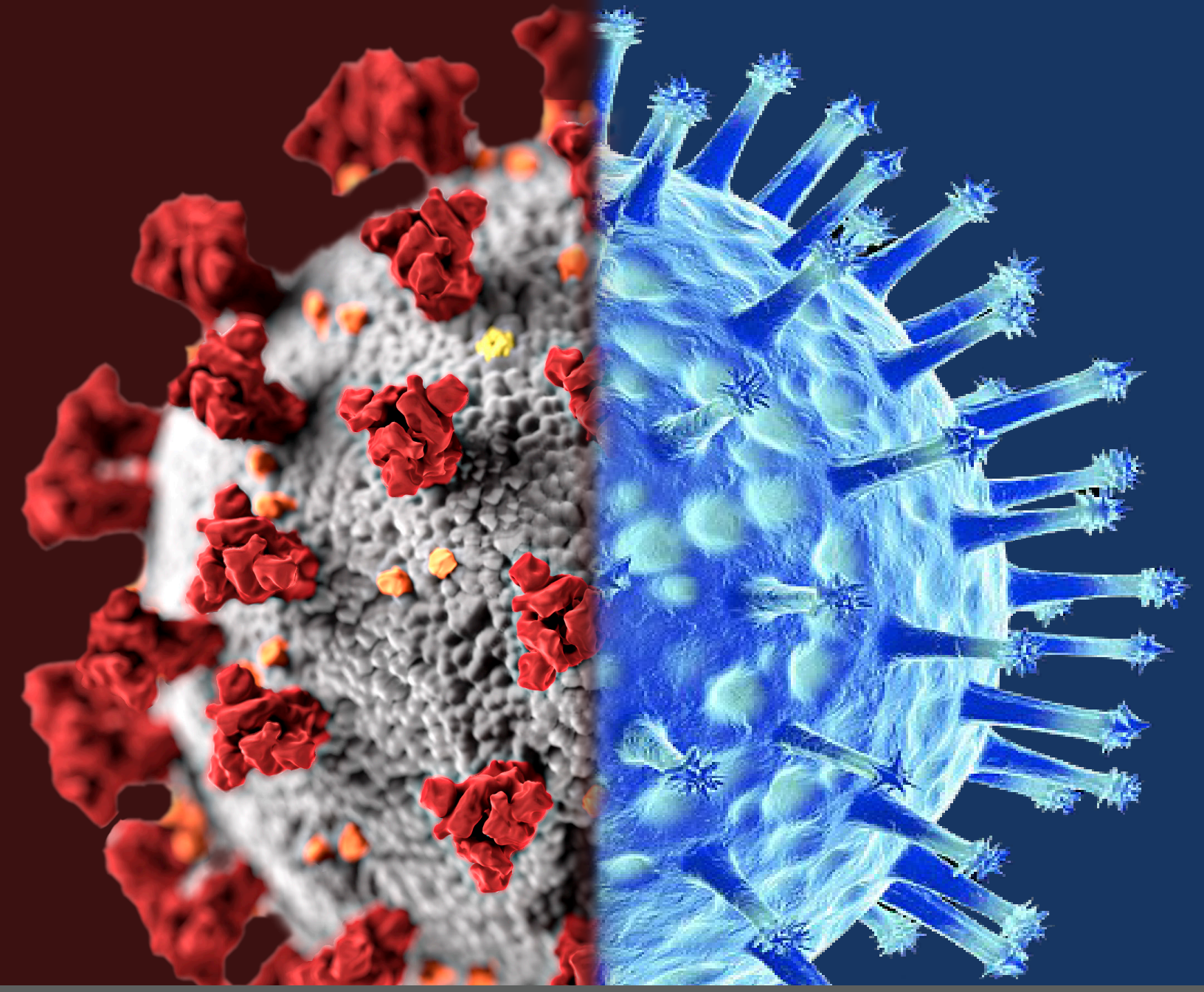
COVID-19 AND SEASONAL INFLUENZA: PREPARING FOR A COLLISION



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Introduction

On December 31, 2019 China reported a cluster of pneumonia-like cases to the WHO Country Office. Though December 1, 2019 marks the earliest known date of COVID-19 symptom emergence, research by scientists at Harvard argues that the virus could have been circulating as early as August (Nsoesie et al., 2020). By early January, the confirmed cases of the disease appeared in countries around the world.

A great deal has changed since the initial Wuhan cluster was reported. As of this writing there are almost 18 million confirmed cases and almost 700,000 deaths globally. Some countries have been successful in controlling the virus and now walk a fine line of reopening and disease containment. Other countries are still struggling with rising cases and challenges related to hospital surge capacity, misinformation, availability of medical equipment, and economic implications.

In the United States there was a decline in daily case numbers and deaths following the initial crisis in New York, but cases have been increasing in recent weeks in the majority of states. Some states are seeing more moderate increases, while others are concerned that the surge could outstrip their containment capacity without another stay-at-home order.

As the country grapples with this new surge in COVID-19 cases, another potential crisis looms: flu season. Every fall and winter, seasonal influenza takes a devastating toll in the United States; particularly among those over the age of 65 and under the age of 5. Hospitals fill up with individuals needing respiratory support and schools serve as epicenters for community spread. The challenges of seasonal influenza alone are great, but when combined with the COVID-19 pandemic, many cities and states could find the impact overwhelming.

The purpose of this white paper is to bring attention to the current state of the COVID-19 pandemic in the United States, provide predictions for how the virus will spread in the fall, and discuss the typical issues and challenges surrounding seasonal influenza. Most importantly, this white paper makes several recommendations for how public health experts and government leaders can anticipate some of most likely challenges and prepare for them accordingly. These recommendations include: 1) increase influenza vaccination rates, 2) implement a face covering mandates at state and local levels according to CDC guidance, 3) increase sanitation measures and room ventilation in K-12 schools, 4) implement cardiovascular evaluations for professional and college athletes returning to practice after COVID-19 infection, 5) maintain social distancing measures, surveillance, and quarantine procedures for travelers, 6) develop vaccine infrastructure for the COVID-19 vaccine, 7) develop a vaccine education campaign to counter misinformation about influenza and COVID-19 vaccines, 8) further expand hospital capacity and production of medical equipment, 9) develop a national strategy for COVID-19 response, and 10) create greater data transparency at the local, state, and federal level for COVID-19 data.

The implementation of these recommendations will help to keep both seasonal influenza and COVID-19 at or below levels that are manageable for hospitals, public health officials, governments, and the general public.

Current State of the COVID-19 Pandemic

As of this writing, the COVID-19 outbreak has infected a confirmed 17,889,134 people and led to 686,145 deaths globally, but it is likely that these numbers are underestimates. Some countries have implemented containment measures that have successfully brought down the

number of infections, allowing their populations to regain a level of normalcy that includes sending children back to school and allowing sporting events with fans. Other countries have, thus far, been unable to contain the outbreak and are experiencing dangerous surges in case numbers. In this section, we will examine current case numbers and containment strategies, and discuss the expected case trend going into the fall of 2020. The purpose of this section is to provide context for the reality that the United States will likely face as seasonal influenza cases begin appearing in hospitals around the country.

Global Cases and Deaths

In the table below, we have outlined the case and death counts of the United States and its peer countries in Europe to provide an understanding of the outbreak among western, wealthy countries. In addition, this table includes Brazil and Russia due to their ranking of high COVID cases.

Table 1: Global COVID-19 cases and deaths, cumulative and per million

Global Cases and Deaths								
Country	United States	United Kingdom	Italy	France	Spain	Germany	Brazil	Russia
Population	331m	68.1m	60.5m	65.3m	46.8m	83.8m	212.6m	145.9m
Cases	4.5m	304k	247.8k	175.9k	288.5k	209.9k	2.7m	850.9k
Cases per million	13,843	4,477	4,098	2,695	6,170	2,505	12,739	5,830
Deaths	152.6k	46.2k	35.1k	30.1k	28.4k	9.1k	92.5k	14.1k
Deaths per million	464	680	581	461	608	109	440	96

*Table updated as of 10:35 am CEST on August 3rd, 2020.
**Population size, cumulative cases and deaths, and cases and deaths per million from January 11th, 2020 to August 3rd, 2020 (WHO, 2020b).

As of this writing, Italy has been the hardest hit European country during the COVID-19 pandemic. Initial cases appeared in Lodi and Padua, Italy at the end of February 2020 (Indolfi & Spaccarotella, 2020) and after a delayed declaration of the state of emergency, Italy implemented strict social distancing measures. The outbreak in Italy peaked in late March and has maintained an overall consistent decline since that point. To date the country has 4,098 cases per million and 581 deaths per million. The death rate in Italy was higher than the global average, an outcome which some have speculated is the result of its older population. Italy has the oldest population in Europe, with a median age of 47.3 (Rettner, 2020). Those over the age of 65 are far more likely to die from the SARS-CoV-2 virus, meaning Italy has a larger percentage of high-risk individuals than many of its peer countries.

While Italy's death toll is high, it is not the highest among the United States and its peer countries. To date, the United Kingdom has experienced 680 deaths per million and Spain has

experienced 608 deaths per million. While there is not definitive data on why the death toll in the United Kingdom ranks highest among its peers, some have argued that it is the result of a combination of factors including a lockdown that was implemented too late and a failure to test, contact trace, and isolate at necessary levels (Panovska-Griffiths, 2020).

