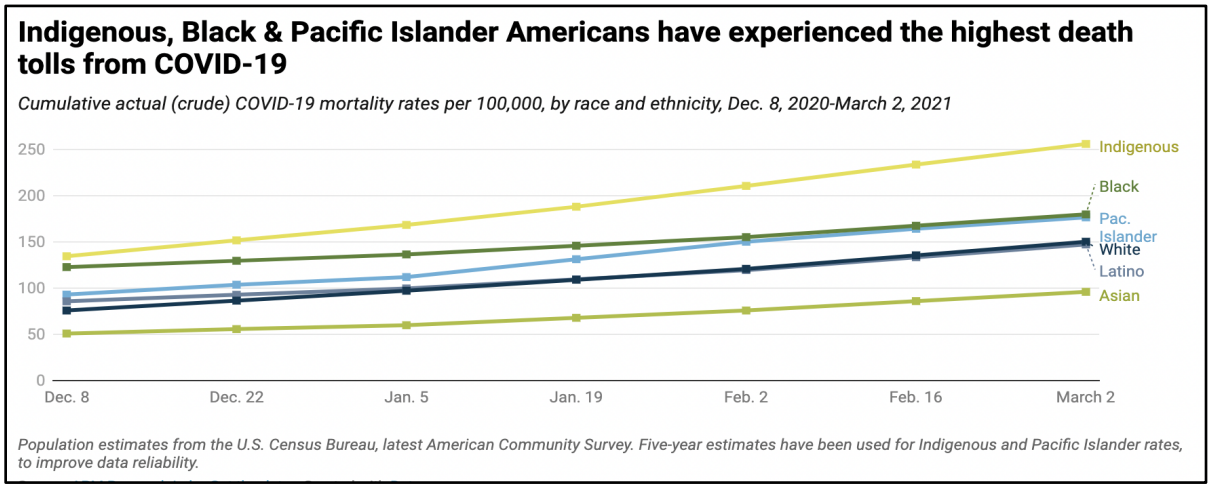
Figure V[5]



The costs of these policy shortcomings have not been borne equally. Figure VI (following page) illustrates the disproportionate impact of COVID-19 on ethnic minorities. Indigenous, Black, and Latino Americans continue to have higher rates of illness, hospitalization, and death compared to White and Asian Americans.

[5] Our World in Data & Johns Hopkins University CSSE (Global Cases)

Figure VI[6]



Our failure to protect these communities stems both from our inaction in the earliest phases of this pandemic, as well as structural determinants of health that predate the pandemic. To make matters worse, many in these communities have now lost their employment, often as essential workers. As Figure VII (following page) illustrates, these losses will extend beyond this generation. While all children have suffered from this pandemic, students of color have fallen the furthest behind, lacking the support and resources they need to successfully navigate their new digital ecosystems. This will have powerful detrimental effects on intergenerational socioeconomic mobility, unless we take urgent steps to address these inequities.

[6] APM Research Lab - The Color of Coronavirus (Deaths by Race)

Figure VII[7]

