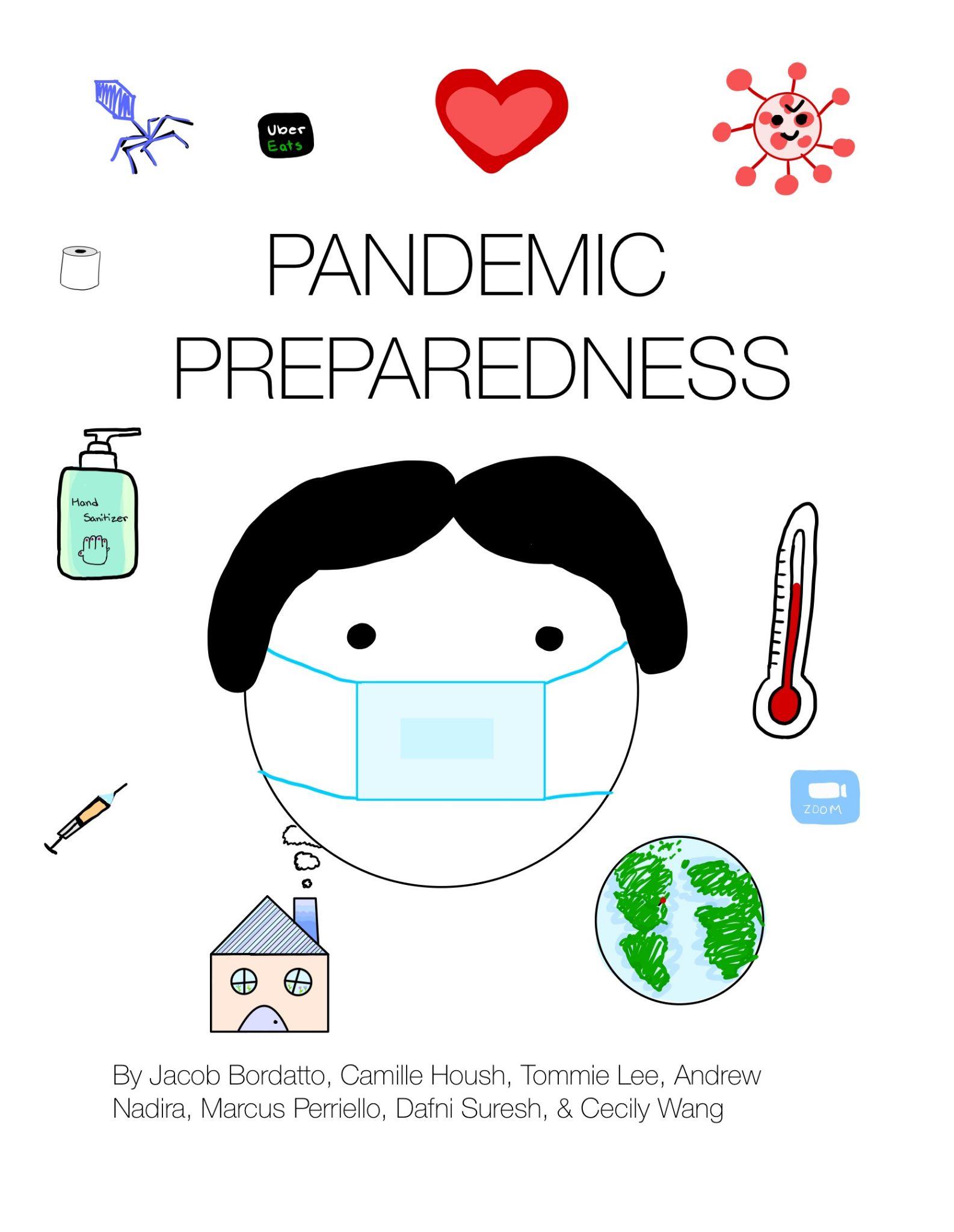
# COVER PAGE



Recommendations to the Centers for Disease Control for improvement of US Pandemic Preparedness Strategies.

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# TABLE OF CONTENTS

Title Page 1

Table of Contents 3

Introduction 4

Background/Context 6

Contemporary Analysis 11

Future Development 34

Policy Recommendation 49

Appendix 54

Works Cited 55

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# INTRODUCTION

The US population is facing increased risks caused by the emergence and reemergence of infectious diseases, with the latest and most prominent infectious disease being SARS-CoV-2, the virus causing the COVID-19 pandemic. With the COVID-19 pandemic not yet out of sight, and its effects still being felt by communities nationwide, the conversation about pandemic preparedness has become an urgent one. Pandemic preparedness is being studied in a new light thanks to the information provided by the COVID-19 pandemic. However, the concept of pandemic preparedness is not new. The US has maintained strategies for preparedness and prevention throughout various pandemics leading up to COVID-19. The recent pandemic, however, put the effectiveness of US pandemic preparedness strategies to the test in a way no previous pandemic has.

While the effects of COVID-19 were and continue to be felt at a global level, the US fared far worse than many of its global counterparts. For example, though only making up “4 percent of the global population, the US accounted for almost 25 percent of the world’s reported cases and tied with Hungary for the fourth-highest per capita COVID-19 confirmed death rate of any western high-income country as of January 11, 2021” (Daszak et al.). When viewing the impact of COVID-19 in the US in a global context, one finds that the US suffered greater losses than many comparable, wealthy Western countries. This fact sheds light on the ineffectiveness of the US’s current pandemic policies and the urgent need for improved pandemic prevention and preparedness measures. A country with the resources and global standing possessed by the US sat in a much better position to withstand the COVID-19 pandemic than many other countries. This begs the question then of why the US ultimately failed to slow the spread and minimize deaths from COVID-19, and equally as important, how the US can improve pandemic policies to better prevent and handle future pandemics.

In light of this need for an improved pandemic preparedness strategy for the United States, a task force of scientists and infectious disease specialists has been appointed by the Centers for Disease Control or CDC. While there are many factors that contribute to the effectiveness of a pandemic prevention and preparedness strategy, this CDC task force will primarily focus on the medical, healthcare, and scientific research aspects. This task force will use an analysis of past and current pandemic strategies to determine which tactics were effective and which areas are in need of improvement. While the task force’s analysis will mainly focus on US pandemic strategies, international context will also be used to determine why the US fared worse than comparable countries and to learn from the pandemic strategies of countries that successfully mitigated the effects of the COVID-19 pandemic.

After gaining a comprehensive understanding of US pandemic strategies up to the present, the task force will use the data gathered to make a recommendation for an improved pandemic preparedness plan for the United States. This recommendation will be in the form of a policy that will be presented to the Centers for Disease Control. This policy will include data about what is effective in the current US pandemic strategy as well as suggestions for innovations and improvements that need to be made in order to create the most effective pandemic preparedness plan. As stated above, there are many factors that determine the effectiveness of a pandemic preparedness plan. While the various factors will not be ignored in the recommendations made by the CDC task force, the policy presented will heavily focus on how to improve the medical, healthcare, and research aspects of the US pandemic preparedness plan. The overall goal of this paper is to present the findings of the CDC task force and provide a policy recommendation for the US to improve its current pandemic strategy for maximum effectiveness.

**BACKGROUND/CONTEXT**

In order to make the best policy recommendations for pandemic preparedness going forward, the task force will be analyzing past pandemics, global epidemics, and how the US addressed these infectious disease outbreaks. While the discussion will focus primarily on infectious respiratory diseases such as the Influenza outbreak of 1918 and the recent COVID-19 pandemic, the task force will also be examining the policies in place during the HIV/AIDS pandemic. In the study of these past pandemics, there will be a focus on the medical practices used for pandemic prevention and mitigation. The task force will use information about US medical strategies during these pandemics to determine their effectiveness. Identifying which tactics had successful outcomes will allow the team to better implement effective policies already in place, and determine which areas are in need of improvement.

## THE 1918 INFLUENZA OUTBREAK

The 1918 Influenza outbreak “was among the deadliest public-health crises in human history, killing an estimated 675,000 people in the United States and an estimated fifty to a hundred million people worldwide” (Fauci and Morens, 1018). Despite the fact that over a hundred years have elapsed since the outbreak of the 1918 Influenza pandemic, there is valuable information to be found by studying the impact of this pandemic and examining the ways in which knowledge regarding infectious respiratory diseases is still lacking over a century later. There is still much uncertainty surrounding the nature and spread of the influenza A virus of the H1N1 subtype that caused the 1918 influenza pandemic, and the “pandemic's explosive and still-unexplained patterns of rapidly recurrent waves and predilection to kill the young and healthy [5-7] cast an element of urgency over pandemic planning today” (1018). While the medical practices in place during the 1918 Influenza outbreak will not inform pandemic preparedness strategies of the present due to advancements in medical understanding, the information regarding the nature of the disease is relevant to the study and prevention of modern infectious disease outbreaks.

By placing the influenza outbreak of 1918 in the context of the pandemic outbreaks and infectious diseases of the last hundred years, one can use the 1918 influenza to examine the concept of pandemic cycles and ideas surrounding the prediction of future pandemics. The seeming regularity of the pandemic outbreaks of the last two centuries led many experts to believe in the idea of predictable pandemic cycles. Three outbreaks occurred in the 19th century and three again occurred in the 20th century, including the 1918 Influenza pandemic. However, this idea of pandemic cycles has since been dismissed, leaving no reliable basis for predicting pandemic outbreaks (1024). While the theory of pandemic cycles proved false, the study of previous pandemics such as the 1918 Influenza pandemic has allowed scientists to continue to refine the understanding of how pandemics start and spread. Through an examination of the origins of past pandemics, “it has become clear that pandemic emergence can result from at least 2 very different mechanisms: de novo emergence of a completely unique avian-descended virus (as in 1918) or modification of a circulating human-adapted virus by importation” (1024). The continued growth of knowledge regarding the nature of past infectious diseases can better inform one’s perceptions about novel emerging infectious diseases today.

## The AIDs/HIV Epidemic:

Since its discovery in 1981, there have been over forty million HIV-related deaths globally with an estimated thirty-eight million people living with HIV as of July 2022 (WHO, *HIV and AIDS*). Though for some time the precise origin of HIV-1 was unknown, recent “noninvasive testing of wild-living ape populations” has shown that HIV-1 comes from central and eastern chimpanzees, as well as a second unknown species of ape from the central African nation of Cameroon (Sharp). As HIV progresses to its third stage it becomes known as ‘Acquired Immunodeficiency Syndrome’ or AIDs, a deadly disease that strongly targets the host’s immune system, is easily transmissible, and will typically kill its host body within three years (CDC). With no cure for AIDs, the US policy was mainly focused on preventing the spread of HIV in hospitals as well as educating the nation on how HIV spreads so they can take precautions for themselves.