With regards to cases per million, the United States has the highest count with 13,843. This is followed by Brazil with 12,739 cases per million. As of this writing, the United States is experiencing case increases in most states with Arizona, Florida, and Texas experiencing the largest surges. The trajectory of coronavirus cases in the United States is dependent on the steps that local and state leaders take now. Actions taken as cases surge today will have an important impact on the challenge of managing COVID-19 and seasonal influenza simultaneously in the fall.

A country that is not included in the above table but should be discussed is Sweden. Sweden took a markedly different approach than many of its peers and, as a result, has different case numbers and death counts than its neighbors. From the arrival of the first cases, Sweden chose to keep businesses and schools open, but to implement social distancing procedures. The Swedish people were able to proceed relatively normally with everyday life and there was a hope that this strategy would avoid the economic and social impacts that accompanied the lockdowns in other countries.

While this approach has allowed the Swedish people to continue a more normal life during the pandemic, it has not helped the country avoid the health and economic consequences of COVID-19. Sweden's deaths per million (568 per million) are higher than that of some of its neighbors, such as Denmark (106 deaths per million) and Finland (59 deaths per million). Deaths per million in Sweden are higher than deaths per million in the United States (464 per million), France (461 per million), Brazil (440 per million), Germany (109 per million), and Russia (96 per million). The outcome so far in Sweden suggests that required social distancing guidelines and stay-at-home orders have had a positive impact on reducing the number of deaths.

The table below shows the countries with the highest number of cases per million and countries with the highest number of deaths per million, globally. This differs from the countries with the highest number of cumulative cases and deaths because population size has been taken into account.

Table 2: Global COVID-19 cases and deaths

Global Cases (per 1 million)			Global Deaths (per 1 million)	
Country	Cases		Country	Deaths
Qatar	38,565		San Marino	1,235
French Guiana	26,278		Belgium	849
Bahrain	24,404		United Kingdom	679
San Marino	21,059		Andorra	675
Chile	18,818		Spain	608
Kuwait	15,900		Peru	589
Oman	15,500		Italy	581
Panama	15,384		Sweden	569
United States	13,844		Chile	503
Armenia	13,179		United States	465
Peru	12,804		France	462
Brazil	12,739		Brazil	440

*Table updated as of 10:35 am CEST on August 3rd, 2020
**Since the introduction of COVID-19 in countries varied, it is critical to recognize that the WHO COVID-19 Dashboard has various start dates for data collection of cumulative cases and deaths per million. Cumulative cases and deaths per million from WHO starting from January 20th, 2020 to March 10th, 2020 through August 3rd, 2020 (WHO, 2020c).

Global Containment Strategy Trends

Since the beginning of the pandemic, global containment strategies have varied by country. Some countries implemented strict lockdowns, while others created a patchwork approach, and some have implemented few restrictions. For those that did implement a lockdown, lifting the lockdown also followed different timelines. Some countries left their lockdowns in place for several months, while others began easing lockdown restrictions within a month.

Because countries across the world have taken different approaches to containing the spread of COVID-19, the results have varied. Vietnam was one of the first countries to report a COVID-19 case outside of China. One hundred days later they had 270 cases but no deaths. Their nationwide lockdown started on April 1 and ended on April 22. The four strategies Vietnam used to control COVID-19 included strategic testing, aggressive contact tracing using a mobile application where citizens could report their health status daily, innovative public communication campaigns, and fast development of testing kits.

Germany, like Vietnam, developed a national response strategy when cases were first identified. The difference between Vietnam and Germany, however, was that the national strategy has been implemented through decentralized local health authorities. Germany also had testing kits readily available and has thus far been able to contain clusters of cases that have emerged since lockdown restrictions were eased.

As of this writing, the United States has not implemented a national response strategy. Response strategies have varied by state. In Washington State, which had the initial case of COVID-19 in the United States, Governor Jay Inslee implemented a lockdown on the entire state despite resistance from some residents and local leaders. In Texas, Governor Greg Abbott initially deferred to the judgment of the local governments, but later transitioned to a statewide stay-at-home order. In Georgia, Governor Brian Kemp put the state on lockdown, but was also the first state to ease restrictions, doing so after approximately 3 weeks.

As of July 3, the state of Texas - which has experienced a surge in cases in recent weeks - has implemented a mandate that masks are required indoors and outdoors, when social distancing is not possible. Violations of this mandate carry a fine of up to $250. According to research conducted by Goldman Sachs, a national mask mandate would not only benefit the health of US citizens but would also have a positive impact on the economy. By implementing a national mask mandate, the nation would be able to ease other lockdown restrictions, ultimately saving the US economy $1 trillion (Hansen, 2020). Mask requirements have been one of the main differences in states that have lower transmission rates. This is especially true for states that require masks for everyone, not just employees. Several of those states have seen a 25 percent decline in COVID-19 cases across the last two weeks (BBC News, 2020).

As the United States works to contain the virus moving into the fall, the Director of the Centers for Disease Control and Prevention (CDC), Dr. Robert Redfield, says that expanding testing is critical to control of the virus (The New York Times Live Coronavirus Updates, 2020c). Expanding testing will require the investment of both personnel and financial resources. It will also require innovative thinking. On July 18, the US Food and Drug Administration (FDA) issued an emergency use authorization for sample pooling in diagnostic testing (FDA, 2020). Pooling involves combining several individual samples into a batch. If the batch tests positive, then each individual sample that was included in the batch can be tested to see which individuals are positive. This allows more people to be tested with the current level of resources.

Implementing state and local mask mandates in accordance with CDC guidelines and developing innovative routes to increase testing capacity are both ways that the United States can mitigate the impact of COVID-19 going into the fall. Without a reduction in daily cases counts and hospitalizations from the levels as of this writing, the combination of COVID-19 and seasonal influenza is likely to overwhelm our healthcare system.

The Challenge of Seasonal Influenza

The seasonal flu is an acute respiratory viral infection that circulates the world (WHO, 2018 and Paules C et. al., 2018). It usually circulates from the southern hemisphere, between the months of April to October, to the northern hemisphere, between the months of October to March (CDC, 2018a and Viboud C et. al., 2004).

Table 3: U.S. influenza case incidence, hospitalizations, and deaths, 2014-2018

	Incidence	Hospitalizations	Deaths
2018	35,520,883	490,561	34,157
2017	44,802,629	808,129	61,099
2016	29,220,523	496,912	38,230
2015	23,504,319	276,198	22,705
2014	30,165,452	590,869	51,376

Seasonal influenza infections, hospitalizations, and deaths vary year-to-year. Table 3 shows this variability across the last five influenza seasons with full data through the 2018-2019 season. Though incidence varied, hospitalizations averaged between 1 percent to 2 percent (1.2%-1.9%) of the influenza illnesses across all five seasons. The 2017 season was considered high severity while the 2018 season was considered mild severity.

It is approximated that 5 to 20 percent of people get influenza during the influenza season (Tokars, J.I. et. al., 2018). Influenza prevention relies heavily on seasonal flu vaccinations, which are made available every year in the United States in October. The number of people receiving seasonal flu vaccinations increased in 2018 compared to 2016 and 2017 vaccination levels. Even with this increase, however, vaccination rates were only 62.6 percent among children and 45.3 percent among adults in the United States (CDC, 2019).

Vaccine effectiveness determines how well the vaccine protects against and reduces the risk of a disease, in this case the flu (CDC, 2020e). In addition to variations in vaccination rates, the effectiveness of the seasonal influenza vaccine also varies from year-to-year. This is because the match of the influenza vaccine to the circulating influenza virus depends on which strain of influenza is the most prevalant that year (CDC, 2020e). From the 2014 season to the 2018 season (the last 5 years where data is available), the vaccine effectiveness ranges from 19 percent to 29 percent. The vaccine for the 2015 flu season had the highest effectiveness rate at 48 percent (CDC, 2020a). Even when seasonal influenza vaccines have a low efficacy rate, however, they are vital to influenza control. Immunization with the seasonal flu vaccine can reduce severity of illness even if it does not entirely prevent infection.

The CDC estimated that there were 410,000 to 740,000 flu hospitalizations from October 1, 2019 to April 4, 2020 (CDC, 2020b). According to data updated March 2020, there are 924,107 total staffed beds in the United States at any given time (American Hospital Association, 2020). With the highest flu hospitalizations, this would leave a little less than 200,000 hospital beds available to accommodate COVID patients, plus other hospitalizations from non-COVID-19 or influenza-related issues. If the influenza season this fall is similar to the previous season,

then the combination of influenza and COVID patients who need hospitalization would overwhelm hospital capacities. Additionally, just as with COVID-19, seasonal influenza does not impact all parts of the United States equally. Some states become influenza hot spots, while others are less affected. A worst-case scenario is the combination of an influenza hot spot and a COVID-19 hot spot simultaneously.

The increase of COVID-19 hospitalizations rates seen in Arizona, Florida, and Texas in recent weeks should serve as a warning for the challenge the United States may face in the fall when a surge of COVID-19 and influenza season converge. CDC Director Dr. Redfield believes that the collision of influenza and COVID-19 is going to have a significant impact on the country (Sternlicht, 2020). This sentiment has been echoed by Dr. Anthony Fauci, Director of National Institute of Allergy and Infectious Disease (NIAID) at the National Institutes of Health (NIH), and other public health experts.