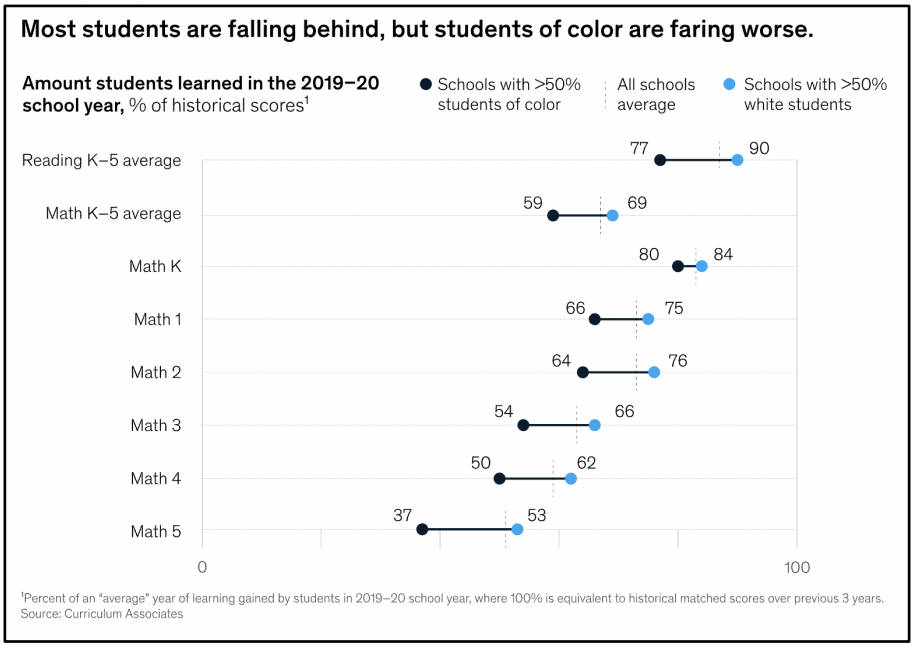
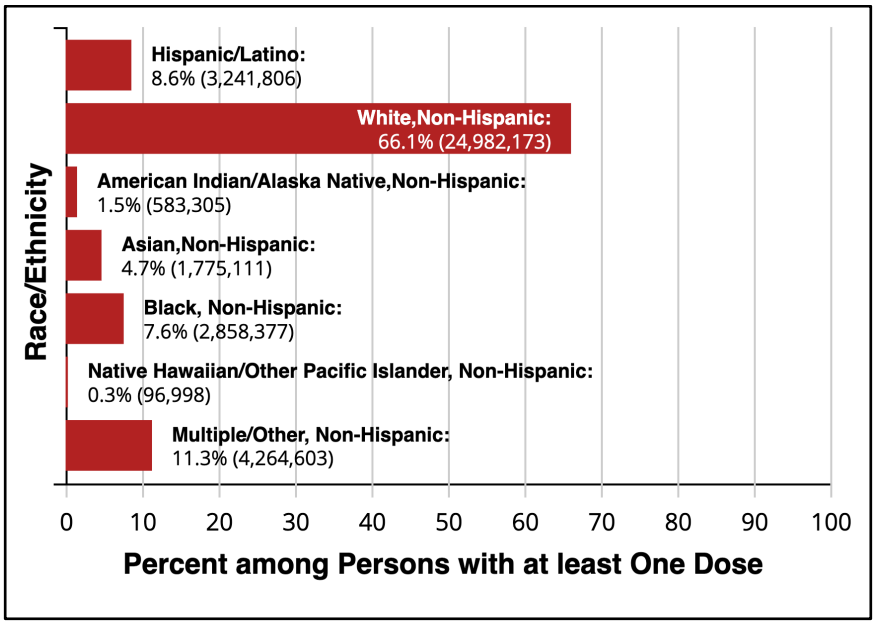


Figure VIII[8]



[7] McKinsey - COVID-19 and Learning Loss: Disparities Grow and Students Need Help
[8] CDC - Vaccination Demographics (3/15/2021)

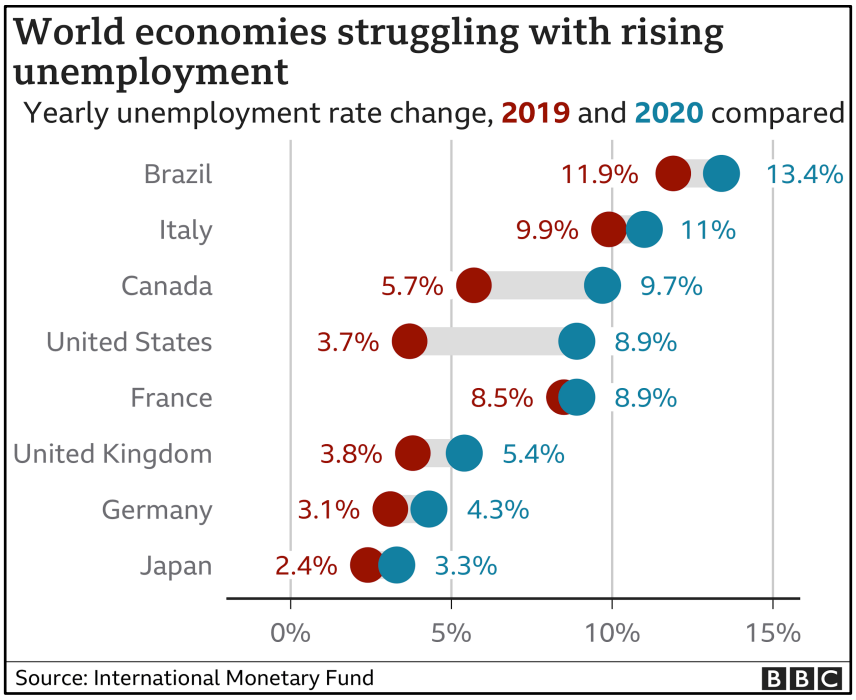
Unfortunately, even as we begin to recover from this virus, we are still not adequately serving communities of color. Figure VIII (previous page) illustrates that out of all U.S. residents who have received a COVID-19 vaccination (as of 3/15/2021), only 7.6% have been Black, and 8.6% have been Latino, numbers that are far below their representation in the population, especially given the disproportionate burden of disease that these communities have suffered. This is clearly unacceptable. Vaccine equity must be a critical priority going forward. But we need not sacrifice speed for equity -- we can do both.

