

# Pandemics epidemiology: Societal impacts and strategic response

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United States		
Confirmed	Recovered	Deaths
4.88M	-	159K

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Worldwide		
Confirmed	Recovered	Deaths
19M +212K	11.5M	712K +5,134

COVID-19 has rapidly spread from a single city to the entire country in just 30 days. The sudden increase in numbers of cases surprised and quickly overwhelmed public health services in China and numerous other nations. In this research paper, we will be looking at how the U.S. responded to the coronavirus. In late February, there were just a few dozen known cases in the United States, most of them linked to travel. But by early summer, the virus

had torn through every state, infecting more people than the combined populations of Wyoming, South Dakota and Washington, D.C. Now there are a total of almost 5 million confirmed cases in all of the US. COVID-19, a disease in relations with the SARS virus, has recently had the entire world wary of even what they touch. With over 19 million confirmed cases worldwide, the USA holds itself accountable for almost 5 million of those. The country's poor response towards this outbreak is a factor as to why it is labelled as the country with most confirmed cases and also deaths. The first reported patient in the US was in late February. In response, the government had issued self-isolation and work from home laws. Near the end of March, Donald Trump had advised 32/50 states to move forth in lockdown. However, a short 2 weeks into said lockdown, the president has already started spelling out the end of it. With restrictions easing too quickly, in the span of a few short months, COVID-19 had struck the US hard, especially in terms of the economy. Now with the opening of almost all of the public places, some states are facing major problems.

## Hospital Resource Use & Future Models

By the end of the COVID-19 pandemic, it is estimated to cost the United States around \$700 billion in medical expenses. This would include hospitalizations, ventilators, and other health resources that patients and healthcare workers would require. Hospital systems all across the USA are designed for average patient loads, not epidemics. These hospitals have 534,964 staffed acute care beds, including 96,596 ICU beds, accounting for a median of 16.7% of all hospital beds. It is important to have an understanding of the U.S. ICU bed supply, use, occupancy, and costs because it will help provide clarity to the width and scope of the critical care medicine enterprise within the U.S. healthcare system and hospital utilization is a fundamental requirement in hospital resource planning.

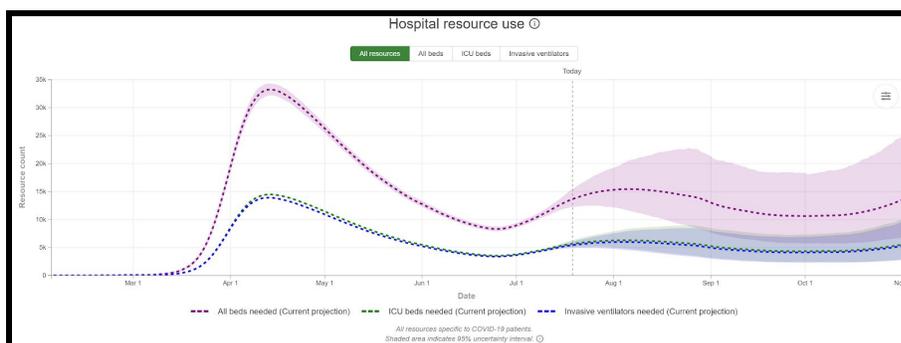


Figure 2. A graphical representation of the hospital resource use in the USA from February to July.

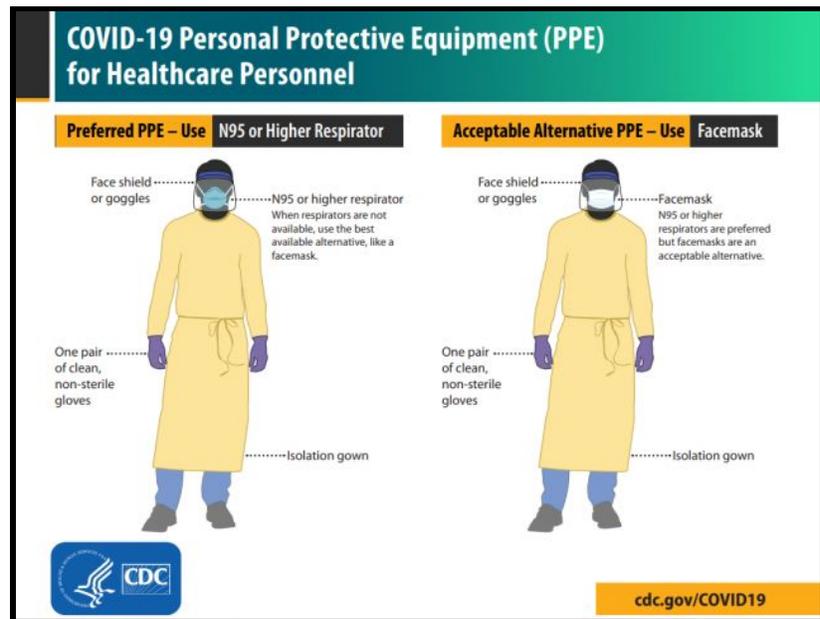
The ICU beds are categorized as an adult, pediatric, or neonatal (relating to newborn children). There are 68,558 adult beds (medical-surgical 46,795, cardiac 14,445, and other ICU 7318), 5137 pediatric ICU beds, and 22,901 neonatal ICU beds. Additionally, there are 25,157 step-down beds and 1183 burn-care beds. Major states are seeing setbacks due to the poor decisions made around the pandemic. With the opening of major places, more than four dozen hospitals in Florida reported that their intensive care units (ICUs) have reached full capacity as COVID-19 cases surge in the state and throughout the country. New York City would need 110,000 hospital beds to treat those suffering from the coronavirus, and it only had 53,000 available. The outbreak of COVID-19 has generated concern that critically ill patients may overwhelm existing ICU bed availability.