Increased cases of COVID-19 in Houston have resulted in Texas Children's Hospital admitting adult COVID patients to help alleviate hospital capacity issues (BBC - Newsday Podcast, 2020). While this is an effective solution now, it may not be possible during the fall because children are one of the most affected age groups for influenza. The result would be hospitalizations of COVID-19 patients similar to current hospitalization levels, with the addition of children needing hospitalization as a result of influenza.

Several large urban cities have started to implement efforts to increase hospital capacity as the potential for a fall surge of COVID-19 cases grows more likely. This is vital as several states are operating near or at hospital capacity as of this writing. In some states, cases rose 30 to 40 percent in a week's time (Reuters, 2020). As cases and hospitalizations continue to surge, potential challenges to hospital capacity arise. Especially since Sars-CoV-2 and influenza are both respiratory diseases and require similar hospital resources.

The Challenges of a COVID-19 Surge and Seasonal Flu in Fall 2020

The United States must be concerned about a potential surge of COVID-19 in fall 2020. Cooler weather will bring more people indoors, providing a more suitable environment for disease spread. Additionally, students across the United States are scheduled to return to K-12 schools and college campuses. The influx of students into school buildings, college campuses, and college towns creates an increased risk of transmission compared to the risk during closure. In the United States, fall sports season remains a daunting challenge as colleges and professional teams work to determine whether it is safe to compete both with and without fans in attendance.

As of this writing, there have been a higher number of cases globally, but herd immunity has still not been reached. Therefore, the chance of transmission is increased, especially in populations that have not experienced the virus (Lauerman, 2020). This includes people in their 20s to 40s, who have only recently become the majority of cases seen in the United States. As colleges open, transmission among these age groups will likely continue to increase. Though young adults are asymptomatic or experience mild symptoms, in North Texas, young people make up a surprisingly large proportion of the hospitalizations.

COVID-19 infections have risen in 32 states in recent weeks (Lardieri, 2020). On July 12, Florida reported a record 15,300 new cases in a single day and on July 15, Texas reported a state record of 10,791 new cases (Silva, 2020). California reported the highest single day count of COVID cases on July 5, with 11,700 new cases. Hospitalizations and ventilator use have increased in the states with the largest surge in cases, including Florida (Lardieri, 2020). As of

this writing, the number of cases has risen faster than testing can accommodate and the surge could overwhelm hospitals in some states (Court et al., 2020). As hospitals start reaching full capacity, several states including Texas, California, and Arizona, have started adjusting distancing requirements (Silva, 2020). As of this writing, daily new cases have decreased in Arizona, Florida, and Texas.

The current surge in COVID-19 cases and hospitalizations could continue throughout the summer and possibly into the early fall, especially as students return to campuses around the country and sporting events resume. Such a scenario would place an unmanageable strain on hospitals when combined with a typical flu season. In this section we will discuss three components that must be addressed to manage the challenge of co-circulation of SARS-CoV-2 and influenza in the fall.

Topic 1: Hot Spots

Attention on hot spots - areas that are most likely to trigger a surge in infections as restrictions are eased - is critical moving into the fall. Most importantly, COVID-19 hot spots are also the most likely to have influenza transmission. Thus, measures to contain COVID-19 could also reduce the number of influenza infections this year. Hot spots include schools, mass gatherings, such as sporting events beginning in the fall, and vacation destinations. Below are descriptions of the challenges and recommendations for how to reduce risk in these settings.

Schools and College Campuses

The return of students to college campuses and K-12 schools creates a challenge for public health officials and communities seeking to limit the spread of COVID-19. With regards to colleges, the start of the school year often means a large influx of young adults from across the country. This movement alone could bring the virus into communities where it had previously been well-controlled. For K-12 students, the start of the school year means an increase in contacts as compared to rates when schools were closed. Both college and K-12 students must navigate the challenges of hundreds or thousands of people in an enclosed space in the midst of a pandemic caused by a respiratory virus. It must be noted, however, that the virus appears to have less of an impact on children under the age of 10. As of this writing many state governments have recommended that schools follow CDC and community guidelines for holding in-person classes (Sternlicht, 2020).

To counter some of the greatest transmission risks, schools will need to implement precautionary measures such as a mandatory mask rule, continued physical distancing (i.e. no sharing of toys, textbooks, or any other school related equipment), and an increase of sanitation practices. To increase sanitation, no contact hand sanitizer stations should be placed in all hallways and, if possible, at the entrance of each classroom. Teachers should wipe down classroom surfaces at regular intervals and students should be encouraged to regularly wash their hands throughout the day. To help maintain social distancing once schools reopen, a staggered approach to transitioning students into and out of the classroom should be developed and strictly adhered to. This will decrease the number of students in the halls at the same time and may require a restructuring of school start times and release times, based on grade and classroom.

It is important to consider the need for students to access the free lunches as well as students who need to take buses to and from school. These services will also have to be adjusted

along with the staggered schedules to ensure that students still have access to these necessary services. School buses would have to require social distancing and districts may need to get more buses and bus drivers to meet these requirements for the capacity of students that take buses to and from schools.

Lastly, a mandatory mask rule should be implemented for all teachers and administrators. To the extent possible, lunches and classes should be held in outdoor areas or well-ventilated rooms. Lastly, students should be distanced within classrooms and windows should be opened to improve room ventilation when possible. Even this simple ventilation strategy has been proven to reduce rates of aerosol transmission of several viruses in enclosed spaces (Gao et al., 2016).

Nationally, American colleges have developed different strategies for mitigating COVID-19 on their campuses for the upcoming school year. Some universities are considering remaining closed throughout the fall 2020 semester while other universities are planning to reopen in the fall with new guidelines. For example, the University of Texas and Texas A&M are planning to reopen in the fall with a semester that ends during Thanksgiving break with students taking finals online. Many schools are also offering hybrid learning options for students in which classes are both available in a remote format and an in-person format.

For any colleges that do bring students back to campus, it will be important to implement guidelines similar to those suggested for K-12 schools. Hand sanitizer should be made available at all classroom entrances and classrooms should be wiped down after each class. Class sizes should be reduced to allow social distancing within classrooms and a remote option should be made available for students that are high risk or who do not feel comfortable attending in-person classes. Additionally, limiting students' ability to gather outside of classes will be important to the successful reopening of college campuses. This might result in the cancellation of fall sports, limited occupancy in dormitories, the cancellation of intramurals, and school traditions that bring students together in mass, though such decisions should be left to individual universities.

Lastly, for states with high levels of community transmission, reopening schools may not be a viable option. Data from 15 countries demonstrates that sending children to in-person classes does not lead to a growth in cases as long as community transmission is low (Guthrie et al., 2020). When community transmission is moderate, however, allowing students to attend in-person classes has contributed a growth in cases (Guthrie et al., 2020). Based on this data, it is likely that reopening schools when community transmission is high, would further impact the level of growth in new cases.

Mass Gatherings

Mass gatherings, whether the result of sporting events, weddings, or holidays, pose a challenge to controlling the COVID-19 pandemic. One way to limit the impact of such events could be by limiting attendance and offering virtual viewing options. Such measures can prevent mass gatherings that would increase the spread of both SARS-CoV-2 and influenza. Rethinking how we participate in sporting events or other festivities that typically bring people together in large numbers is critical (Sanger-Katz, M. et. al., 2020).

For many, there are limited options for a safe return of mass gathering events and no options that safely allow the events to return in the way that we would normally expect. In Texas, Governor Abbott took additional precautions during the Fourth of July holiday, implementing a statewide mask mandate, to help control the surge of cases (Svitek, 2020). Additionally, Florida closed its beaches for the Fourth of July weekend in a similar attempt to

limit mass gatherings (BBC News, 2020). Continuing and expanding measures taken to limit gatherings will be a key element of containing the pandemic in the fall.

In addition to protecting crowds at sporting events, we must also consider ways to protect athletes from COVID-19. Given the link between severe COVID-19 infection and obesity, it has been suggested that athletes with higher BMI, such as linemen in football, might be at higher risk. However, it was also suggested that wide receivers, who are in the line of respiratory secretions, could also be at higher risk (Wolken, 2020). Other fall sports, such as soccer, offer numerous opportunities for viral spread as running has been shown to spread viral particles as far as 33 feet (Blocken et al., 2020).

A possible solution is a plan for athletes to return after isolation developed by a cardiovascular doctor. The plan includes cardiovascular evaluations when a player is preparing to return to training after recovering from COVID-19 infection (Phelan, 2020) and it should be put in place for all sports across the country to help ensure the safety of athletes returning after infection.

Most fall sports teams have started pre-season training and this return has led to clusters of infections. For example, The University of Texas at Austin has started pre-season football training this past month and has already seen more than a dozen football players test positive for COVID, with ten other student athletes testing positive who were asymptomatic. After six athletes were confirmed positive at the University of Houston, workouts were suspended (Justin, 2020). Additionally, athletes at Kansas State University have tested positive for coronavirus (The New York Times Live Coronavirus Updates, 2020c). It is inevitable as athletes begin pre-season training that the virus will begin transmitting through college and professional teams and it will be important that we have a plan in place to protect them when they return to the field.