To educate the public about a disease one must first be familiar with the disease, starting with how it is transmissible. Once it was discovered that HIV spread through the transmission of bodily fluids, “universal precautions” for healthcare workers such as “wearing masks, gloves, and goggles” were implemented when working with people infected with HIV (Sencer). In addition to protective equipment, hospitals saw the introduction of “safe needle disposal cases” which would be marked “biohazard symbol displayed prominently on all sides and an opening at the top” to ensure the safe handling of dangerous and infectious needles. (Sencer) The hope was that with these precautions there would be no cross contamination from caregiver to patient or between patients.

As a new disease in the US, AIDs was largely not understood by the public which led to widespread panic when it was diagnosed in individuals (Sencer). This panic would eventually lead to the announcement by Surgeon General Everett Koop of the *Surgeon General’s report on AIDs* which “ …called for a comprehensive program of sex and AIDS education, urged the widespread use of condoms, and dispelled myths that HIV could be spread by mosquitoes” (Sencer). The CDC would also look to further educate Americans by releasing an article titled *America Responds to AIDs* with the goal of “(increasing) awareness and understanding of AIDS, to prevent HIV infection, and to encourage people to seek more information and counseling” about AIDs and HIV (Sencer).

## THE COVID-19 PANDEMIC

The outbreak of COVID-19 is the most recent of the pandemics that will be studied by the task force in order to analyze past US pandemic strategies. At the outbreak of the COVID-19 pandemic, the US had in place what seemed like a comprehensive plan for responding to and dealing with emergencies such as the outbreak of a pandemic. This plan included “data surveillance, testing, tracing the contacts of people carrying a contagious virus, hospital preparedness, distribution of medical supplies from a federal stockpile and federal guidance to state leaders and the public” (Vaida). Throughout the pandemic, a variety of these tactics were implemented, but for many reasons were largely unsuccessful. This has to do in part with the fact that “despite repeated emerging infectious disease crises in recent years, U.S. political leaders from both parties have not prioritized pandemic prevention and response. They have invested in creating preparedness programs, but as each emergency ended, political priorities shifted, and the programs were cut back or defunded” (Vaida). While the task force will be focusing on the medical aspects of the US pandemic preparedness plan during COVID-19, the team recognizes that there were many political and economic factors influencing the effectiveness of such strategies. After establishing an overview of the medical strategies in place early on in the COVID-19 outbreak, the task force can begin to analyze the effectiveness of the US pandemic preparedness plan immediately preceding the pandemic. Having an understanding of the pandemic preparedness plan leading into COVID-19, the task force will be better equipped to determine which medical tactics can be successful with the right support and which are in need of improvement.

The US’ strategies for minimizing and controlling the spread of COVID-19 were predominantly built around limiting contact between citizens so there would be less opportunity for transmission. The first action that the government implemented that directly affected life in America was a travel ban starting on March 13th, 2020 which banned entry for non-citizens to the US from twenty-six European countries (CDC, “CDC Museum…”). This action was followed by a nationwide shutdown on the 15th of March (CDC, “CDC Museum…”) initiated first by Governor Newsom of California ordering “all individuals living in the State of California to stay home or at their place of residence…” (Newsom) which would be the first of 42 states to shut down (Elser). Along with these, it was recommended that the public wear face masks to “filter out particles, including the virus that causes COVID-19…” as well as “ block droplets and particles you breathe, cough, or sneeze out so you do not spread them to others” (CDC, “How to Protect…”). In addition to wearing masks, it was recommended to avoid crowded places as the closer you are to a greater number of people, the more likely you are to be exposed to the virus” (CDC, “How to Protect…”). This is because even though masks filter out particles, there is no way to guarantee 100% efficacy (CDC, “How to Protect…”). Though these plans were implemented very early in the pandemic when the US was facing its first potential cases and were effective in theory, in practice they were largely ineffective at stopping the spread of COVID-19 as cases continued to rise rapidly.

As mentioned above, the US fared far worse during the COVID-19 pandemic than many comparable countries. Knowledge of how the US handled, or failed to handle, COVID-19 in a global context is necessary for further analysis of the US pandemic preparedness plan up to the present, and for an understanding of the areas in which the US plan fell short. The US has historically faced various pandemic and epidemic outbreaks, and “before 2017 the US took part in successful international interventions around influenza, Ebola, Zika, and many other infectious diseases. However, the US capacity to tackle infectious diseases on the global stage and domestically has never been tested as severely as it has by the COVID-19 pandemic” (Daszak et al.). The US’s global position as a wealthy, influential Western power “with globally respected agencies for infectious disease research (the National Institute of Allergy and Infectious Diseases [NIAID]), public health (the Centers for Disease Control and Prevention [CDC]), evaluation and licensing of drugs and vaccines (the Food and Drug Administration [FDA]), and unparalleled academic and pharmaceutical capacity” makes it surprising that the US largely failed to mitigate and prevent the spread of COVID-19 (Daszak et al.). Because of this anomaly, it is all the more important that this CDC task force thoroughly analyze the weaknesses of the pandemic strategy in place at the time and determine what improvements in medical tactics can be made to ensure a more successful plan in the future.

# CONTEMPORARY ANALYSIS

On March 11, 2020, the director of the World Health Organization, Dr. Tedros Adhanom Ghebreyesus, declared the spread of COVID-19 as a pandemic (“WHO Director-General's Opening…”). Dr. Adhanom Ghebreyesus gave a very concise outline of the precautions that should be taken by the US government in order to combat the spread of the virus. He describes the steps of this preparation as “First, prepare and be ready. Second, detect, protect and treat. Third, reduce transmission. Fourth, innovate and learn” (“WHO Director-General's Opening…”). This outline helped the CDC and other government organizations build a framework for what steps to take in order to deal with the threat of the pandemic. The covid pandemic took over the lives of millions of people worldwide. It shut down businesses, emptied the streets, and destabilized housing, food availability, global trade, and the world economy. Many people were hurt or killed by COVID-19. In order to understand the best possible steps in order to decrease the effects of a future pandemic, the decisions taken during the most recent one must be studied and analyzed.

The infectious disease specialists will begin this investigation on January 7th, 2020. The first action the CDC took was to create “an incident management structure” in response to the new strain of coronavirus found in Wuhan, China (“Middle East Respiratory Syndrome…”). This was based on a plan made for the Middle East Respiratory Syndrome Coronavirus which was also transmitted to humans through animals, specifically camels (“Middle East Respiratory Syndrome…”). On January 29th, the CDC created a team of medical officers who would screen US passengers arriving from Wuhan for symptoms of the SARS-CoV virus (“CDC Museum Covid-19 Timeline”). During this time, all passengers were “issued quarantine orders upon arrival at their designated quarantine location” (CDC). The passengers who were in quarantine had medical care readily available (CDC).

While the most urgent response lay on the shoulders of public health in controlling and preventing the spread and working on a vaccine, equally as important was the task of stabilizing the economy and extending crucial assistance to citizens and businesses as quarantines impacted the livelihood of the most vulnerable. Congress acted swiftly and passed urgent legislation aimed to help individuals and families, small businesses, and major industries. The first wave of these government programs was disbursed urgently and amended repeatedly for the past three years in response to trickling economic data. Their degree of effectiveness on the economy is currently being debated by government economists and academic scholars.The benefit of hindsight and, more importantly, crucial analytical data was not available at the start of the pandemic. At the onset, as the world plunged into uncertainty, leaders and health experts were cautiously balancing the appropriate response.

## SOCIAL DISTANCING AND MASKING

On March 28, among the increasing number of COVID-19 cases and the strain on hospitals, the White House extended “social distancing measures through the end of April 2020”. Social distancing played a huge part in “lower[ing] the rates of COVID-19 infection” (Mahmoudi and Xiong). It was found that “mandatory measures to increase social distancing—and most notably stay-at-home orders” were the most effective policies in reducing the rate of transmission of the disease (Andersen). The goal of “flattening the curve” came from the CDC hoping to reduce the number of COVID-19 cases in the US. In a study done by the *Center for Infectious Diseases*, it was found that early actions such as social distancing did not “flatten the curve” but significantly lowered the peak as well as showing a slower curve growth. Specifically, reducing contact between both adults and children by 75% within the first fifty days of the pandemic would see 21,000 fewer cases during the peak of the pandemic. (Matrajt and Leung). Further reduction of contact to 95% would see 22,500[[1]](#footnote-0) fewer cases during the pandemic’s peak (Matrajt and Leung). On April 3rd, in addition to the stay-at-home orders, the CDC released guidelines on masking. This guideline recommended the use of a “cloth face covering” when outside of the home (“Factors Associated with Cloth Face Covering Use…”). In a study done to test the effectiveness of cloth face masks, it was found that “the most effective cloth mask was (made out of) a hybrid of cotton/chiffon” and had a 97% filtration efficiency[[2]](#footnote-1) (Ataei, Mahshid, et al.). Several factors influence the effectiveness of cloth masks such as the weight, if they are woven or knitted, and the shape being either flat surgical masks or cone-shaped masks (Ataei, Mahshid, et al.). Though a two-ply 100% cotton mask has an FE of 77% for particles as small as 10 nm, they are unable to be replaced by seemingly similar materials such as a cotton handkerchief which are ineffective with particles as small as 75 nm due to their lack of ability to be properly fitted to an individual (Ataei, Mahshid, et al.).

While cloth masks were recommended during a supply shortage of medical-grade masks, they are far less effective than the aforementioned medical masks. When comparing the infection prevention rates of N95s and cloth masks to those of not wearing a mask, it was found that N95s have a 95% prevention rate (PR) while cloth masks rate a 55% PR (Gurbaxani, Brian M, et al.). In regards to comparisons between medical masks, mainly N95 respirators and surgical masks, randomized testing has shown that in most cases there is no “evidence that medical masks are inferior to N95 respirators…” as they performed similarly to N95s in “preventing laboratory-confirmed influenza infection” (Bartoszko et al.). Medical masks are only inferior in the case of aerosol-generating procedures where N95s are recommended (Bartoszko et al.).