To enable this dual-pronged approach, local and federal leaders must continue to establish high-volume mass vaccination sites across the country, specifically in communities of color that have been hit hardest by the pandemic. But beyond these sites, there is now ample evidence that key providers, such as community health centers, that have a deep relationship with communities of color must be prioritized for vaccine distribution. And where people cannot get to a vaccination site, we must bring the vaccine to them, with credible community voices addressing concerns. Currently, a lack of standardized reporting undermines our data on vaccine equity. States report vaccination data by race/ethnicity in different ways -- and many fail to report that data at all. We must develop and implement standardized protocols to systematically collect and publicly report data on vaccinations by race, ethnicity, age, and income to ensure Americans who most need vaccines are getting them and to know where and when interventions are needed to make sure that happens.

II. The Global Impact of COVID-19

Globally, the pandemic has severely impacted not just health, but also economic and social well-being. The World Bank has estimated that the COVID-19 pandemic pushed between 119-124 million more people into poverty, partially due to increased rates in unemployment (Figure IX). The International Monetary Fund has estimated that the global economy shrunk by 4.4% in 2020, the worst decline since the Great Depression. Remittance flows are estimated to have shrunk by 14% compared to levels in 2019. In short, the pandemic has drastically increased the gap between wealthy economies and the developing world across education, gender, health, and democracy.

Figure IX[9]



[9] World Economies Struggling with Unemployment (IMF through BBC)

The COVID-19 pandemic has undermined education around the world, particularly for girls and vulnerable children. Lack of access to the internet and electricity has exacerbated difficulties in continuing education for millions of children. At the peak of school closures in April 2020, 94% of students out of 1.6 billion children worldwide were out of school. Groups that were most impacted were children living in poor and rural areas, those displaced and living in refugee camps, girls, and children with disabilities. COVID-19 has highlighted the need for investments to close the digital divide and increase resilience in the education system here and around the world. The World Bank has worked across 62 countries to help finance and assist schools in re-opening, but much remains to be done, particularly for girls and young women.

Globally, as in the U.S., women and young girls have been particularly impacted by the economic and social burdens of the pandemic. Women have been harder hit by unemployment, but also have had to take on the increased burden of unpaid household care, childcare, and other care work. New UNFPA estimates indicate that a loss of access to contraceptives due to travel restrictions and clinic closures has led to 1.4 million unplanned pregnancies. Younger girls are more likely to be affected by school closures compared to their male counterparts, and have often been forced into child marriages. The pandemic is set to erase decades of progress in support of girls' educational retention. School closures, increased social stress, and lockdowns have also increased gender-based violence. At the end of June 2020, COVID-19 was linked to an increase in gender-based violence rates in 90% of humanitarian field sites across the world.

In addition to women, refugees and Internally Displaced People (IDPs) have been particularly harmed by COVID-19 due to vulnerabilities including living in crowded settings, loss of

employment, and a lack of access to healthcare. COVID-19 infections have likely been underreported in displaced populations. Additionally, lockdown restrictions have impeded international aid responses to displacement crises, closing relief centers and reducing support for those who are living in informal settlements and refugee camps.