While sporting events have been the major focus of mass gatherings for the fall, there are several other types of mass gatherings that warrant attention. The first are weddings. Throughout the country, the wedding landscape has changed. Many people have chosen to postpone their weddings or cancel them all together (Fetters, 2020). Even for those who have chosen to move forward with their wedding plans, weddings have looked very different than in pre-pandemic times. In-person invitation lists are much shorter, more weddings are held outdoors, and some couples are even wearing masks (La Gorce, 2020). As COVID-19 cases surge around the country, some wedding venues have closed for the remainder of the year, eliminating fall wedding options for some couples (La Gorce, 2020). Such measures, while frustrating for couples, is important to controlling COVID-19 throughout the fall. The inability to hold large weddings during COVID-19 has not been a negative for many couples, however, and there are predictions that COVID-19 might start a trend of small weddings well into the future (Fetters, 2020).

Another challenge going into the fall are holidays that typically bring large numbers of people together, such as Labor Day. The national-level data from Memorial Day shows that communities with reproductive ratios above 1 - even if barely above 1 - experienced the greatest impact from the holiday weekend (Rubin et al., 2020). Common holiday destinations such as the west coast of Florida and popular beaches of Texas are seeing surges in new cases that are at least partly related to the crowds over Memorial Day weekend. With the long-term side effects of COVID-19, it may be more economical for mass gatherings to remain on hold for another year.

Travel

Despite increased movement within states or to neighboring states, most Americans remain hesitant to travel. In a survey conducted in late June, the Tourism Crisis Management Initiative, run by the University of Florida, found that 75.5 percent of respondents (n=765) would avoid travel if health officials asked them to (TCMI, 2020). While travel anxiety has fluctuated over the 18 weekly surveys, a recent survey has shown that Americans are anxious about both domestic and international travel. On a scale of 1-5 where 1 is Anxiety and 5 is Relaxed, the June 29 survey mean score for domestic travel was 2.7 and the mean score for international travel was 2.4 (TCMI, 2020). Overall, the weekly surveys show that Americans travel anxiety has been growing in recent weeks.

Memorial Day weekend in the United States, as previously mentioned, has already demonstrated the danger of travel to the spread of COVID-19. As countries begin to open for tourists and residents begin to move more freely between states and around their own countries, governments must implement procedures such as fever checks, symptom questionnaires, and quarantines to reduce the importation of cases. Without careful social distancing procedures, symptom surveillance, and quarantine procedures, it is likely that resuming travel will lead to greater spread of COVID-19.

Topic 2: Vaccinations

The search for a COVID-19 vaccine is one of the largest global scientific endeavors ever undertaken and is seen by some as the only way out of the pandemic. Creating a vaccine is complicated, however, and even though the timeline for the vaccine can be shortened, many challenges remain to providing a safe and effective COVID-19 vaccine. These challenges include the possible - though increasingly unlikely chance of antibody dependent enhancement - and length of immunity. With regards to antibody dependent enhancement, which was an issue in one set of vaccines for SARS and is known to occur in some coronaviruses (Wan et al, 2020), presence of existing antibodies to a virus could lead to more severe infection rather than protection. To date, little evidence has emerged to suggest that this will be an issue with the COVID-19 vaccine, but adequate safety testing will be required to conclusively determine that it is not a risk.

In addition to challenges in shortening the vaccine development timeline and the potential for antibody dependent enhancement, there is still little knowledge on if every infected person acquires immunity and how long it lasts. In Senegal, scientists have documented the presence of antibodies for up to two months, but they have also seen people who do not develop any antibodies. This is a finding that has been repeated in a handful of studies (Long et al., 2020; Liu et al., 2020). Concern over the potentially short-term existence of antibodies must be further evaluated to determine the impact it could have on vaccine development, but there is promising research regarding T cells that suggest T cell immunity exists with COVID-19 and is longer lasting than antibodies (Grifoni et al., 2020; Sekine et al., 2020).

When a safe and effective vaccine has been developed, the challenge then moves to vaccine distribution. Gavi has identified three categories of obstacles that will arise at this point. These include logistical challenges, in-country challenges, and COVID-19 specific challenges. With regards to logistical challenges, they have identified limited supply of the vaccine in the first few months of production, legal agreements - especially for damage liability - that will need to be made between WHO and vaccine manufacturers, quality control during distribution, and disruptions to distribution such as natural disasters (GAVI, 2020e). In addition, the distribution

of vaccines on the scale required for COVID-19 has never been done. Infrastructure to do it does not exist, though many pharmaceutical companies are placing bets on the most likely vaccine and building the infrastructure to develop it (Coronavirus, Explained, 2020).

Once these obstacles have been overcome and a COVID-19 vaccine is made available, it is critical that enough people get it so that herd immunity can be established. As of June 28, Dr. Fauci stated that vaccine effectiveness is only one part of the equation and that efforts to reach herd immunity will be unattainable if too many people refuse to get vaccinated (CNN Health, 2020). In order to achieve herd immunity, which stops the spread of the virus by minimizing susceptible individuals in the population and protects individuals that are unable to get vaccinated, a minimum of 70 percent of the population would have to have immunity to SARS-CoV-2 (D'Souza & Dowdy, 2020). In the United States that is approximately 230.3 million people who would need to achieve immunity either by natural infection or vaccine.

The anti-vaccine movement may have a detrimental impact on the country's ability to reach herd immunity once a vaccine is available. Dr. Peter Hotez, a Baylor University vaccine scientist, was optimistic that the general public would feel a need for the COVID-19 vaccine, therefore holding off the anti-vaccine movement. However, recent polling data shows that it appears to have had the opposite effect. On May 24, only about 50 percent of Americans said they would get vaccinated against COVID-19, a number that is lower than that needed to reach herd immunity (Zhang, 2020). By the end of June, one third of the population says that they would not get a COVID vaccine, even if it is accessible and affordable (CNN Health, 2020). To counter the anti-vaccine sentiment, it will be important to improve communication to the public on the concept of herd immunity and why receiving a vaccine is important. There will also be a need to fight misinformation on social media platforms. A vaccine education campaign that can reach into the community to explain why vaccines are important, especially in a pandemic, what herd immunity means, and that they do not cause autism, would be beneficial as part of the pandemic surge plan (CNN Health, 2020). Such a campaign should be designed at the national level but led at the local level. Trusted local leaders including local public health officials, doctors, religious leaders, and elected officials can improve vaccine uptake if they become involved in educating the public and encouraging them to get vaccinated.

This is not only relevant to the COVID-19 vaccine, but also to the seasonal influenza vaccine. With the prospect of simultaneous circulation of influenza and SARS-CoV-2, the importance of receiving a seasonal influenza vaccine is heightened. Minimizing the number of seasonal influenza cases could help keep all hospitalization rates at manageable numbers. It is unlikely that a COVID-19 vaccine will be available before flu season or even before the end of flu season but with an available vaccine for seasonal influenza we can decrease the number of influenza cases with enough vaccine uptake.

Topic 3: Healthcare Systems

COVID-19 mortality is estimated at 3.3 percent in the U.S. compared to seasonal influenza, which is less than 0.1 percent (JHU, 2020b; WHO, 2020e). Mortality, while an indicator of disease severity, is also an indicator of the accessibility and affordability of health care systems. As cases, hospitalizations, and deaths due to COVID increase, the healthcare systems are being impacted. In some states, ICU units are inching closer to reaching their maximum capacity (BBC World Service - Newshour, 2020). To counter this challenge in the fall

the United States must investigate ways to further increase hospital capacity and maximize production and distribution of medical equipment.

Mechanical ventilators are an important resource for those severely affected by COVID, influenza, and several other respiratory diseases. Without a vaccine to prevent COVID-19 infection, ventilators are an important tool to help save those who are most severely affected by this virus. As of 2006, of the 105,000 ventilators available in the United States, 100,000 are used during a typical flu season (Patrone D. et al., 2014). Based on the most recent public data from 2010, the United States now has 160,000 ventilators, 62,000 of which are mechanical ventilators with full features. Assuming the number of influenza patients requiring ventilators has not increased since 2006, this only leaves 60,000 ventilators available for both COVID-19 patients and others who require respiratory ventilators (Johns Hopkins Center for Health Security, 2020).

As a result of the 2009 influenza pandemic, researchers and medical personnel reassessed ventilator specific allocation guidelines. Each state has the flexibility to determine ventilator allocation themselves, meaning that guidelines can vary across states. For example, the state of New York focused their guidelines on the primary goal of saving the greatest number of lives. To do this, ventilators were prioritized for patients who were most likely to benefit from the use of a ventilator (New York State Task Force on Life and the Law, 2015). Other states have written ventilator allocation guidelines that are based on age or pre-existing conditions and some have prioritized certain professions, such as healthcare providers (Piscitello et al., 2020). Setting these guidelines in advance will help ensure that states are not scrambling to make these decisions during a crisis.