## PCR TESTING

COVID-19 testing was crucial to controlling the spread of the pandemic. In confronting the pandemic issues at home, the CDC pushed a EUA to the FDA for a SARS-CoV-2 diagnostic test. Many different types of testing were used throughout the COVID-19 pandemic. However, the most common was the “molecular-based real-time RT-PCR” (Kwok). This test is “more sensitive” and is best for the initial phase of the infection where symptoms may not be shown (Kwok). This test can detect “a relatively low level of RNA copies” which allows for less spread of the virus (Kwok). If a person is aware of their infection, they are able to use more levels of protection like wearing a mask and isolating in order to stop the spread. Once there were positive cases in three US states, the CDC updated its Criteria to Guide the Evaluation and Testing of Patients Under Investigation (PUI) for COVID-19. This time, those who had “severe respiratory illness” regardless of travel history could still be put under investigation for COVID-19 (“CDC Museum Covid-19 Timeline”). This step was very beneficial because soon after these investigations, sixty cases were found across twelve US states. Of the sixty, twenty-seven were of unknown spread origin (“CDC Museum Covid-19 Timeline”).

There were many innovations related to testing which helped the public be more prepared for the pandemic. As the pandemic grew, AI software company *Axial3D*, rose to the challenge to tackle the shortage of nasal testing swabs (Morgan). Using the innovative technology of 3D printing, they designed “a 3D printed nasal swab”(Morgan) for COVID-19 tests. This filled an important gap in the supply chain to combat the disease. On May 8th, 2020, the FDA authorized a COVID-19 test which allowed people who use home-collected saliva samples to test for the disease (“CDC Museum Covid-19 Timeline”). The impact of “at-home rapid antigen tests” was “tremendous” (Spencer). In Michigan, there was a program called “Say Yes! COVID Test” where half a million free COVID-19 tests were distributed (Spencer). The counties that received the free tests had “on average 40 cases per day” less than the counties that didn’t (Spencer). This program was selectively given by the NIH and CDC to counties that had “lower vaccination rates and socioeconomic status” (Spencer). By providing additional resources to places lacking in funding and education, the CDC was able to mend the gap caused by misinformation.

## VACCINES, TREATMENTS, AND STRAINS

In lieu of a vaccine in the first couple of months of the pandemic, the first treatment for those who were hospitalized because of COVID-19 was Remdesivir. This drug has been shown to reduce the risk of death and mechanical ventilator use for COVID-19-positive patients who have low oxygen flow (Jeyapalina, Sujee, et al.).Vaccines have been the most effective response to eradicating communicable diseases. The US government initiated collaboration with various institutions to develop a vaccine in late December 2019 when COVID-19 started spreading. On January 11th, 2020, Chinese scientists distributed the first genetic sequence of SARS-CoV-2, the virus responsible for causing the outbreak, to the National Institute of Health (CDC, “CDC Museum Covid-19 Timeline”). With this information, scientists were able to focus on creating a vaccine to address COVID-19. Once the World Health Organization (WHO) declared the virus a pandemic, President Trump issued a state of national emergency. The work on the vaccine went full throttle on April 30th with the full weight of the federal government supporting the effort, in what was called, Operation Warp Speed (CDC, “CDC Museum Covid-19 Timeline”). Operation Warp Speed was created in order “to produce a vaccine against the SARS-CoV-2 virus” (“CDC Museum Covid-19 Timeline”). Typically, vaccine production is a lengthy process that goes through various steps from animal trials to several phases of human trials, before access becomes safe to the public (“CDC Museum Covid-19 Timeline”). The process usually takes years. The rapid introduction of the COVID-19 vaccine can be attributed to several reasons. First, scientists worldwide stopped their research and focused their efforts simultaneously on developing the vaccine (“CDC Museum Covid-19 Timeline”). Funds were available and guaranteed by governments to speed up the research effort. (“CDC Museum Covid-19 Timeline”). With this genetic makeup available, scientists acted quickly and uploaded it to other global databases. (“CDC Museum Covid-19 Timeline”). Having access to this crucial piece of information allowed scientists to make a vaccine quickly. The technique used to develop the vaccine, mRNA, was discovered in 1961 and has since been used successfully and safely on viruses such as HIV/AIDS, Ebola, and MERS. (“CDC Museum Covid-19 Timeline”). On March 16th, 2020, the NIH began clinical trials for the Moderna mRNA vaccine. (“CDC Museum Covid-19 Timeline”). However, it is worth noting that scientists were divided on the risks and benefits of speeding up vaccine trials. While some argued that the benefits outweighed the risks, others cautioned that vaccine adverse effects might shake the public confidence in science, play to the anti-vaccine narrative, and delay the pandemic even longer. Regardless, the effort continued. (CDC, “CDC Museum COVID-19 timeline).

In December 2020, a vaccine created by Pfizer-BioNTech was available for those 16 years and older (Office of the Commissioner). In response, the CDC released a report outlining the “phases of COVID-19 vaccination allocation” (“CDC Museum Covid-19 Timeline”). Phase 1a included “healthcare personnel and residents of long-term care facilities” (“CDC Museum Covid-19 Timeline”). Phase 1b was for “essential workers and all persons ages 75 years and older” (“CDC Museum Covid-19 Timeline”). Phase 1c was “all persons ages 65–74 and all persons ages 16–64 with a medical condition that increases their risk of severe disease from COVID-19” (“CDC Museum Covid-19 Timeline”). Phase 2 was for all of those 16 years and older that were not in the previous phases (“CDC Museum Covid-19 Timeline”). By this time, the death toll from COVID-19 surpassed 300,000 (“CDC Museum Covid-19 Timeline”). In January 2021, the Biden Administration released “the National Strategy for the COVID-19 Response” which included ten executive orders that increased “access to testing supplies and vaccines” (“Summary: Biden Administration’s ‘National Strategy…”). The document allowed for “health centers to access vaccine supplies directly” and “launch more mobile clinics…to reach remote areas” (“Summary: Biden Administration’s ‘National Strategy…”). The document also allowed for free COVID-19 testing for uninsured individuals and “ensures against out-of-pocket costs for vaccines, regardless of immigration status” (“Summary: Biden Administration’s ‘National Strategy…”). This policy was based on the distribution of four vaccines in the US. Pfizer-BioNTech vaccine included “three doses administered over at least 11 weeks (Office of the Commissioner). This vaccine was 96.1% effective for the prevention of death due to COVID-19 ("Pfizer-BioNTech COVID-19 Vaccine"). The Moderna vaccine had two shots that were administered 4-8 weeks apart (Katella). This vaccine had an efficacy of 95% in the prevention of COVID-19 (Katella). The Novavax included 2 doses 3-8 weeks apart and had a 90% efficacy in the prevention of COVID-19 (Katella). The Johnson and Johnson vaccine consisted of only one shot and had an efficacy of 67% in “preventing moderate to severe/critical disease by 14 days after vaccination” (Katella).

One of the biggest concerns regarding vaccination and vaccines was the ability to withstand COVID-19 variants. There were many variants of COVID-19. Alpha was the first “highly publicized” variant appearing in “Great Britain in November 2020” (Katella). This variant was “30-50% more contagious” than the original strain (Katella). All four of the vaccines prevent this strain (Katella). The Beta variant was found in South Africa; this variant was 50% more contagious than the original strain however, it was common in the US (Katella). The four vaccines do protect against this variant except their efficacy was lower (Katella). The Delta variant was identified in India and became the most prominent version of the SARS-CoV-2 virus until mid-December of 2021. This variant was “90% more transmissible than the Alpha variant” (Katella). This strain caused an increase in hospitalization after a steady decline in June 2021 (Katella). The four vaccines were effective in preventing “severe illness, hospitalizations, and death.” However, there were “breakthrough infections,” where fully vaccinated people got infected (Katella). The most predominant strain in the US was called Omicron. It was discovered in South Africa in 2021. This strain caused an increase in COVID-19 infections by over a million in December 2021. This strain is known to be the “most transmissible strain of the virus so far” and is caused by the mutations on the “virus’s spike protein” which “attaches to human cells” (Katella). In order to prevent this strain, booster vaccines are recommended because “breakthrough infections in vaccinated people are expected” (Katella). As for the boosters, the Pfizer and Moderna booster was able to prevent “Omicron and Omicron sub-variants BA.4 and BA.5 '' (Katella). Novavax is creating a vaccine to protect against the “Omicron sub variants in 2023” (Katella). The Johnson and Johnson vaccine is shown to be 85% effective in preventing hospitalization when Omicron was a dominant variant in South Africa (Katella).

By March 2021, “100 million COVID-19 vaccine doses were administered (“CDC Museum Covid-19 Timeline”). As the rates of COVID-19 fluctuated with new variants of the Sars-CoV-2 virus entering the US, the CDC created the Center for Forecasting and Outbreak Analysis (“CDC Museum Covid-19 Timeline”). This department was created in order to help the nation understand and predict “health threats including pandemics” through data analysis (“CDC Museum Covid-19 Timeline”). This center allowed “leaders at all levels to prepare for a surge in cases” in response to the Omicron variant (“CFA 2023 Annual Report:...”). CFA was able to analyze hospital data to predict the “typical severity” contrasting with “ large case numbers” as the Omicron variant spread “CFA 2023 Annual Report:...”).

As for treatment, the FDA issued another “EUA for the use of convalescence plasma” (“CDC Museum Covid-19 Timeline”). Plasma was used to treat those who were “critically ill” and immunocompromised (Amanati, Ali, et al.). In a study published by the New England Journal of Medicine, 98% of the hospitalized patients were unvaccinated (Spencer). After receiving plasma infusions, most patients had improved symptoms like “body temperature normalization…and weaning from the ventilator between one day to 35 days” (Amanati, Ali, et al.). It was found those who received plasma were “significantly less likely to be hospitalized” (Spencer).

The dire healthcare needs that arose from the pandemic drove brilliant innovations such as low-cost ventilators. Many people who were stricken with COVID-19 had severe respiratory issues and needed ventilators. The high demand for these expensive devices sparked the Department of Defense to issue a challenge and scientists and engineers rose to the occasion. (Department of Defense) Ventilators that could be quickly manufactured for less than $500 were put together and presented for approval, within a few weeks, which under normal circumstances, would have taken years (Department of Defense). It was an example of human ingenuity and selfless cooperation that was a true silver lining in the middle of these dark days.