The COVID-19 pandemic has also challenged health workers around the world (especially in low- and middle-income nations) tasked with responding to these inequities. Healthcare workers are at higher risks of infection -- as of October 2020, one in every seven COVID cases reported to the WHO linked to a healthcare worker. Cumulatively, over 300,000 healthcare workers have been infected with the virus, and as of this month, at least 17,000 have died. Beyond caring for their own health, healthcare workers must also hold the lives of others in their hands. Shortages in standard medical equipment have forced these workers to make difficult decisions. Now, some healthcare workers are being blamed and assaulted for the deaths of their patients. The UC Berkeley Human Rights Center has identified over a thousand such attacks in the past year. Under usual conditions, some studies have reported physician burnout affects up to 33% of critical care nurses, and 45% of physicians. COVID-induced burnout rates and mental health degradation are much higher, and likely contribute to even worse clinical outcomes. These impacts extend to other illnesses, beyond COVID-19. Even here in the United States, as healthcare capacity was stretched, ICU admissions for non-COVID diseases declined. Furthermore, hospitals with unfavorable demographics (those in rural areas, or counties with high uninsurance rates) reached their clinical capacities much faster.

Lastly, COVID-19 has undermined democratic institutions around the world. Freedom House has reported that since the COVID-19 outbreak began, democracy and human rights have worsened in 80 countries, with the four most impacted issues being in the transparency of information, corruption, protection for vulnerable populations, and governmental abuses of power. In Ethiopia, national elections scheduled for August were postponed by the Election Board until international health institutions deemed the threat to be over. In Uganda, the opposition candidate for president was arrested for allegedly breaching lockdown restrictions.

The COVID-19 pandemic has harmed health, education, and democracy, both in the United States and around the world. The cost to human lives has been immense. As of March 16th, we have surpassed 120 million global cases, and over 2.6 million deaths. The economic costs, too, will extend far into the future. The World Bank estimates that the number of people per million in extreme poverty could increase from pre-pandemic baselines of around 600 per million, up to 700 or 750 per million. Much of this loss in wages will come from increased health spending, even in countries with weak health infrastructure and poor clinical outcomes. COVID-associated debts could impose heavy burdens on LMICs' social policies and development efforts well into the future. The immense losses in global education also won't be apparent until a generation from now. Many governments still have no plans of returning to in-person learning. Restoring our global livelihoods in the wake of COVID-19 will require coordinated, multilateral action. The United States must take the lead.

We have now begun to bring our national pandemic under control through vaccination and public health and must help end the pandemic and support broad and equitable recovery around the world, through supporting and leading multilateral efforts in development and global health.

III. Global Efforts to Combat COVID-19

The impact of this pandemic and its consequences for key global health goals demand a vigorous, multi-pronged approach to bring this pandemic to a close and protect global and domestic public health. The Biden Administration has reestablished relations with the World Health Organization -- a critical first step in supporting effective multilateral health interventions to end this pandemic and prevent and contain those to come. But the coronavirus pandemic has also underscored the need to reform the WHO, which I and other observers have advocated for years.

The United States must help to lead the effort to redesign the WHO to be fit for purpose in the pandemic world. A clearer, more streamlined set of responsibilities will allow the WHO to build stronger capacities to monitor infectious disease outbreaks and share critical health data among countries. Having a more focused and coherent agenda would help the organization secure more stable funding. The WHO must be better at doing the things that only it can do, including setting shared global health norms and coordinating responses to transnational health threats. Its leadership, with full input from its member states, must ensure that such reforms aren't merely cosmetic; but rather recast the WHO to meet modern challenges.

The United States must likewise play a leadership role in the COVAX facility -- established by the WHO and its partners to supply coronavirus vaccines to vulnerable low- and middle-income

countries. President Biden's $4 billion commitment to COVAX is a significant first step, but money alone will not get the job done. America will never be truly free of the virus until it is successfully contained around the world. This will require vaccinating billions of people, in a very short timeframe.