Placing early warning systems in hospitals that would indicate when supplies, personnel, and hospital capacity has reached moderate and high concern would be beneficial to ensuring hospital systems can handle both COVID and influenza cases. By implementing plans to intervene when systems trigger a certain risk level, the impact in the fall can be mitigated. These early warning systems, such as the Proposed Early Warning Monitoring and Mitigation Metrics developed by Texas Medical Center, can be useful not only for the collision of COVID and seasonal influenza, but for future diseases which may take up large hospital capacity. These metrics include ICU capacity, personal protective equipment (PPE), and case trends (Texas Medical Center, 2020).

In addition to the healthcare system, the necessary intersection with the homeless shelter system needs to be accounted for. The COVID-19 pandemic has seen higher hospitalization rates than previous pandemics and caused a greater economic impact due to the lockdown (Gavi, 2020d). Especially with the increase in job loss, there has also been an increase in homeless shelter use and tent cities, where social distancing and mask wearing precautions are not always possible. This creates a large population of people who lack safe housing and the ability to maintain sanitary and hygiene recommendations (Gavi, 2020d). If subpopulations such as people living in homeless shelters or on the streets, are not accounted for and protected, it will further exacerbate the issues with hospital capacity as cases increase in those subpopulations.

There is also a need for transparency of data and clear processes to correct inaccurate information. Without clear and consistent information about the number of cases, number of deaths, and level of hospital capacity in cities and states around the country, it can be difficult for the public to understand the risk posed to them by the pandemic. Additionally, frequently inaccurate or misleading information or a lack of transparency in data can erode public trust in public health and government officials.

The Potential Scenarios for the Fall and Beyond

Gavi, The Vaccine Alliance, published an article outlining three potential scenarios for the future of the COVID-19 pandemic (Gavi, 2020b). The first scenario is that we could experience several months of mini waves - small surges that rise and then decline with relative frequency. The second scenario is similar to the 1918 influenza pandemic in that a massive second wave occurs after the first wave dies down. The final scenario is that a sustained, though not overwhelming outbreak, similar to the outbreak in the United States in May, will continue through the end of 2022. Which scenario we will end up with depends heavily on the policy and containment choices the United States makes in the coming months.

What is important for this report, however, is which one of these is likely to appear in fall 2020 and how that scenario will combine with seasonal flu to impact hospital capacity and deaths for both individuals infected with COVID-19 and those infected with influenza. Given the surge in cases during summer 2020 throughout many parts of the United States, the initial idea of a second wave in the fall is fading because we have not completed the first wave yet. As cases surge now, strict and focused interventions will be required to bring the cases under control by September. However, if college campuses open, social distancing is relaxed, and travel resumes without health guidelines, we can expect to see a surge in fall 2020 similar to what we are experiencing in several states currently. Such a surge would be the next in a set of mini waves, which would require the reimplementation of containment measures and would again strain hospitals in hot spots across the country.

If another mini wave of COVID-19 occurs in October or November - the start of flu seasons - we will quickly see hospitals overwhelmed. During a typical flu season there are approximately 200,000 people hospitalized for influenza (CDC, 2018b). These hospitalizations combined with tens of thousands of hospitalizations for COVID-19 would be unmanageable without dramatic changes to our health care capacity and medical equipment production. To increase the United States ability to manage a mini wave in the fall and seasonal influenza we offer the following recommendations:

Recommendations

1. **Increase influenza vaccination rates**
   One of the best defenses that we have against seasonal influenza is the annual flu vaccine. With increases in vaccine uptake in recent years, the percentage of Americans receiving their annual flu vaccination has increased, but this number is still under 50% for adults and just over 60% for children. The reduction in both cases and disease severity that accompany high flu vaccine uptake could make the difference between a manageable public health challenge in the fall and an unmanageable one.

2. **Implement face covering mandates at state and local levels in accordance with CDC guidance**
   Recent data on mask wearing has shown that certain types of masks can reduce the transmission of SARS-CoV-2 from an infected person. Given that there is evidence of pre-symptomatic and asymptomatic spread of the virus, mask wearing could lower

transmission because even people who did not know they were infected would be taking this precaution. Mask wearing cannot replace distancing requirements, but it works in combination with them to further reduce transmission. State and local levels should implement and enforce the mandates in accordance with CDC guidance and transmission risk in their communities.

3. **Increase sanitation measures and room ventilations in K-12 schools**
   To help increase the success of reopening schools in the fall there is a need for increased sanitation and room ventilation. Hand sanitizer should be available in the hallways and classrooms should be cleaned between classes. Additionally, research has shown that even opening a window can reduce transmission, so we recommend opening classroom windows and/or holding classes and lunches outdoors, if possible.

4. **Implement cardiovascular evaluations for athletes returning to practice after COVID-19 infection**
   The return of college and professional sports in the fall has been a central and challenging discussion which involves both protecting the fans and protecting the athletes. To protect athletes, we recommend that cardiovascular evaluations are put in place for athletes returning to practice after infection. These evaluations will help protect the health of the recovering athlete as they reintegrate with their team.

5. **Maintain social distancing measures, surveillance, and quarantine procedures for travelers**
   Some countries are lifting travel restrictions and welcoming tourists into their cities. As people from around the world move around more freely and Americans start to visit popular tourist destinations again, it is important that the airline, transportation, hotel, and service industry implement and maintain social distancing measures that have been proven to reduce transmission. It is also important that syndromic surveillance is conducted on airline passengers, as well as other travelers crossing international borders, staying in hotels, eating at restaurants, and visiting tourist attractions.

6. **Develop vaccine infrastructure for COVID-19 vaccine**
   Vaccine distribution on the level that is required for COVID-19 has never been done before. For this reason, developing a vaccine is not the only challenge we face in containing the pandemic. To support fast and effective distribution of a COVID-19 vaccine once it is developed, we must also develop the vaccine production and distribution infrastructure necessary to vaccinate roughly 70 percent of the world's population. This will require building new factories, something that has already started, and preparing our transportation and distribution networks to be able to accommodate the scale necessary for success.

7. **Develop vaccine education campaign to counter misinformation about the influenza and COVID-19 vaccines**
   There is growing concern that the anti-vaccine movement in the United States could negatively impact our country's ability to achieve herd immunity once a vaccine is available. To help counter this challenge we recommend developing an education

campaign to counter vaccine misinformation and to help the public understand the important role of the vaccine in controlling the pandemic and allowing us to return to normal. This campaign should be designed at the national level but implemented at the local level. The campaign will be most successful if it is led by local public health officials, doctors, and religious leaders.

8. **Further expand hospital capacity and production of medical equipment**
   As discussed previously in this paper, seasonal influenza alone often brings hospitals to near capacity. The addition of a surge in COVID-19 cases to the average hospital admission rate for seasonal influenza would undoubtedly push hospitals beyond their capacity, even with current extended capacity requirements. While a large part of managing hospital capacity will be controlling infections, we must continue looking for ways to maximize our hospital capacity to cope with both respiratory diseases at once. This will likely require innovative thinking and preparation well before flu season.

9. **Create a national strategy for the COVID-19 response**
   A challenge of the magnitude of COVID-19 requires a coordinated national strategy and national-level leadership. This requirement is even more urgent given the dual challenges of COVID-19 and seasonal influenza. A national strategy would assist in coordination, supply procurement, collaboration, and guidance, but does not mean that states would not have flexibility to adjust as needed within the national strategy.

10. **Create greater data transparency at local, state, and federal levels for COVID-19 data**
    Understanding a rapidly changing situation is challenging for everyone, but for people with limited background in infectious disease it can feel overwhelming. Greater transparency and communication on how cases are recorded, why contact tracing is necessary and how successful it has been, how COVID-19 deaths are determined, and current hospital capacity will increase public understanding and may reduce anxiety. At times when data is unavailable or uncertain, sharing that uncertainty will build public trust and might make people more willing to follow public health guidelines.

References

American Hospital Association. (2020, March 2020). Fast Facts on U.S. Hospitals, 2020. Retrieved from https://www.aha.org/statistics/fast-facts-us-hospitals

BBC - Newsday Podcast. (2020). Coronavirus: Texas faces a 'humanitarian catastrophe.' *BBC World News*. Retrieved from https://www.bbc.co.uk/sounds/play/p08hyj64?at_custom2=facebook_page&at_custom3=BBC+World+Service&at_custom1=%5Bpost+type%5D&at_medium=custom7&at_custom4=BAD9A074-B6D1-11EA-AEFC-7A424D484DA4&at_campaign=64

BBC World Service - Newsday. (2020a, June 8). New Zealand reports zero active cases of coronavirus. *BBC World News*. Retrieved from https://www.bbc.co.uk/programmes/p08gc6wb

BBC World Service - Newsday. (2020b, June 18). Why having Covid-19 might not lead to immunity. *BBC World News*. Retrieved from https://www.bbc.co.uk/programmes/p08h9mt1

BBC World Service - Newshour. (2020, June 28). Miami Mayor: 'sheer numbers' are putting a stress on healthcare system. *BBC World News*. Retrieved from https://www.bbc.co.uk/programmes/p08j88zp

BBC News. (2020, June 30). Coronavirus: What's behind alarming new US outbreaks? *BBC US & Canada News.* Retrieved from https://www.bbc.com/news/world-us-canada-53228134