## TELEHEALTH: RURAL VS. URBAN

In response to the surplus of hospital patients, CMS (The Centers for Medicare and Medicaid) temporarily allowed for more telehealth benefits to be added to their criteria (“CDC Museum Covid-19 Timeline”). During the pandemic, the US Government Accountability Office found that “the number of telehealth services” increased fifteen times from 2.1 million the year prior to the pandemic to 32.2 million during the pandemic (U.S. Government Accountability Office). The role of telehealth during the pandemic brings up issues such as equity in access to care and quality of care. There are more than a hundred federal programs dedicated to expanding internet access to all communities (U.S. Government Accountability Office). However many communities have been left out of this network, especially in rural areas. For example, thirty percent of the people who reside in tribal lands do not have broadband access (U.S. Government Accountability Office). The GAO has recommended many actions in order to fix this problem including the creation of a “National Economic Council” which would focus on “closing the gap in broadband access on tribal lands” (U.S. Government Accountability Office). A second part of this recommendation includes the appointment of an NTIA Administrator to “establish[ing] a framework within the American Broadband Initiative for addressing tribal barriers”(U.S. Government Accountability Office). In regards to the quality of medical care through telehealth, the GAO reported concerns about child wellness visits and care for those suffering from an injury or disability. The concerns stemmed from the lack of ability to “test reflexes” and detection of symptoms during checkups as well as issues regarding "effective physical therapy" (U.S. Government Accountability Office). Currently the CMS “does not collect, assess, or report information about the quality of telehealth care given by Medicaid providers” (U.S. Government Accountability Office). Telehealth has been an excellent tool in order to provide care without the risks of entering a hospital. However, issues of broadband availability and effectiveness must be addressed in order to make this form of healthcare more accessible for all populations in the future.

## TRAVEL RESTRICTIONS

Some of the earliest mitigation strategies implemented by the US government at the beginning of the COVID-19 outbreak were travel restrictions and screening protocols. This was in an effort to keep COVID-19 out of the US by focusing on international travel. Early in January 2020, the CDC began attempting to screen individuals traveling from Wuhan, China into the US through San Francisco, New York, and Los Angeles airports (“CDC Museum COVID-19 Timeline”). This would be the beginning of what turned out to be a long string of US restrictions specifically on travel from China in 2020. Despite these early travel precautions, by late January the US already had five confirmed COVID-19 cases in various states (“CDC Museum COVID-19 Timeline”). The US was not the only country implementing travel bans early on. Along with restrictions and screening within China’s borders, by “31 December 2019, the same day that the Chinese Centre for Disease Control first notified WHO of a cluster of atypical pneumonia cases in Wuhan, some jurisdictions (including Taiwan, Russia, and Macau) began to impose travel-related measures on travelers from Wuhan, mainly airport screening” (Grépin KA, et al. pp.2). These early travel bans set the tone for travel-related restrictions and precautions throughout the COVID-19 pandemic in the US.

By the spring of 2020, the travel restrictions became more widespread and urgent. On March 13th, 2020, the Trump administration “declared a nationwide emergency and issued an additional travel ban on non-U.S. citizens traveling from 26 European countries due to COVID-19” (“CDC Museum COVID-19 Timeline”). Domestically, the CDC also made recommendations in an attempt to slow the spread within the United States, and urged states with “high community transmission of COVID-19…to refrain from all non-essential domestic travel for at least 14 days, effective immediately” (“CDC Museum COVID-19 Timeline”). In addition to travel restrictions, the US also implemented symptom-based COVID-19 screenings for individuals traveling from China and other specific areas. However, these screenings were discontinued by the CDC in September 2020 because of the complications caused by the asymptomatic spread of the disease (“CDC Museum COVID-19 Timeline”). As the pandemic progressed, the CDC’s recommendations shifted focus away from travel restrictions and towards accurate COVID-19 testing for travelers. On November 21st, 2020, the CDC began “recommending that all travelers test 1-3 days before and 3-5 days after all international air travel in addition to staying home for 7-14 days after travel to avoid transmitting the SARS-CoV-2 virus” (“CDC Museum COVID-19 Timeline”). These testing and quarantine recommendations shifted as pandemic cases rose and fell in various countries, with the CDC changing its policies accordingly.

The effectiveness of such travel restrictions and precautions as those implemented by the US and various countries have since been analyzed. One country of focus for such analyses is China and more specifically the city of Wuhan in the Hubei province. China was early to implement restrictions during the outbreak of COVID-19, and with the privilege of hindsight, the success of this early action is becoming evident. For example, “among the studies that investigated the impact of the Wuhan travel measures, there was a consensus that the measures led to a 70%–77% reduction in the number of cases exported internationally through early to mid-February” (Grépin KA et al. pp.11). Similar efficacy was found to be true of other travel bans from certain countries like Australia, which placed restrictions on travel to and from China early on (Grépin KA et al. pp.11). Other cases, however, proved only moderately effective in slowing or preventing outbreaks. Japan’s travel restrictions, for example, were found to be “only modestly delayed due to the Wuhan travel ban and that the median time delay in a major outbreak was only 1–2 days” (Grépin KA et al., 11). Examining various international travel bans and their respective effectiveness provides a global context in which to examine the effectiveness of comparable US travel policies.

Despite there being many similarities between early US travel policies and those of other countries, current analyses reveal that early travel restrictions implemented by the Trump administration were not nearly as effective. One study found “that the travel ban did not curtail the spread of COVID-19 in the United States” at all and that “President Trump’s February 2, 2020 ban on travel from the PRC did nothing to slow the spread of COVID-19 in the United States” (Nowrasteh 7). This stark difference in effectiveness between US travel restrictions and those of other countries requires an explanation. The same study attempts to provide such an explanation, saying, “Peer-reviewed papers on the effect of international travel bans on the spread of COVID-19 find that they delay the spread by a few days up to 2-3 weeks. However, those papers rely entirely on epidemiological models of emigration restrictions from the epicenter of the outbreak in Hubei, focus on travel restrictions imposed by other countries like Japan, or on how domestic travel restrictions in the PRC affected the spread of COVID-19 among Chinese cities” (Nowrasteh 1). Based on the clarifications provided by this study, as well as the evidence of other countries’ success with travel restrictions it is clear that the US’s pandemic travel policies require improvement.

## DATA COLLECTION

The next step was to create a hospital surveillance network in order to monitor the spread in hospitals (“CDC Museum Covid-19 Timeline”). The CDC referred to this as “COVID-NET” (“CDC Museum Covid-19 Timeline”). This network was created by monitoring a previous network created for hospitalizations associated with influenza and RSV (“CDC Museum Covid-19 Timeline”). Due to the rising number of cases, the FDA took away the criteria for “the CDC to perform confirmatory testing” in order to receive a “positive COVID-19 diagnosis” (“CDC Museum Covid-19 Timeline”).

By this time, some states began to partially reopen. However, health experts were advising against this decision (“CDC Museum Covid-19 Timeline”). The CDC then launched SPHERES, which was a national network that could help public health response teams track the SARS-CoV-2 virus’ evolution (“CDC Museum Covid-19 Timeline”). This network included many universities, federal, state, and local agencies and laboratories, as well as non-profit corporations, and international help (“Spheres”). The goal of this organization was to “reduce barriers to bioinformatic analysis and data sharing” and “accelerate the use of real-time pathogen sequence data and molecular epidemiology for the COVID-19 pandemic response” (“Spheres"). By creating organizations that combine COVID-19 data, the production and creation of vaccines, treatments, and complications of the disease were able to be better understood. During this pandemic, the NS3 program allowed for “national virus monitoring”, “enhanced surveillance”, and “virus characterization” (“CDC's Role in Tracking Variants"). This allowed the CDC to better prepare their response to the virus and new strains. In addition to the “spheres” used for the collection of data as a disease, the CDC also used a chain system to track and document COVID-19 cases. Local hospitals, healthcare providers, and laboratories would report information about cases to their local or state government which would then report that information to the CDC (CDC, “FAQ: COVID-19 Data…”). The information would then be used to publish the data to the public as “national case surveillance data” and send the information to the W.H.O. as required (CDC, “FAQ: COVID-19 Data…”). This “chain of information” method is not without fault as having local and state governments as a middleman for information creates opportunities for falsifying information such as skewing the number of infected individuals as well as the number of COVID-19-related deaths.

## RELIEF ACTS/FUNDING

On March 6, 2020, The first act signed into law, The Coronavirus Preparedness and Response Supplemental Appropriations Act, distributed $8.3 billion to various federal agencies, such as Central for disease control (CDC), to mobilize and lay the groundwork for fighting the virus on multiple fronts (Lowey). The second act, the Families First Coronavirus Response Act was signed on March 18, 2020 (Lowey). It dealt with the issue of COVID-19 spreading within the United States and its ramifications, and presented guidelines for offering help to families for nutrition, insurance coverage for virus testing, unemployment, and sick leave (Lowey).

During the pandemic, with brutal demands falling on the shoulders of all healthcare providers, the federal government stepped in to support their vital role and keep the system functioning. The Provider Relief fund was part of the CARES ACT created to help hospitals and various providers nationwide to fight Covid-19, an effort that has severely strained their resources and proven quite costly (CDC). When factoring in the revenue loss related to lower hospital admissions and the system-wide postponement of all non-urgent care and procedures, it becomes evident the relief funds were crucial to stabilizing the healthcare network and even in keeping some hospitals open. The same issues also impacted outpatient clinics and physicians’ care. Subsequently, to the CARES ACT, the Provider Relief fund was funded by the Paycheck Protection Program, the Health Care Enhancement Act, and the Consolidated Appropriations Act, 2021 for a total amount of $178 billion dollars (HRSA).

In the first round of payouts and in an effort to give fast access to funds, the Health and Human Services Department (HHS) gave grants to providers that are enrolled in Medicare and based the allocated dollar amounts on their reported annual patient revenue times at least 2% (Courtney). This approach created inequities in the allocation of funds as it left out Medicaid and CHIP providers, who did not contract with Medicare and tended to serve the most vulnerable populations (Courtney). Also, the major source of payments to health care providers come from Medicare, Medicaid, and private insurance. Private insurance reimbursed providers at a higher rate than Medicare and Medicaid (Courtney). And since the relief funds to providers were allocated as a percentage of revenue, which resulted in bigger and wealthier institutions receiving higher payouts than smaller institutions that had lower cash reserves and an urgent need for assistance. The Phase 4 fund allocations made changes to eligibility which aimed to target smaller providers who tend to help vulnerable populations and included a bonus payment to providers who were enrolled with state Medicaid programs, and state CHIPS between January 1, 2019, to December 31, 2020 (Courtney).

The American Rescue Plan (ARP) addressed the needs of rural healthcare providers who contracted with Medicare, Medicaid, and CHIP (White House). $8.5 Billion was allocated to rural needs and included a wider range of providers such as hospice, in-home health, health clinics as well as suppliers (White House). Safety Net providers who offer care regardless of the ability to pay and care for mostly the uninsured received funding, such as reimbursements for testing and telehealth (Biden). Several healthcare providers qualified for funds under the Paycheck Protection Program which were part of The CARES ACT aimed at small businesses and allocated loans to employers that could be forgivable on the condition of keeping their employees on payroll and abiding by a list of requirements (Biden).