The United States' interest in accelerating global vaccination against the coronavirus is driven by self-interest in ending this global pandemic, by the ethical and humanitarian commitments that have motivated past major global health investments (such as the President's Emergency Plan for AIDS Relief -- PEPFAR), and by the need to restore our country's leadership and standing after four years of corrosive "America First" nationalism. Already, China and Russia have pledged vaccine doses to low- and middle-income countries, because they understand that taking a leadership role in ending the pandemic will pay long-term political and social dividends.

The United States can offset this "vaccine diplomacy" through a leading role in COVAX. COVAX has shipped more than 12 million doses of vaccines to 29 countries, with plans to deliver two billion doses by the end of 2021. But ending the pandemic will require billions more vaccinations. Vigorous and effective American leadership must be used to accelerate vaccine delivery worldwide.

In light of the Biden Administration's commitment, the challenge facing COVAX and the world has less to do with money, and more to do with limited supply of the vaccines themselves. So how can we accelerate the production of vaccines? It won't be easy, but we must make an aggressive effort to do so. To meet the global need for vaccines, we need to continue to accelerate production

by establishing new manufacturing capacity wherever possible. Some have proposed altering licensing or other intellectual property rules through the World Trade Organization. But such an approach will not by itself sufficiently increase vaccine supply.

Resolving intellectual property constraints to scale up global vaccine production will not be nearly as helpful as many believe. Vaccine manufacturing and production is a complex, exacting process; producing biologic agents for administration to healthy people requires the utmost rigor and quality assurance. Few companies will be able to pivot to manufacture vaccines both rapidly and responsibly, particularly mRNA vaccines. The United States government has already played a critical role in upscaling vaccine production by helping to broker a deal for Merck to use its facilities to accelerate "fill and finish" of Janssen vaccines. The United States must play a similar role in helping to explore and broker partnerships to expand production elsewhere in the world as opportunities present themselves. The recent Quad summit of leaders from India, Japan, Australia, and the United States was a good step towards this goal.

So, what can the U.S. do? Companies that can potentially make more of these vaccines need not just access to the intellectual property, but a much broader technology transfer -- deep know-how of how to make these vaccines. Here, partnerships with existing manufacturers are far more likely to be effective than coercive efforts that could lead to release of intellectual property but none of the expertise needed to actually make the vaccine. Beyond these partnerships, there has to be a concerted effort to source raw materials and ensure that we have the global supply chains needed to make these vaccines. Obviously, this will need to include further ramping up of production of key materials such as medical glassware, syringes, needles, and so forth; boosting cold chain

capacity through manufacture and distribution of refrigerators and freezers; and revising export controls and global supply chain blockages. In particular, the U.S. could fund sourcing of lipid envelopes used to wrap Pfizer and Moderna vaccines' RNA, as these materials are currently amongst the scarcest, or promote more "fill and finish" efforts by competitors -- as these operations often fall within the production capabilities of existing facilities.

The United States also must pursue every option to produce more vaccines that we are already using here, including the mRNA vaccines, the J&J vaccine, and the likely soon to be authorized Novavax vaccine. The J&J and Novavax vaccines use longstanding vaccine technology, and are therefore more likely options to scale up vaccine production through licensure and technology transfer in the short to medium term.

To do so, we must incentivize these firms to invest both in additional production capabilities, and in new partnerships. India, Brazil, and Israel all have major manufacturers who might be able to ramp up further production. Sanofi, Novartis, and other major pharmaceutical companies have multiple facilities in South Africa and elsewhere. And while the U.S. has lagged, other nations have taken advantage of these idle resources. China has already developed production hubs in the Middle East, in Southeast Asia, and throughout Africa. Russia has formed global partnerships for the production of their Sputnik-V vaccine. The U.S. must follow suit, repurposing global facilities to maximize vaccine production to meet the pressing need for vaccines in Latin America, Africa, and the Indian subcontinent.

Pfizer and BioNTech have already taken an important first step, partnering with 13 global competitors to outsource their production efforts. Each firm will play a key role in specific phases

of the production process. The German company Rentschler Biopharma will purify and filter the mRNA, while the Swiss company Novartis develops the DNA molecules. German companies Merck and Evonik will then supply lipids to wrap the mRNA, supported by Acuitas Therapeutics in Canada and Forschung GmbH in Austria. In the last step, Delpharm SAS, a French company, will fill the solution into vials. Prior to its partnership with BioNTech, Pfizer had no mRNA production capacity at all, and has continually fallen short of production targets. Now, executives hope this partnership will enable both firms to meet their target of 2 billion doses produced by the end of this year. In order to incentivize other companies to shift production and begin investing in these capabilities, the U.S. must promote similar global partnerships. In forming these partnerships, we must also note the unique raw materials and production processes required for each individual vaccine, and make informed decisions based on projected adjustment costs.