Becerra-Flores, M. and Cardozo, T. (2020, May 2). SARS-CoV-2 viral spike G614 mutation exhibits higher case fatality rate. *The International Journal of Clinical Practice.* DOI: 10.1111/ijcp.13525

Beer, T. (2020, July 17). Texas School Districts Can Now Delay Re-Opening For Up To 8 Weeks. Forbes. Retrieved from https://www.forbes.com/sites/tommybeer/2020/07/17/texas-school-districts-can-now-delay-re-opening-for-up-to-8-weeks/#45a5a1c9b0f5

Bermudez, AF and Robles, F. (2020, May 31). Resisting Lockdown, Nicaragua Becomes a Place of Midnight Burials. *The New York Times*. Retrieved from https://www.nytimes.com/2020/05/31/world/americas/coronavirus-nicaragua-burials.html

Blocken, B., Malizia, F., van Druenen, T., Marchal, T. (2020). Towards aerodynamically equivalent COVID-19 1.5 m social distancing for walking and running. Retrieved from http://www.urbanphysics.net/COVID19_Aero_Paper.pdf

Borjas, GJ. (2020, April). Demographic Determinants of Testing Incidence and COVID-19 Infections in New York City Neighborhoods. *NBER Health Economics and Labor Studies Project Working Paper No. 26952.* Retrieved from https://www.nber.org/papers/w26952

Buckley, J. (2020, June 15). How Countries in Europe are Reopening. *Conde Nast Traveler*. Retrieved from https://www.cntraveler.com/story/how-countries-in-europe-are-reopening

Center for Disease Control and Prevention [CDC]. (2018a, July 12). The Flu Season. Retrieved from https://www.cdc.gov/flu/about/season/flu-season.htm

Centers for Disease Control and Prevention [CDC]. (2018b, November 5). Frequently Asked Questions about Estimated Flu Burden. Retrieved from https://www.cdc.gov/flu/about/burden/faq.htm

Center for Disease Control and Prevention [CDC]. (2019, September 26). Flu Vaccination Coverage, United States, 2018-2019 Influenza Season. Retrieved from https://www.cdc.gov/flu/fluvaxview/coverage-1819estimates.htm

Center for Disease Control and Prevention [CDC]. (2020a, February 21). CDC Seasonal Flu Vaccine Effectiveness Studies. Retrieved from https://www.cdc.gov/flu/vaccines-work/effectiveness-studies.htm#figure

Center for Disease Control and Prevention [CDC]. (2020b, April 17). 2019-2020 U.S. Flu Season: Preliminary Burden Estimates. Retrieved from https://www.cdc.gov/flu/about/burden/preliminary-in-season-estimates.htm

Center for Disease Control and Prevention [CDC]. (2020c, June 13). Laboratory-Confirmed Influenza Hospitalizations. *FluView Interactive*. Retrieved from https://gis.cdc.gov/GRASP/Fluview/FluHospRates.html

Seasonal Influenza (Flu). (2020d, January 8). Estimated Influenza Illnesses, Medical visits, Hospitalizations, and Deaths in the United States - 2018-2019 Influenza Season. Center for Disease Control and Prevention [CDC]. Retrieved from https://www.cdc.gov/flu/about/burden/2018-2019.html#:~:text=vaccination%20uptake11.-,Conclusion,the%202018%E2%80%932019%20influenza%20season.

Seasonal Influenza (Flu). (2020e, January 3). Vaccine Effectiveness: How Well Do the Flu Vaccines Work?. Center for Disease Control and Prevention [CDC]. Retrieved from https://www.cdc.gov/flu/vaccines-work/vaccineeffect.htm#doe_flu_vax_effect_vary_by_type_subtype

Center for Global Health Science and Security at Georgetown University. (2020, June 19). COVID AMP Analysis and Mapping of Policies. *Georgetown Infectious Disease Atlast [GIDA]*. Retrieved from https://covidamp.org/

Christie, B. (2020, June 10). Arizona hospitals at 83 percent capacity, elective surgery may stop. *PBS*. Retrieved from https://www.pbs.org/newshour/health/arizona-hospitals-at-83-capacity-elective-surgery-may-stop

CNN Health. (2020, June 28). Fauci says Covid-19 vaccine may not get US to herd immunity if too many people refuse to get it. *CNN.* Retrieved from https://www.cnn.com/2020/06/28/health/fauci-coronavirus-vaccine-contact-tracing-aspen/index.html

Collman, A. (2020, June 24). The federal government is ending funding for coronavirus test sites in 5 states as Trump claims the US is testing too much. *Business Insider*. Retrieved from https://www.businessinsider.com/us-coronavirus-test-sites-ending-funding-5-states-2020-6

Coronavirus, Explained. (2020). The Race for a Vaccine. *Netflix.*

Court, E. and Baker D.R. (2020, June 10). Second U.S. Virus Wave Emerges as Cases Top 2 Million. *Bloomberg*. Retrieved from https://www.bloomberg.com/news/articles/2020-06-10/second-u-s-virus-wave-emerges-after-state-reopenings

Davis, C. (2020, June 25). Miami will begin issuing fines of up to $500 for not wearing a mask in public. *Business Insider*. Retrieved from https://www.businessinsider.com/miami-issue-fine-for-not-wearing-mask-in-public-2020-6

Di Donato, V., Ruotolo, N., and Smith-Spark, L. (2020, March 20). Italy calls in military to enforce coronavirus lockdown as 627 people die in 24 hours. *CNN*. Retrieved from https://www.cnn.com/2020/03/20/europe/italy-military-coronavirus-intl/index.html

D'Souza, G. and Dowdy, D. (2020, April 10). What is Herd Immunity and How Can We Achieve it with COVID-19? *Johns Hopkins School of Public Health Expert Insights.* Retrieved from https://www.jhsph.edu/covid-19/articles/achieving-herd-immunity-with-covid19.html

Education Development Center. (2020). Exploring Infectious Diseases - Ebola, Measles, and COVID-19: Ecology and Biology. *National Science Foundation*. Retrieved from http://infectiousdiseases.edc.org/content/module/1/reading/3a

FDA. (2020, July 18). Coronavirus (COVID-19) Update: FDA Issues First Emergency Authorization for Sample Pooling in Diagnostic Testing. Retrieved from https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-issues-first-emergency-authorization-sample-pooling-diagnostic

Fetters, A. (2020, May 18). The Pandemic's Long-Lasting Effects on Weddings. *The Atlantic.* Retrieved from https://www.theatlantic.com/family/archive/2020/05/coronavirus-could-change-weddings-years-come/611716/

Gao, X., Wei., J., Lei, H., Xu, P. et al. (2016). Building Ventilation as an Effective Disease Intervention Strategy in a Dense Indoor Contact Network in an Ideal City. *PLoS ONE, 11*(9): e0162481. DOI: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5017609/

Gavi. (2020a, May 25). Here are four ways Vietnam has managed to control Covid-19. *#Vaccineswork*. Retrieved from https://www.gavi.org/vaccineswork/here-are-four-ways-vietnam-has-managed-control-covid-19

Gavi. (2020b, May 18). The future with COVID-19: three potential scenarios. *#Vaccineswork*. Retrieved from https://www.gavi.org/vaccineswork/future-covid-19-three-potential-scenarios

Gavi. (2020c, June 19). The long-term health effects of Covid-19. *#Vaccineswork*. Retrieved from https://www.gavi.org/vaccineswork/long-term-health-effects-covid-19

Gavi. (2020d, June 1). How does COVID-19 compare to past epidemics? *#Vaccineswork*. Retrieved from https://www.gavi.org/vaccineswork/how-does-covid-19-compare-past-pandemics

Gavi. (2020e, April 24). Lessons in Preparing to Distribute COVID-19 Vaccine. Retrieved from https://www.gavi.org/vaccineswork/lessons-preparing-distribute-covid-19-vaccine

Gavi. (2020f, June 30). COVID-19 Situation Report #12. Retrieved from https://www.gavi.org/sites/default/files/covid/Gavi-COVID-19-Situation-Report-12-20200630.pdf

Gill, J. (2020, June 21). If trend persists, Houston 'would become the worst affected city in the US,' expert Peter Hotez says. *The Houston Chronicle.* Retrieved from https://www.houstonchronicle.com/news/houston-texas/houston/article/Texas-sees-weekend-sur e-in-COVID-19-15356042.php

Grifoni, A., Weiskopf, D., Ramirez, S.I., Mateus, J., Dan, J.M, et al. (2020, June). Targets of T Cell Responses to SARS-CoV-2 Coronavirus in Humans with COVID-19 Disease and Unexposed Individuals. *Cell, 181*(7): 1489-1501. DOI: https://doi.org/10.1016/j.cell.2020.05.015

Guthrie, B.L., Tordoff, D.M., Meisner, J., Tolentino, L., Jiang, W., et al. (2020, July 6). Summary of School Re-Opening Models and Implementation Approaches During the COVID 19 Pandemic. Retrieved from https://globalhealth.washington.edu/sites/default/files/COVID-19%20Schools%20Summary%20%282%29.pdf?mkt_tok=eyJpIjoiTkRreE5XWXlORFF3TXpNeCIsInQiOiJIbVNQTTVySEo0Vzk1cHVBZVVqWnFGVmR1UEJxRGdpd01mTXg4OGw3Mk5nTnpmaUoyMGt2UXIwWVZBOE5GVjIybHA5aStrbzJ3MUxsanoxamZibmlocmpSbXZyVFVoV0VHYU1aTGx0RnpsMXlmOEtXSVJqaDJsZ0RJU1BQcVZjZSJ9. Accessed July 14, 2020.