Other strategies the federal government used to put more money in the coffers of healthcare providers were temporary changes to Medicare payments such as increased reimbursements and the suspension of sequestration which is a Congress budgetary rule that triggers a 2% reduction in Medicare payments, all provisions afforded under the emergency declaration act (Green). Medicare reimbursements related to COVID-19 inpatient hospitalization increased by 20% (Green). Increased reimbursements also targeted vaccine administration and Covid testing costs. Title III of the CARES ACT was all about “supporting America’s Health Care System in the fight against The Coronavirus” with six subtitles A through F each targeting a crucial pillar from health, education, labor, and finance provisions to tackling supply chain issues, inspiring innovations, addressing labor shortages and over the counter drugs (Guthrie). All these provisions existed and continued in conjunction with the national emergency declaration (Guthrie).

The Department of Defense, with the help of Human Services (HHS) and the U.S. The Department of Health agreed to sign a $2.2 million dollar contract, with the aim of increasing the production of masks for the United States (Department of Defense). This funding was supported by the CARES Act and was set to ensure the supply chain. It was set to begin in August 2020 (Department of Defense). These organizations collaborated with Hollingsworth & Wove and vowed to make 3.1 million N95 respirators per month as well as 27.5 million N95 ventilator filters available to the public (U.S. Department of Defense). After the CDC recommended that masking is an essential step in the fight to eradicate COVID, President Biden announced that he will deliver a total of 25 million masks to 1,300 Community Health Centers around the nation (DHHS). On top of that, he also committed 60,000 masks to soup kitchens and food pantries, specifically to those who were the most vulnerable (CDC). These centers tend to cater to lower-income populations with greater needs and typically, over half are part of a racial or ethnic minority (CDC). Also, 1.4 million people in that community were homeless (CDC).

Although the US needed an estimated 3.5 billion “respiratory protective devices”[[3]](#footnote-2), only 42 million were stockpiled at the start of January (Bartoszko et al). With high prices for N95 respirators, it was recommended that further research in the comparative tests between N95s and surgical masks be conducted to investigate if surgical masks are an acceptable alternative in providing protection (Bartoszko et al). If equal to N95s in levels of protection, surgical masks could be a cheaper alternative that is easier to stockpile in large quantities.

The “Coronavirus Aid, Relief, and Economic Security Act” (CARES Act) was signed by President Trump on March 27, 2020 (Guthrie). Although the individual aid provided by the CARES Act did not directly pertain to medical intervention, it is nonetheless relevant as it eased some of the mental stress citizens were experiencing from the economic disruption to their livelihood, caused by the pandemic. With a two trillion dollar budget, its goal was to keep American workers employed and paid, to sustain the healthcare system, and to stabilize the economy (Green). The aid targeting individual households totaled $560 Billion dollars and was released in two ways (Green). As a one-time direct Economic Impact Payment of $1200 for every adult and $500 for every child based on a specific income threshold set by the IRS and based on certain income brackets, and as an additional $600 weekly payment for people receiving unemployment benefits (Guthrie). Although the benefits were helpful, people experienced delays when it came to receiving them. This impacted the most vulnerable populations who were living paycheck to paycheck with little to no savings (Guthrie). It was not enough to simply make funds available to citizens. Specific means for delivering these benefits to the most vulnerable were not considered.

On January 30, 2023, the decision to lift all emergencies related to the Covid-19 pandemic was announced by the Biden Administration (Biden). The national emergency and public health emergency declarations are set to end on May 11, 2023 (AMA). For the past three years, these emergency declarations allowed the federal government to change or relax some regulations affecting many health institutions in their effort to stop the pandemic. Also, they enabled Congress to pass legislation such as the Families First Coronavirus Response Act (FFCRA), the Coronavirus Aid, Relief, and Economic Security (CARES) Act, the American Rescue Plan Act (ARPA), the Inflation Reduction Act (IRA), and the Consolidated Appropriations Act, 2023 (CAA) (Biden).

All these provisions tied to the emergencies will either completely expire, change, or get extended. For example, any Medical care, vaccines, and testing relating to Covid-19 will require cost sharing for all Medicare beneficiaries and out-of-pocket expenses for the privately insured (AMA). For people enrolled in Medicaid or CHIP programs, coverage, and cost-sharing will vary by state (AMA). As for the non-insured, Medicaid will no longer offer any free services related to Covid-19 testing, vaccinations, or treatments (AMA). The pandemic has definitely highlighted the complexity of the healthcare system, and healthcare providers and citizens alike will need to be vigilant in navigating the updated regulations (AMA).

## COMMUNICATION DURING COVID-19

Communication during a pandemic is vital to the success of pandemic preparedness policies; what good is a plan if no one listens to it? The government of any country must be able to clearly present to its people the plan for dealing with the pandemic and why that plan should be followed by showing through research and evidence that the plan will work without overstepping the government’s reach. As such, part of the US’ failure during the COVID-19 pandemic can be attributed to a failure in communication between the government and its people. Even within the government, there were failures to communicate specifically between the CDC and the Trump administration. This internal failure first began after having released a plan on April 16th, for how states should reopen “calling for states or metropolitan areas to meet benchmarks like reducing COVID-19 cases or deaths before reopening or stopping mitigation strategies” that “top White House officials blocked a CDC document *Guidance for Implementing the Opening Up America Again Framework* that included detailed advice on how to safely reopen the country” which created the divide that would only continue to grow (CDC, “CDC Museum…”). This divide would further expand on July 15th, 2020 when Trump ordered hospitals to “stop sending critical information about COVID-19 hospitalization rates and equipment availability to CDC” and instead they should enter that information into “a new system set up by HHS using a private contractor, raising concerns over the politicization of public health, data, and privacy” (CDC, “CDC Museum…”). The failure of the government to work as a cohesive unit would only serve to create a split and create the politicization that concerns were raised over. The separation was completed with the White House effectively saying that the CDC should not be trusted despite its focus being solely on disease control and prevention.

Now that of course begs the question “Why politicize the pandemic when it was so detrimental to the health of the general public and the economy?” for which it must be pointed out that the politicization began much earlier with Trump’s downplaying of COVID-19 in the early stages of the pandemic. He openly admitted in an interview that he actively played down the severity of the pandemic saying “I wanted to always play it down…I still like playing it down, because I don't want to create a panic” (Summers). While it may be said that his intention was genuine, it is clear that the actual effect his words had were more damaging than they were beneficial. The effects of the Trump administration’s downplaying of COVID-19 are shown clearly through studies and polls such as one done by Quinnipiac University which found that “6 in 10 Republican voters were not especially concerned that the coronavirus would disrupt their lives” despite major disruptions taking place including total state shutdowns as well as lockdown orders implemented by the US government (Motta).

While the Trump administration had many moments in which what they said would negatively impact the US population as a whole, they are not the sole proprietors of misinformation during the pandemic. A portion of it came from predominantly right-wing, conservative news outlets such as Fox News and Breitbart (Motta). When comparing stories that contained misinformation it was shown by a Pew Research Center study that Fox News and Breitbart ran “3,839 stories that reference misinformation about COVID-19 in that time period, while mainstream outlets[[4]](#footnote-3) highlighted misinformation considerably less frequently (1,541 stories)” spreading almost double the misinformation of the mainstream media outlets (Motta). Some of the information spread were theories that covid had been created in a lab or that a vaccine had already been created by May 2020 and was being withheld from the public. A further study by the PWC showed that 22% of Americans believed covid was created in a lab and that 24% believed that a vaccine already existed (Motta).

CURRENT STRATEGIES/INNOVATIONS

In an effort to control the spread and minimize interactions between patients and healthcare providers, hospitals were innovative in the use of robots to deliver help in simple everyday tasks such as delivering PPE, samples to labs, and COVID tests. *Moxi,* the name of the robot invented to complete these tasks, was a rolling robot with one arm that was created to assist hospitals. Those are a few examples of the coming together of experts, professionals, and regular people, in a touching effort to help humanity survive the pandemic and its harsh consequences (Morgan).

By August 2020, COVID-19 was found to be the “3rd leading cause of death in the U.S.” (“CDC Museum Covid-19 Timeline”). The illness was affecting those living in rural areas tremendously. There were higher rates of infections, less testing, and more frequent chronic health conditions due to a lack of resources for treatment (“CDC Museum Covid-19 Timeline”). There was a 14% difference between rural and urban areas in rates of vaccinations. To combat this rising problem, the FDA issued another EUA for a COVID-19 testing method developed by the Yale School of Public Health which allowed for an increase in capacity and efficiency (“CDC Museum Covid-19 Timeline”). This method, called SalivaDirect, uses inexpensive reagents in order to bring the price to “1.29 to $4.30 per test” (Greenwood). If a lab is “CLIA certified and located within the United States” they are potentially able to use SalviaDirect (Greenwood). Despite the benefits of telehealth medical services, there are many ways in which rural communities continue to be disadvantaged when it comes to medical care; however, innovations in testing can help bridge the gap between these two populations guaranteeing better safety for all.

# FUTURE DEVELOPMENT

In the likely event of another pandemic, it is crucial to ensure that the healthcare system is better equipped to withstand the onslaught of a new infectious disease. When attempting to improve the healthcare system’s ability to mitigate the effects of a new pandemic, one must first look at strengthening the infrastructure of the healthcare system and implementing medical intervention measures that can be used during the outbreak of a new infectious disease. The second point that needs to be addressed is the creation of a more accessible and long-term database system that will help organize incoming information concerning diseases. A more comprehensive database will allow such information to be used in future bureaucratic and medical decisions. Finally, the last measure within the task force’s policy that is necessary for a successful pandemic preparedness plan is vaccinating the community.

Earlier this year, the Biden-Harris Administration announced that the US’s Office of Science and Technology Policy was initiating a new plan that would “Advance Open and Equitable Research '' across the US Federal government (OSTP). This policy would encompass the direct measures and administrations needed in order to prevent another unorganized pandemic such as COVID-19. This policy would also help make sure that in the long run, the US will continue to build on its network between the scientific community and the government in order to produce a collaborative environment that will benefit the public.

The task force recognizes that there are important sub-categories and administrations within this new policy initiative that must be prioritized in order to create a United States that is better prepared for the next pandemic. These subcategories are as follows: the National Institute of Health’s policy on Data Management and Sharing which was finalized on January 25, 2023, the Commerce, Energy, Nasa, Defense Information Management Group (CENDI), and the Office of Management and Budget (OMB). By supporting these areas, the task force emphasizes how the healthcare, data, and scientific community are essential to building the foundation for the US’s pandemic preparedness plan. By supporting these administrations, the US will put more resources and support into the healthcare community, data collection, and management (and by default, research), and vaccination efforts will be increased. All of these aspects come together to form the necessary basis recommended by the task force for the improvement of US preparedness for future pandemics.