Over this past weekend, the Biden Administration announced that it has formed agreements with the Quadrilateral Security Dialogue to bolster global manufacturing capacity and address shortages in Southeast Asia. Through this compact, the Biden Administration has committed to funding Indian manufacturer Biological E in pursuit of 1 billion doses produced by the end of this year. This is an important step. But while these partnerships are valuable, they will take time. The Pfizer-BioNTech partnership with Sanofi likely won't be fully functional until this summer. In the meantime, the federal government could leverage existing stockpiles by beginning to export excess doses -- including AstraZeneca vaccines, which have not been authorized for use in the U.S. Exporting vaccines presents some risk of extending current supply shortages, but this risk is very small. The notion that the U.S. will find itself with shortages of vaccines during late April or May when AstraZeneca might become authorized in the U.S. seems very low. In fact, it is likely that

very few Americans will ever get the AstraZeneca vaccine -- because by the time it is available and authorized, we will have more than enough of the other vaccines as to make this vaccine superfluous. Sharing these vaccines now, while we await authorization, seems like a far more prudent approach.

To end the pandemic and achieve global herd immunity, our goal should be to vaccinate 60-70% of the world's population by the end of this year. That's approximately 4.5 billion people in the next nine months. This audacious goal will require United States leadership to mobilize and maximize every element of global capacity.

IV. America's Response to ending the global COVID-19 Pandemic

The United States has a crucial role to play in leading and supporting multilateral efforts to end this pandemic. The United States must:

1. Focus on Global Vaccine Manufacturing Capacity: Even when we have fully vaccinated our population, we must maintain high levels of vaccine production. This pandemic will not end until herd immunity is achieved around the world. The United States should utilize its domestic manufacturing infrastructure to continue to provide supply to the globe, and also support partnerships between pharmaceutical companies and international pharmaceutical manufacturers to increase global supply.
2. Reform and Expand Global Health Institutions for the Pandemic Age: The United States must work with partners to reform key global health bodies like the WHO to meet the

challenges of this and future pandemics, and continue to play a leading role in key multilateral responses to the pandemic, such as the COVAX facility.

3. Foster Global Health Resiliency: Through renewed investments in health systems, disease surveillance, primary care, and harnessing the promise of digital technology.

V. The Path Forward: New Challenges in Pandemic Resilience

We are entering the Pandemic Age, in which global disease outbreaks will become increasingly common as a result of climate change, deforestation, agricultural intensification, and globalization. Of all new and emerging human infectious diseases, 75% can be traced to animals, mostly from wildlife. This number will only increase in the future, as ecological reserves shrink and human-animal interactions increase. Additionally, as global travel becomes more pervasive, epidemics are more likely to turn into pandemics. For example, the number of Chinese passengers who traveled by air in 2019 was 7 times higher than in 2003, when the original SARS pandemic hit. World Bank data shows a global increase of passengers from 1.7 billion in 2003 to 4.2 billion in 2018.

We must not be caught unprepared again. Pandemic preparedness must be a key goal for Congress including investments, both nationally and globally, in disease surveillance, stockpiling healthcare supplies, and increasing the capacity and resilience of our public health infrastructure.

Conclusion

As we look ahead to the steps necessary to rebuild from the pandemic, it is in our national interest to make sure that the globe rebuilds with us. The longer that the pandemic continues, the more likely it is that dangerous viral variants enter our society, including those that could potentially

escape our vaccines. It is imperative that the United States commit itself to getting people around the globe vaccinated as quickly as possible.

It is also time that we redefine our role in global health. This pandemic has laid bare inequalities across the economy, education, healthcare, and gender. Our nation's leadership will be critical in engaging with partners and re-focusing attention on creating a multilateral global health structure that is prepared to handle future global emergencies.