Hansen, S. (2020, June 30). A National Mask Mandate Could Save The U.S. Economy $1 Trillion, Goldman Sachs Says. *Forbes.* Retrieved from https://www.forbes.com/sites/sarahhansen/2020/06/30/a-national-mask-mandate-could-save-the-us-economy-1-trillion-goldman-sachs-says/#77b52db056f1

Huang, P. (2020, June 5). How Will the U.S. and WHO Fare Without Each Other? *NPR.* Retrieved from

https://www.npr.org/sections/goatsandsoda/2020/06/05/869913174/how-will-the-u-s-and-who-fare-without-each-other

Indolfi, C. and Spaccarotella, C. (2020, April). The Outbreak of COVID-19 in Italy. *JACC: Case Reports.* DOI: 10.1016/j.jaccas.2020.03.012

Johns Hopkins Center for Health Security. (2020, July 1). Ventilator Stockpiling and Availability in the US. *Johns Hopkins Bloomberg School of Public Health.* Retrieved from https://www.centerforhealthsecurity.org/resources/COVID-19/COVID-19-fact-sheets/200214-VentilatorAvailability-factsheet.pdf

Johns Hopkins Center for Health Security. (2020b, August 3). Mortality Analyses. *Johns Hopkins Bloomberg School of Public Health.* Retrieved from https://coronavirus.jhu.edu/data/mortality.

Justin,R. (2020, June 18). 13 University of Texas football players test positive for coronavirus. *The Texas Tribune*. Retrieved from https://www.texastribune.org/2020/06/18/coronavirus-university-texas-football/

Korber, B. et. al. (2020, June 26). Tracking changes in SARS-CoV-2 Spike: evidence that D614G increases infectivity of the Covid-19 virus. *Cell*. Retrieved from https://www.cell.com/action/showPdf?pii=S0092-8674%2820%2930820-5

La Gorce, T. (2020, June 17). A Very Small Family Gathering Will Do This Time. *The New York Times.* Retrieved from https://www.nytimes.com/2020/05/15/fashion/weddings/huge-family-small-wedding-coronavirus.html

Lardieri, A. (2020, July 6). California Records Highest Daily Coronavirus Case Count of Any State. *U.S. News.* Retrieved from https://www.usnews.com/news/health-news/articles/2020-07-06/california-records-highest-daily-coronavirus-case-count-of-any-state

Lauerman, J. (2020, May 22). Why a Second Wave of COVID-19 Is Already a Worry. *The Washington Post*. Retrieved from https://www.washingtonpost.com/business/why-a-second-wave-of-covid-19-is-already-a-worry/2020/05/22/1f4c0488-9c2a-11ea-ad79-eef7cd734641_story.html

Lewis, S. (2020, June 27). Florida breaks daily record with nearly 10,000 new coronavirus cases. *CBS News.* Retrieved from https://www.cbsnews.com/news/florida-breaks-daily-record-nearly-10000-new-coronavirus-cases/

Liu, T., Wu, S., Tao, H., Zeng, G., Zhou, F., Guo, F., Wang, X. (2020, June 16). Prevalence of IgG antibodies to SARS-CoV-2 in Wuhan - Implications for the ability to produce long-lasting protective antibodies against SARS-CoV-2. *medRxiv*. DOI: https://doi.org/10.1101/2020.06.13.20130252

Livesay, C. (2020, March 29). Italian hospital is turning scuba masks into ventilators as supplies run low. *CBS News.* Retrieved from https://www.cbsnews.com/news/coronavirus-italy-maggiore-hospital-parma-modifying-scuba-masks-into-ventilators-2020-03-29/

Long, Q.X., Tang, X.J., Shi, Q.L., Li, Q. Deng, H.J., et al. (2020). Clinical and immunological assessment of asymptomatic SARS-CoV-2 infections. *Nature Medicine.* DOI: https://doi.org/10.1038/s41591-020-0965-6

Mahbubani, R. (2020, June 22). As Texas reports 10th straight day of record-high coronavirus hospitalizations, ex-FDA chief warns outbreaks could be 'tipping over into exponential growth.' *Business Insider*. Retrieved from https://www.businessinsider.com/texas-reports-record-high-coronavirus-hospitalizations-for-10-days-2020-6

Minder, R. (2020, April 7). Spain's Coronavirus Crisis Accelerated as Warnings Went Unheeded. *The New York Times*. Retrieved from https://www.nytimes.com/2020/04/07/world/europe/spain-coronavirus.html

Moatti, J.P. (2020, May). The French response to COVID-19: intrinsic difficulties at the interface of science, public health, and policy. *Lancet*. Retrieved from https://www.thelancet.com/action/showPdf?pii=S2468-2667%2820%2930087-6

New York State Task Force on Life and the Law. (2015, November). Ventilator Allocation Guidelines. *New York State Department of Health*. Retrieved from https://www.health.ny.gov/regulations/task_force/reports_publications/docs/ventilator_guidelines.pdf

Nsoesie, E.O., Rader, B., Barnoon, Y.L., Goodwin, L., and Brownstein, J.S. (2020). Analysis of hospital traffic and search engine data in Wuhan China indicate early disease activity in the Fall of 2019. *Harvard Library.* Retrieved from https://dash.harvard.edu/handle/1/42669767

Panovska-Griffiths, J. (2020, June 10). Coronavirus: five reasons why the UK death toll is so high. *The Conversation.* Retrieved from https://theconversation.com/coronavirus-five-reasons-why-the-uk-death-toll-is-so-high-140005

Patrone, D. and Resnik, D. (2014, March 14). Pandemic Ventilator Rationing and Appeals Process. *Health Care Analysis*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3954608/

Paules, C. and Subbarao, K. (2017, March 13). Influenza. *Lancet*. Retrieved from https://pubmed.ncbi.nlm.nih.gov/28302313/

Pedroso, R. (2020, June 30). Nearly eight million Brazilians out of work due to Covid-19. *CNN World.* Retrieved from https://www.cnn.com/2020/06/30/americas/brazil-coronavirus-unemployed-intl/index.html

Phalen, D., Kim, J.H., Chung, E.H. (2020, May 13). A Game Plan for the Resumption of Sport and Exercise After Coronavirus Disease 2019 (COVID-19) Infection. *JAMA Cardiology*. Retrieved from https://jamanetwork.com/journals/jamacardiology/fullarticle/2766124

Piscitello, G.M., Kapania, E.M., Millier, W.D., et al. (2020). Variation in Ventilator Allocation Guidelines by US State During the Coronavirus Disease 2019 Pandemic: A Systemic Review. *JAMA Network Open, 3*(6): e2012606.

Rabin, R. C. (2020, January 21). First Patient With Wuhan Coronavirus Is Identified in the U.S. Retrieved from https://www.nytimes.com/2020/01/21/health/cdc-coronavirus.html

Racaniello, V. (2020, July 9). No evidence of increased human transmission of SARS-CoV-2. *Virology Blog.* Retrieved from https://www.virology.ws/2020/07/09/no-evidence-for-increased-human-transmission-of-sars-cov-2/.

Rapoza, K. (2020, June 23). Brazil's Coronavirus Response Has Been an Embarrassment. *Forbes*. Retrieved from https://www.forbes.com/sites/kenrapoza/2020/06/23/bolsonaro-brazils-coronavirus-response-has-been-an-embarrassment/#1d57dae0226a

Rettner, R. (2020, March 10). Why Deaths from Coronavirus Are So High in Italy. *Scientific American.* Retrieved from https://www.scientificamerican.com/article/why-deaths-from-coronavirus-are-so-high-in-italy/

Reuters. (2020, June 11). Fears of Second U.S. Coronavirus Wave Rise on Worrisome Spike in Cases, Hospitalizations. *The New York Times*. Retrieved from https://www.nytimes.com/reuters/2020/06/11/us/11reuters-health-coronavirus-usa-secondwave.html

Rubin, D., Tasian, G., and Huang, J. (2020, June 10). COVID-19 Outlook: The Memorial Day Effect Comes into View. *Children's Hospital of Philadelphia Policy Lab.* Retrieved from https://policylab.chop.edu/blog/covid-19-outlook-memorial-day-effect-comes-view

Sandler, R. (2020, July 17). California Blocks Most Schools From Reopening With Strict New Guidelines. Forbes. Retrieved from https://www.forbes.com/sites/rachelsandler/2020/07/17/california-blocks-most-schools-from-reopening-with-strict-new-guidelines/#d6732ad44ac3

Sanger-Katz, M., Miller, C.C., Bui, Q. (2020, June 8). When 511 Epidemiologists Expect to Fly, Hug, and Do 18 Other Everday Activities Again. *The New York Times*. Retrieved from https://www.nytimes.com/interactive/2020/06/08/upshot/when-epidemiologists-will-do-everyday-things-coronavirus.html