## HEALTHCARE AND MEDICAL EFFORTS

Although there are multiple ways in which the American populace can better prepare for a possible pandemic, the most prominent area of focus should be placed on strengthening healthcare and medical efforts. The efforts the task force will examine will range from a variety of topics such as international intervention models, accessibility of efficacious treatments, and increased collaboration between Global Health institutions. These efforts are not necessarily constrained to the medical field but rather highlight the necessity for broadening the US’s current healthcare system in order to optimize its ability to handle novel infectious diseases in the future.

The first effort to be examined is the various international intervention models in response to past pandemics, and what has been most efficacious. By analyzing which responses were most effective for which countries, the task force should be able to ascertain which model would be most effective for America, and how the healthcare system may be improved upon moving forward. In the article, “Ranking the effectiveness of worldwide COVID-19 government interventions,” authors Nina Haug et al. examine 79 territories’ NPIs (non-pharmaceutical interventions) and their corresponding reproductive rates of COVID-19. They found that early and comprehensive interventions, including school closures, lockdowns, and travel restrictions, were more effective in controlling the spread of the virus. However, they also added that the effectiveness of interventions varies widely across countries and was associated with factors such as a strong public health system, effective communication, and low levels of corruption. Ultimately, they concluded that less disruptive and less costly NPIs (such as social distancing) can be just as effective as drastic NPIs (such as national lockdowns). (Huag, et al.). This article highlights the importance of coordinated and comprehensive global responses to pandemics and the need for countries to invest in their public health systems and communication infrastructure.

This article sheds important light upon the drawbacks of the current US healthcare system, but it, more importantly, highlights that there does not need to be an upheaval of the US’s current social system. While the article claims that countries with more universalized support such as healthcare and public schooling were more efficacious in early intervention, they also explained that less disruptive NPIs can still be as effective as drastic ones. This evidence is of benefit to the American healthcare system, as often pandemics, especially those that are airborne, have a very fast infection rate. If another pandemic were to occur in the near future, America obviously would not have the time and resources to pass universal healthcare, so an efficient first response may be to encourage NPI until a more comprehensive plan can be taken into action.

While America is not lacking in its medical efforts, the main issue to be mitigated is the accessibility of treatments when they are developed. In the article, “A practical treatment for COVID-19 and the next pandemic,” authors Jahar Bhattacharya et al.discuss two new antiviral drugs that appear to reduce the development of serious disease when given to patients just diagnosed with COVID-19. However, the article adds that these drugs will be expensive for those living in more developed countries, while those in less developed ones will not have access at all. They additionally add that, “For the next pandemic, as with the current COVID-19 pandemic, it is unlikely that people in resource-poor countries (where most deaths will occur) will ever get new vaccines and antivirals in time to significantly reduce mortality” (Bhattacharya et al.). While this serves as a grim reminder of the unfortunate price tag on health, the authors explain that there is hope moving forward in order to make these treatments more accessible.

They found that severe COVID-19 is dominated by endothelial dysfunction, which can be mitigated by ACE inhibitors and angiotensin receptor blockers. These treatments essentially target the host response to infection and excessive inflammation through the usage of repurposing inexpensive generic drugs. These drugs are familiar to practicing physicians everywhere and should be available in any country with a basic healthcare system. While the US is considered a developed country, there are many areas within it that have lacking access to proper healthcare, especially in rural and/or historically underprivileged areas. Perhaps the key to treating future pandemics is not to invent a new cure but rather to take the inexpensive resources that are accessible to most and rework their chemical makeup into a new form of treatment.

The CDC also labels treatment accessibility as one of the tenants of pandemic response, while drawing attention to how pandemic treatment should be commonplace. In “CDC Strategy for Global Response to COVID-19 (2020-2023)” they listed the acceleration of equitable access to COVID-19 vaccines as a priority of pandemic response. Furthermore, they aimed to integrate COVID-19 vaccines into health systems while minimizing disruptions to other routine immunizations and health services. This could look like offering COVID-19 vaccines as part of standard yearly immunizations in order to ensure they are widely available and received. Essentially, the US’s medical systems could better treat pandemics by including immunization and treatments as part of routine checkups.

The final effort to be examined is the effect that globalization can have on the accessibility and efficacy of pandemic preparedness. Authors Thomas Sors et al*.* argue for a more globalized healthcare system in their report, “Reciprocal Innovation: A new approach to equitable and mutually beneficial global health partnerships.” The authors discuss how global health researchers often discount mutual learning opportunities which leads to a lack of understanding of how to make treatment for pandemics accessible to low-income areas all around the globe. They claim that the mistakes of the past can be rectified through a concept called “reciprocal innovation” in which the exchange of knowledge and ideas is open to global collaboration. The authors cite that the success of AMPATH (Academic Model for Prevention and Treatment of HIV/AIDS) in Kenta resulted in several innovations being “brought back” to the US. Already, the Indiana CTSI-Global company hosts annual meetings of multinational researchers in order to promote the bidirectional flow of innovations; however, it would be a great benefit if these efforts were to be expanded. Because the nature of a pandemic is that it’s global, those of us in the US would see much benefit from collaborating with non-US entities. To assume that the US has the only/best treatments available would be an overly nationalistic and naive claim, as the AMPATH research has shown that the US can gain great benefit from global collaboration in the healthcare system.

The authors of “Ethical and Legal Considerations in Mitigating Pandemic Disease” echo this sentiment, as they analyze the ethics of mitigating a pandemic, and the importance of a global plan to this end. The authors explain that the US already depends on fast-moving global markets in the economic sector and that government officials often falsely promote pandemic planning through the private sector (such as insurance) to serve as a proxy for recognizing the true reliance the US has on the global market. They go on to examine other national organizations that have already aided in pandemic preparedness, such as the World Bank and the United Nations Children Fund, and how they are able to equitize pandemic preparedness through resource allocation. The US still has many underprivileged communities that struggle with food insecurity and healthcare accessibility. If the federal government were to openly collaborate with international healthcare systems and open the channels for bidirectional innovation, the US would be able to make pandemic preparedness and treatment more accessible.

## ADDRESSINGMENTALHEALTH SUPPORT FOR FRONT-LINE WORKERS

Looking back at the COVID-19 pandemic, many of the weaknesses of the US pandemic management system were exposed. The US saw issues such as the delicate balance between patient intake, PPE, and the challenges faced by primary healthcare workers only to name a few. Specifically, these healthcare workers have to deal with demanding schedules and emotional stress, which can lead to rapid burnout and a shortage of workers when they are most needed. An article from Unicef highlights the necessity of implementing a robust emotional support system for primary care, as without healthcare workers, there could be no pandemic response (Unicef, “How to Improve Primary Health Care”). Healthcare workers experience high rates of psychological distress and PTSD, and not only should they be supported in their physical health by ensuring they are among the first groups to receive vaccines, but there must also be steps taken to support their mental health.

Other countries, such as Sweden, have implemented effective mental health support systems that have been observed to relieve stress in healthcare workers (McCracken). Enforcing such interventions will help to prevent and reduce psychological distress in healthcare workers during future outbreaks. To this end, the US can also proactively prevent the burnout of frontline healthcare personnel, allowing them to treat those affected by a novel disease outbreak in a more efficient and effective manner (BMJ 369). One of the under-addressed aspects of pandemic preparedness is proactively preventing burnout in healthcare workers. The US should prioritize the issue of burnout in healthcare providers as part of its pandemic preparedness plan, especially because of the US’s position as one of the most densely populated countries in the world. The US’s dense population means that diseases may spread faster, which can lead to a higher number of individuals in hospital care and a larger amount of healthcare workers required. Some other aspects of the healthcare industry that could be improved upon include creating a healthy and more collaborative work environment when it comes to dealing with stressors in the workplace. This can be done through implementing a routine mental health checkup for those who work with patients, as well as making sure that they have easy access to mental health support within and outside of the hospital, even when there is not a pandemic (Billings 923). Without a proper support system for these healthcare workers, the US will see faster rates of burnout in future pandemics, and therefore a less effective pandemic preparedness plan.

## DATA MANAGEMENT DURING A GLOBAL HEALTH CRISIS

A necessary basis for preventative care and treatment for combatting future pandemics is ensuring that the US has a data management system that is comprehensive in order to provide clinicians, researchers, and government entities with structured and organized access to a myriad of information and statistics. Having this structural pyramid of data is the backbone of future success in mitigating and preventing infectious diseases because of its wide implications in the sectors of healthcare, research, and policy that are all aided by such medical technology.

As mentioned previously, the shortcomings of the United States healthcare system were further exaggerated by the COVID-19 pandemic. But, during the COVID-19 pandemic, there were many strategies created and practiced that can aid in the improvement of the US healthcare system in the future. This includes issues of transparency, patient privacy, testing, and data collection. Examining the policies implemented by government officials, healthcare executives, and health departments, can also provide guidance for areas of focus for future healthcare policies. One such implementation into the healthcare policy has to do with data associated with the health-science community acting as a pillar of support for the US healthcare system moving forward (Kizer 469-493). The importance of data dashboards in visualizing and analyzing COVID-19 data is immeasurable when it comes to gathering an abundance of data and making it useful. It highlights successful strategies including collaboration with stakeholders and continuous monitoring and improvement.

One such software that was heavily utilized by more than 70 countries during COVID-19 was the District Health Information Software (DHIS2). Its main facets include a health information system for aggregate and case-based data, contact tracing, ports of entry, analysis, mapping, dashboards, and mobile data collection (DHI). However, there is a need for clear communication and user-friendly interfaces within this technology to ensure that the dashboard is accessible to a wide range of users. These data dashboards can play a critical role in informing decision-making and promoting public health during pandemics. Because of this, efforts to work on this technology and make it more user-friendly will be beneficial as the scientific community continues to harness and organize data during an age of emerging infectious diseases that will continue to arise in the future (CDC, “CDC Strategy for Global Response”). By using this pre-existing software created for the COVID-19 emergency, the US is better prepared technologically to function with a more detailed network of “openly shared” research information that will be useful in mitigating the spread of infectious diseases in the future (Ma 127-129). This software can easily be integrated by hospitals into their IT system and thus, can be consistently utilized as a default method of entering data and information which can be analyzed on a consistent basis and provide meaningful information that will serve the public’s interest.

Standardizing data collection and reporting is crucial for accurate and efficient analysis. Inconsistent data collection methods and reporting standards lead to errors and delays in detecting and responding to outbreaks (Galaitsi et al. 102352). To address this challenge, efforts must be made to develop clear guidelines for data collection and reporting, as well as mechanisms for ensuring compliance with these guidelines. Developing standardized protocols and procedures for data collection and reporting can help improve data quality and reliability. This can be achieved by establishing clear guidelines for data collection, establishing a centralized data repository, and implementing quality control measures to ensure data accuracy.

Improving data sharing and transparency is another challenge that needs to be addressed. Data must be shared across organizations, regions, and countries to enable effective decision-making. However, privacy and security concerns often limit data sharing. Developing secure data-sharing mechanisms and protocols that balance privacy and security concerns with data accessibility is crucial. This can be achieved by implementing privacy-preserving data-sharing protocols, developing secure data repositories, and establishing clear data-sharing agreements between organizations (Donnelle et al., 10).

As the COVID-19 pandemic sparked a global state of emergency, digital technology became a vital tool for many countries to perform rapid contact tracing via smartphones. Contact tracing is not new, as it was performed in historical pandemics such as the bubonic plague and the HIV crisis. In the past, this contact tracing was carried out through a more analog system where infected patients were asked to recall who they had last been in physical contact with. Because COVID took place in a more modernized world, societies such as South Korea, which had experienced the MERS outbreak in the past, passed legislation that would permit health authorities to gain temporary access to individuals’ geolocation in order to efficiently perform contact tracing methods (O’Connell et al. 484-487). Although this may pose ethical protests in the future of performing contact tracing, it is a necessary measure that emerged early on in the US when the COVID-19 pandemic was beginning. Apps such as “COVIDAlert” were quickly adopted by East Coast states and were used as a supplementary non-pharmaceutical intervention (NPI) measure to prevent the fast spread of covid within the community (Akinbi et al. 18). As of now, these kinds of apps are not popping up as quickly as they were at the beginning of COVID-19, but it is an important NPI medical technology that will help manage, control, and identify those infected in future pandemics. This means that it is important to look into the maintenance of these apps, make sure that they are as accurate as possible when it comes to contact tracing and authorize government funding for public medical technology innovation that can be used as one of the first measures used when an emerging infectious disease outbreak arises. Because this technology already exists, the most efficient way to use current resources is by updating the software, integrating artificial intelligence, and testing it to ensure that it will produce even more accurate results in the future (Pham et al. 1308).

## VACCINE DEVELOPMENT AND DISTRIBUTION

Since their first use in 1796, vaccines have proven to be effective and crucial in combating viral and bacterial infections. Polio, which ravaged many countries in the mid-nineteenth century, has been almost eradicated thanks to the widespread use of the polio vaccine. To ensure the containment and prevention of viral and bacterial diseases, vaccination must be effectively implemented in as many communities as possible. In order to ensure this, the development and distribution of a vaccine must be swift. In 2021, the White House released a proposal titled *American Pandemic Preparedness: Transforming Our Capabilities* that outlines policies to be put in place to ensure the US is capable of effectively combating another pandemic. In this proposal, vaccine development and distribution is the first subject that is focused on. It calls for vaccine development to begin rapidly, within a hundred days of a possible pandemic-causing threat being identified. After development, the proposal also encourages vaccine production within a hundred and thirty days and two hundred days after a threat has been identified (White House). The proposal also mentions researching alternative vaccination methods such as skin patches or nasal sprays. This would, theoretically, ease the process of distributing the vaccine by removing the use of needles as well as increase the availability of vaccines for the general public.

While vaccines are designed to harden the body’s defenses against specific viruses and bacteria, it is possible that other diseases can be affected by those vaccines. In 2020, a paper led by Kiddus Yitbarek looked into the possibility of the Bacillus Calmette–Guérin (BCG) vaccine’s ability to protect against COVID-19. The BCG vaccine was designed to vaccinate against tuberculosis. However, Yitbarek and his team reviewed several previous studies concerning the other effects of the BCG vaccine and found that it generally raises the immunity of those who were vaccinated against other respiratory tract infections. In the case of COVID-19, a respiratory disease, it was found that countries that implemented BCG vaccination policies had fewer deaths per million from COVID-19 than those without BCG vaccination policies (Yitbarek et al.). It is possible that, for the next pandemic, some already existing vaccines might be able to partially mitigate the effects of a new disease. Until a vaccine is designed to specifically target this new disease, it might be in the nation’s best interest to investigate possible existing vaccines that could partially defend against the new disease and distribute them to those most vulnerable, such as children or the elderly.

In the case of any vaccine distribution, major strides will have to be made in order to increase the efficiency of distributing vaccines as compared to the COVID-19 pandemic, both on a national and international level. In May 2020, Operation Warp Speed was put into effect, which outlined strategies that would reduce the amount of time needed to develop a COVID-19 vaccine. Such strategies included overlapping the various phases of testing and allocating more resources to vaccine development. In under a year, vaccines were developed and ready for manufacturing.

One of the first stumbles seen in the vaccine distribution process was the number of vaccines that are being manufactured. By January 2021, vaccines were being manufactured at a rate that would require an entire year's time to be able to produce enough vaccines for the entire US population (Wilcox). Eventually, vaccine manufacturers were able to produce vaccines at a more effective rate by March 2021. However, if an adequate amount of full vaccine doses are unable to be manufactured and distributed effectively, it would be beneficial to research dose sparing. Dose sparing involves administering a fraction of the standard vaccine dosage with the goal of still effectively immunizing that person. A yellow fever epidemic hit Angola and the Democratic Republic of the Congo and both countries were facing vaccine shortages. To immunize a great portion of their populations, the vaccines were given in fractional doses, resulting in seven million people being able to receive vaccination. In a future pandemic, in the event that an area faces vaccine shortages, which is almost inevitable, research into effective dose sparing could be vital in ensuring that most people are able to be vaccinated.

One of the biggest challenges to overcome in vaccine distribution is hesitancy towards vaccines. With a substantial number of people following the “anti-vax” movement, being able to effectively vaccinate a population can be difficult when a large number of people are not willing to receive the vaccine. In February 2021, forty-four percent of adults in a survey were either hesitant in receiving the vaccine or refused to receive it (Wilcox), even if the vaccine became mandatory. While it may seem disheartening that a large portion of the American population is unwilling to get vaccinated, there has been a trend of people who were hesitant at first eventually getting the vaccine (Lutrick et al.). This can be attributed to seeing people close to them get the vaccine, as well as effectively educating the public on the topic. While more people are accepting the vaccine as time goes on, there is still a portion of the population that has stayed adamant about not receiving the vaccine, with the majority of these people being white Republicans (Wilcox).

Another problem faced during vaccine distribution in the US was the disparity between the vaccination of white Americans and minority groups. Despite having some of the highest mortality rates from COVID-19, black and Hispanic Americans received far fewer vaccines than white Americans (Wilcox). Many factors could be responsible for this inequity, such as immigrants needing to provide personal information which could lead to them being outed as undocumented, or due to wealthier white people receiving vaccinations from distribution sites meant to serve minority-populated areas.

Moving away from the US, it is vital that, on an international level, vaccines are effectively distributed to as many countries as possible. One of the problems faced during the COVID-19 pandemic was the unequal distribution of vaccines between wealthier and poorer nations. Countries with developing economies were only able to purchase enough vaccines to suit a small fraction of their population, while wealthier countries often bought in excess (Brown et al.). Many countries producing vaccines were also reluctant to share their supply with other countries, prioritizing their populations before moving on to other countries (Brown et al.). While it makes sense that a nation would want to ensure its people are provided with safety from disease first, keeping the vaccine restricted to one area would have disastrous results for everyone. An example comes from the Brazilian city of Manaus, in which those governing the city tried to rely on herd immunity to keep the population healthy. Ultimately, many ended up becoming reinfected, spawning a new COVID-19 variant (Brown et al.). By not effectively distributing vaccines to areas in need, it runs the risk of letting variants of the disease come into existence, which could even affect those who are vaccinated. Countries need to cooperate in order to ensure that vaccines are distributed around the world, ensuring that resistance against a new pandemic disease is high enough to halt the spread and lower the risk of mutations.

## ADDRESSING LONG-TERM ILLNESS

As the COVID-19 pandemic continued, many people who were infected suffered from symptoms that continued long after the initial infection. What became known as “long COVID” describes a myriad of symptoms that range in intensity. For some, these symptoms can develop into lifelong challenges. Even after the initial infection, it should still be in the interest of the United States to address and take action towards assisting those affected by long-term symptoms of a disease, especially in the case of a pandemic.

It is possible that long-term symptoms can keep someone from living their regular life. Jobs that were once stationed by healthy individuals might be left empty due to lasting complications from a pandemic disease. In order to ensure that these individuals are able to live without having to rely on income from their job that they can no longer perform, it is vital that they have access to both paid sick leave and social security disability insurance benefits (Congress, *Understanding and Addressing Long Covid*). It is possible that some jobs can still be done remotely, which could let some with long-term illness continue to work, however, this is not the case for every position. Ensuring that those affected are still able to acquire income through both their employer and the federal government will ease the burden of dealing with debilitating symptoms.

A problem facing current medical practitioners dealing with long COVID is actually being able to reach patients experiencing symptoms. Since the cause of long COVID is still unknown, patients are treated based on their specific symptoms rather than a universal treatment. If a pandemic in the future results in similar long-term complications, it is crucial that medical professionals are able to address the specific symptoms that people would be suffering from. Reasons for professionals being unable to reach some patients include the fear of being reinfected or the simple inability to physically meet with a medical professional. A possible solution to this could be through using a digital medium to treat patients. By removing the need to meet with a patient in person, medical professionals can treat those who might be unable or unwilling to leave their homes. Through digital interventions, it is possible that more people would be able to have their long-term illnesses treated (Rinn et al.).

# POLICY RECOMMENDATION

Throughout the last three years, the COVID-19 pandemic has left almost everyone affected in some way. The lives of loved ones, friends, and colleagues were taken by the disease, many of which could have been considered preventable. In the case of a global pandemic, it is critical that any governing body takes the necessary steps to prevent as many deaths as possible. This involves coordination between the government and its people, major pharmaceutical companies, and other nations around the world. The goal of the proposal the task force created is to ensure that, in the case of another pandemic, the United States, or any nation, is able to effectively and efficiently keep its population safe from any new infectious disease.