Sekine, T., Perez-Potti, A., Rivera-Ballesteros, O. Straling, K., Gorin, J.B, et al. (2020, June 29). Robust T cell immunity in convalescent individuals with asymptomatic or mild COVID-19. *bioRxiv.* Retrieved from https://www.biorxiv.org/content/10.1101/2020.06.29.174888v1

Silva, C. (2020, July 5). U.S. COVID-19 Deaths Near 130,000; Florida and Texas Report Record Case Numbers. *NPR.* Retrieved from https://www.npr.org/sections/coronavirus-live-updates/2020/07/05/887445479/u-s-covid-19-deaths-near-130-000-florida-and-texas-report-record-case-numbers

Sternlicht, A. (2020, June 30). Fauci Tells Congress U.S. Could Start Seeing 100,000 New Cases A Day. *Forbes*. Retrieved from https://www.forbes.com/sites/alexandrasternlicht/2020/06/30/fauci-tells-congress-us-could-start-seeing-100000-new-cases-a-day/#19cd1351538a

Strazewski, L. (2020, May 8). Harvard epidemiologist: Beware COVID-19's second wave this fall. *American Medical Association*. Retrieved from https://www.ama-assn.org/delivering-care/public-health/harvard-epidemiologist-beware-covid-19-s-second-wave-fall

Svitek, P. (2020, July 2). Gov. Greg Abbott orders Texans in most counties to wear masks in public. *The Texas Tribune*. Retrieved from https://www.texastribune.org/2020/07/02/texas-mask-order-greg-abbott-coronavirus/

Swaby, A. (2020, June 19). Coronavirus cases are increasing at Texas child care centers, but the state repealed safety rules. The Texas Tribune. Retrieved from https://www.texastribune.org/2020/06/19/coronavirus-cases-increase-texas-day-cares-state-safety-rules-expire/

Texas Medical Center. (2020, June 27). TMC Daily New COVID-19 Hospitalizations. Retrieved from https://www.tmc.edu/coronavirus-updates/tmc-daily-new-covid-19-hospitalizations/

Texas Medical Center. (2020, June 22). Proposed Early Warning Monitoring and Mitigation Metrics. Retrieved from https://www.tmc.edu/coronavirus-updates/proposed-early-warning-monitoring-and-mitigation-metrics/

The New York Times Live Coronavirus Updates. (2020a, June 10). E.U. Slams China Over Disinformation Campaign. *The New York Times*. Retrieved from https://www.nytimes.com/2020/06/10/world/coronavirus-live-updates.html

The New York Times Live Coronavirus Updates. (2020b, June 23). Coronavirus in the US: Latest Map and Case Counts. *The New York Times*. Retrieved from https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html

The New York Times Live Coronavirus Updates. (2020c, June 23). Coronavirus Live Updates: Fauci Warns Next 2 Weeks 'Will Be Critical' to Slowing Surges Around U.S. *The New York Times*. Retrieved from https://www.nytimes.com/2020/06/23/world/coronavirus-updates.html

The New York Times Live Coronavirus Updates. (2020d, June 24). Brazil and the U.S. Drive New Coronavirus Infections. *The New York Times*. Retrieved from https://www.nytimes.com/2020/06/21/world/coronavirus-updates.html

The New York Times Live Coronavirus Updates. (2020e, July 14). Trump Administration Strips C.D.C. of Control of Coronavirus Data. The New York Times. Retrieved from https://www.nytimes.com/2020/07/14/us/politics/trump-cdc-coronavirus.html

The New York Times Live Coronavirus Updates. (2020f, July 8). N.Y.C. School's, Nation's Largest District, Will Not Fully Reopen in the Fall. The New York Times. Retrieved from https://www.nytimes.com/2020/07/08/nyregion/nyc-schools-reopening-plan.html

Tokars, J.I., Olsen, S.J., Reed, C. (2018, May 2). Seasonal Incidence of Symptomatic Influenza in the United States. *Clinical Infectious Disease.* Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5934309/

Tourism Crisis Management Initiative. (2020, June 29). Trust & Travel Anxiety Perceptions. *University of Florida.* Retrieved from https://static1.squarespace.com/static/5e8b3fc3511d90234fbd821b/t/5efa76ea4ba50510f1b0ffec/1593472750047/Wave+18+%28June+29%29+COVID-19+Topline+Data+%28Insights+on+Trust+and+Travel%29.pdf

Usero, A. (2020, May 24). Reopening too soon: Lessons from the deadly second wave of the 1918 flu pandemic. *The Washington Post*. Retrieved from https://www.washingtonpost.com/history/2020/05/24/second-wave-pandemic-flu-1918-coronavirus/

Vaccaro, A. (2020, April 14). Six Takeaways For Policymakers From Italy's Response to Covid-19. *Forbes*. Retrieved from https://www.forbes.com/sites/iese/2020/04/14/six-takeaways-for-policymakers-from-italys-response-to-covid-19/#5f4f13ce43b8

Viboud, C., Boelle, P.Y., Pakdaman, K., Carrat F., Velleron A.J., Flahault, A. (2004, January). Influenza Epidemics in the United States, France, and Australia, 1972-1997. *Emerging Infectious Diseases*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3322745/

Wan, Y., Shang, J., Sun, S., Tai, W., Chen, J. et al. (2020). Molecular mechanism for antibody-dependent enhancement of coronavirus entry. *Journal of Virology, 94*(5): e02015-19

Wolken, D. (2020, May 31). Are offensive lineman at greater risk of COVID-19 complications because of their size? *Austin American Statesman*. Retrieved from https://www.statesman.com/sports/20200531/are-offensive-linemen-at-greater-risk-of-covid-19-complications-because-of-their-size?template=ampart

World Health Organization [WHO]. (2018, November 6). Influenza (Seasonal). Retrieved from https://www.who.int/en/news-room/fact-sheets/detail/influenza-(seasonal)

World Health Organization [WHO]. (2020a, June 17). Rolling updates on coronavirus disease (COVID-19). Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen

World Health Organization [WHO]. (2020b, July 25). WHO COVID-19 Data Explorer. Retrieved from https://covid19.who.int/explorer

World Health Organization [WHO]. (2020c, July 25). WHO Coronavirus Disease (COVID-19) Dashboard. Retrieved from https://covid19.who.int/

World Health Organization [WHO]. (2020d, June 8). WHO Influenza update - 369. Retrieved from https://www.who.int/influenza/surveillance_monitoring/updates/latest_update_GIP_surveillance/en/

World Health Organization [WHO]. (2020e, March 17). Q&A: Influenza and COVID-19 - similarities and differences. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-similarities-and-differences-covid-19-and-influenza?gclid=CjwKCAjwqpP2BRBTEiwAfpiD-0e7iM_uCbJzjGOJtSY8gc68PzPtp8fRxdaSpx1LYKdpaHMKPErMfBoCIYkQAvD_BwE

Zhang, S. (2020, May 24). We Don't Even Have a COVID-19 Vaccine, and Yet the Conspiracies Are Here. *The Atlantic*. Retrieved from https://www.theatlantic.com/science/archive/2020/05/covid-19-vaccine-skeptics-conspiracies/611998/

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Scowcroft Institute of International Affairs White Paper – Fall 2020

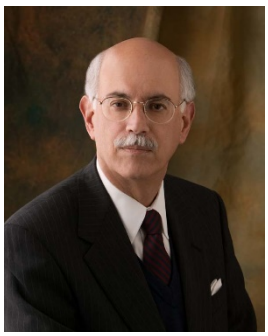
Authors

Christine Crudo Blackburn, PhD

Dr. Christine Crudo Blackburn currently serves as the Deputy Director of the Pandemic and Biosecurity Program at the Scowcroft Institute of International Affairs in the Bush School of Government and Public Service at Texas A&M, conducting research on various aspects of pandemic disease policy and control. She teaches at the Bush School and at the Texas A&M School of Public Health.

Anmol Desai, MPH

Anmol Desai is a Public Health Epidemiology Program Research Associate at the University of Texas Health San Antonio. Anmol has prior experience working with the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) in India and Gavi, The Vaccine Alliance. She has also been actively participating in the COVID-19 contact tracing efforts in Austin, Texas with the University of Texas Health Austin. Anmol received her MPH in 2018 from Columbia University as part of the Epidemiology Department and Global Health Certificate.



Andrew S. Natsios

Andrew S. Natsios is an Executive Professor at the Bush School of Government and Public Service at Texas A&M University and Director of the Scowcroft Institute of International Affairs. Natsios served as Administrator of the U.S. Agency for International Development from 2001 to January 2006. He was the U.S. Special Envoy to Sudan (2006-2007) to deal with the Darfur crisis and the North-South peace agreement. He is a graduate of Georgetown University (BA History) and Harvard University's Kennedy School of Government (MPA).

Scowcroft Institute Leadership

Gerald Parker, DVM, PhD
Director, Pandemic and Biosecurity Policy Program, the Scowcroft Institute of International Affairs
Associate Dean, Global One Health, Texas A&M College of Veterinary Medicine

Leslie Ruyle, PhD
Associate Research Scientist and Assistant Director, The Scowcroft Institute of International Affairs, The Bush School of Government and Public Service, Texas A&M University

General Mark Welsh III
Dean, Holder of the Edward & Howard Kruse Endowed Chair, and Executive Professor, The Bush School of Government and Public Service, Texas A&M University