As the task force supports the active Open Science plan brought about by the Biden-Harris administration earlier this year, in relation to pandemics, the most immediate action to be taken in the occurrence of an emerging infectious disease pandemic would be to employ non-pharmaceutical intervention (NPI) measures. The more efficient communication and research behind NPIs would only be possible by deploying the newly created “Fifth US Open Government National Action Plan” that ensures that the US government provides more information to the public (The White House). This is crucial especially when it comes to emerging diseases and how the public should proceed as a collective with the government. Depending on how rampant the spread of a disease currently is, the NPIs used could range drastically. However, many of the less intense NPIs that were standard during the COVID-19 pandemic, such as social distancing and working from home, could be just as effective in preventing the spread of disease. Encouraging simple NPIs could be a great starting point in early pandemic control. This would go along well with the proper distribution of personal protective equipment. In order for this to happen, the task force recommends generating a cooperative community between the scientific and governmental communities. This is almost exactly what the White House’s new plan outlining the coming changes to “Open Science” does. One such measure that the task force believes is dire to preparing for future pandemics that are not touched upon in the White House Open Science Plan is making sure that the healthcare system is provided with the necessary medical equipment for an emergency and giving them enough support in order to maximize their ability to help fight against any emerging infectious disease.

All of this needs the foundation of an accessible and organized database system for the emerging disease in order for a better understanding of the disease; how it transmits, how many people it affects, and when and where. This would be most useful if, during a pandemic, the US agreed to have open communication with other countries (OSTP). Within the new ‘Open Science Policies’ Plan one of the sub-categories includes the NIH’s final policy on Data Management and Sharing (NIH). This is a big step in making sure that the US is prepared for future pandemics because it increases accessibility to nationwide and government information.

It is paramount that vaccines be safely yet swiftly developed to combat the spread of an ongoing pandemic. As laid out in *American Pandemic Preparedness: Transforming Our Capabilities*, vaccines are to be worked on as soon as within a hundred days of a pandemic threat, with domestic production occurring a hundred and thirty days after the recognition of threat and international production occurring two hundred days after. Under a plan similar to Operation Warp Speed, which sped up vaccine development considerably, vaccines can be ready to be produced and distributed as early as possible. As development and production occur, research into the effectiveness of already existing vaccines in combating a new pandemic threat should be done. As seen with the BCG vaccine’s ability to prevent high rates of infection of COVID-19, it would be beneficial to find and distribute any vaccine that could combat an emerging disease.

Once a vaccine is approved, production should be swift to ensure that anyone who wants to be vaccinated is able to. If vaccine production underperforms, it might be necessary to ration vaccine doses to ensure that as many people can at least be partially immunized to the disease. It is also important that people are actually able to access the vaccine. Many of the people that were not vaccinated during the COVID-19 pandemic were either unwilling due to mistrust of vaccines or from needing to provide personal information in order to receive the vaccine. While trust of the COVID-19 vaccine increased over the course of the pandemic, it is still vital to effectively communicate the effectiveness of a vaccine. To ensure that those who are worried about sharing documentation, the need to provide sensitive personal information should not be required. Vaccines are able to prevent the spread of disease only if as many people are vaccinated as possible, so eliminating the fear of revealing sensitive information will be beneficial in vaccinating a population.

While securing vaccines and effectively vaccinating the US population is essential, the worldwide need for vaccination can not be ignored. It is the duty of every country to assist one another in vaccine development and distribution to ensure the spread of any pandemic disease is as low as possible. Even if a country were able to vaccinate its entire population but other countries are unable to, the proliferation of the disease in those countries can still affect the vaccinated country. As the disease spreads, it can mutate and possibly become resistant to the current vaccine, compromising the work done by that vaccinated country. Nations need to work together to ensure that vaccines are distributed to as many corners of the world as possible.

Concerning the issue of long-term illness, it is important that those afflicted are provided access to their necessary resources. Many facing long-lasting effects of a pandemic disease might not be able to work on location, forcing them to work at home. For others, they might lose the ability to work entirely, in which case they should be compensated through social security disability benefits. For those who are too sick/are at risk of becoming more ill from leaving their home, it is possible that, over a digital medium, doctors can help patients through their illnesses. Removing the need for doctors and patients to communicate in person will provide medical access to many people around the country. This method would be most effective if as many people as possible were able to access the internet, which is still out of reach for many Americans. There will need to be a major focus on expanding internet access to more rural parts of the country.

Not only must nations increase cooperation in order to appropriately distribute vaccines, but it is also of the utmost importance that countries prioritize globalizing pandemic research. As described in “Reciprocal Innovation: A new approach to equitable and mutually beneficial global health partnerships,” global health researchers are able to provide novel treatments for emerging diseases when given opportunities to collaborate with scientists all around the globe. The “pan” in “pandemic” refers to the fact that an emerging disease can affect the whole globe, so in order to better develop a treatment, it would be in the nation’s best interest to increase lines of global collaboration. The benefits of doing so are that a bidirectional flow of innovation can increase the speed and efficacy by which a treatment for a disease can be developed, as well as increase shared knowledge about a disease.

Another benefit to increasing international collaboration is that it may also increase the accessibility of treatments to those in underserved areas. The authors of “Ethical and Legal Considerations in Mitigating Pandemic Disease” explain how pre-established national organizations such as the United Nations Children Fund are able to equitize pandemic preparedness by reallocating economic resources. If there was increased global collaboration, the US may be able to establish more national organizations that could aid in the effort of delivering treatments to areas that may not be at the forefront of the supply chain.

Increasing treatment accessibility should be another major priority, as pandemics are only able to be mitigated if the majority of people utilize immunization and other forms of treatment. There are many areas in the US in which certain communities are lacking access to pandemic treatments; this problem is so pervasive that the CDC listed the acceleration of equitable access to COVID-19 vaccines as a priority of pandemic response. In order to properly respond to pandemics, the US must include immunization as part of routine checkups and ensure these treatments are widely available to all. In “A practical treatment for COVID-19 and the next pandemic,” the authors explain that one way to do so is to utilize commonly available and cheap drugs in order to create cheap and accessible treatments. The key to treating future pandemics is not to invent a new cure but rather to take the inexpensive resources that are accessible to most and rework their chemical makeup into a new form of treatment.

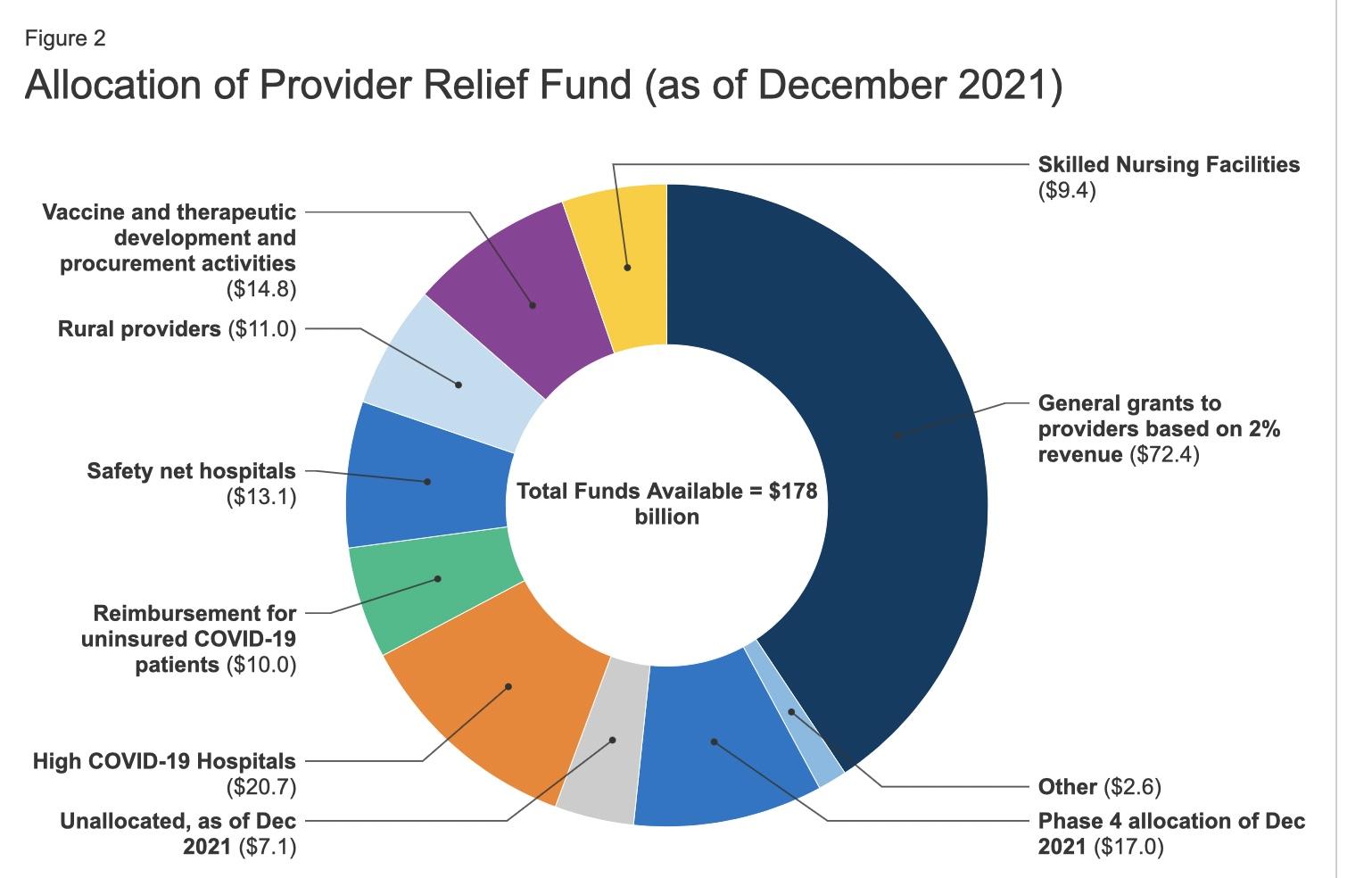


Figure 1 Pie Chart illustrating the allocation of funds The Provider Relief Fund

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1. That is 98% of cases [↑](#footnote-ref-0)
2. Abbreviated as FE. [↑](#footnote-ref-1)
3. Surgical Masks and N95 Respirators. [↑](#footnote-ref-2)
4. The “mainstream” outlets were *The New York Times* and *USA Today* as these four outlets were chosen based off their high rated popularity in their respective markets, with NYT and USAT were the top rated mainstream outlets where Fox and Beritbart were the top rated right leaning outlets. [↑](#footnote-ref-3)