The USA has also been on a shortage of personal protective equipment which includes gloves, face masks and gowns. Healthcare workers have had to work in such harsh and dangerous situations without the proper

protective clothing and are forced to reuse existing supplies. Health systems and governments knew they needed robust, resilient personal protective equipment supply chains to successfully defeat the virus. But, with most essential supplies produced outside of the U.S., supply disruptions, policy changes and freight snarls threatened U.S. institutions' ability to successfully procure personal protective equipment (PPEs) like gloves, face masks and gowns in a timely manner. For

months, however, there have been widespread reports of healthcare workers having to make do without the proper protective clothing or forced to reuse existing supplies. Many Americans outside the medical profession have resorted to fashioning make-shift masks from scarves and coffee filters, as protective items are even harder for them to find. When a nurse visiting the White House last week told the president that supplies of personal protective equipment (PPEs) like gloves, face masks and gowns have been "sporadic but manageable", the president replied: "Sporadic for you, but not sporadic for a lot of other people". Trump told states it was primarily their responsibility to acquire the needed supplies, quipping that the federal government was "not a shipping clerk". That left many states bidding against each other on the open market for protective gear and, on occasion, facing federal government seizure of shipments they had ordered for themselves.

In the past 400 years thirty influenza pandemics have occurred, three in the past century, meaning that the next pandemic may arrive fairly shortly. Firstly pandemic planning is important because Influenza pandemics, whether mild, moderate or severe, affect a large proportion of the population and require a multisectoral response over several months or even years, therefore,



more planning and preparedness is critical to help mitigate the impact it will have on both the citizens and economy of countries. We have to learn from each mistake, so next time we can be more proactive and have better outcomes.

The fragmented American public health system is the result of overwhelmed officials at the state or local level who have struggled to report accurately and consistently. During this pandemic, the public has not received an accurate, up-to-date record of coronavirus cases, tracked to the county level. Individual states and counties have tracked their own cases and presented them to the public with varying degrees of speed and accuracy, but those tallies provide only limited snapshots of the nation's outbreak. This is a result of a fragmented American public health system in which overwhelmed officials.



From this pandemic, we have realized how important it is to manage supplies and resources in hospitals. Hospitals must be stocked for emergencies such as pandemics. By observing outbreaks in other nations, the US can start to model and anticipate both what the ultimate capacity to provide care will be and when that capacity will be exceeded. US hospitals routinely operate at or near full capacity

which has been a great sight during this pandemic. This has also limited the ability to rapidly increase services, and have shortages of healthcare workers of all kinds. There is a need for the involvement of advanced analytical methods and machine learning techniques to help make better decisions regarding the allocation and use of hospital beds (and other resources) in order to improve patient care and save money. To make these improvements hospitals should focus their initial preparedness efforts in Comprehensive and realistic planning based on actual CDC FluSurge projections in each hospital, and collaborative planning among all hospitals in a region (e.g. healthcare coalitions). Limiting the spread of the virus to protect the healthcare workers and thus maintain a hospital workforce; prevent the hospital from being a disease amplifier; and protect the non-COVID-19 patients from infection, so as to maintain the ability to provide essential non-COVID-19 health care. Allocating limited healthcare resources in a rational, ethical, and organized way so as to do the greatest good for the greatest number.

Some countries the USA should look at as good examples are South Korea, Germany and Taiwan. The common themes in success have been massive testing, adaptive policy recommendations for different regions, and communication by public officials that is constant, transparent, and honest. Taiwan has been successful at combating the virus through aggressive testing and containment measures. South Korea, while initially inundated with patients from a rapidly spreading cluster, has successfully mitigated spread (at least temporarily) with minimal associated mortality. Since 2003, the Chinese government has improved its epidemic response capacity. They knew that specific treatment and prevention options such as targeted antiviral drugs and vaccines were not yet available for COVID-19, so China focused on traditional public health outbreak response tactics (i.e. isolation, quarantine, social distancing, and community

containment). These more successful countries can provide encouragement for the US that a well-executed public health response can minimize the potential for operational crises.

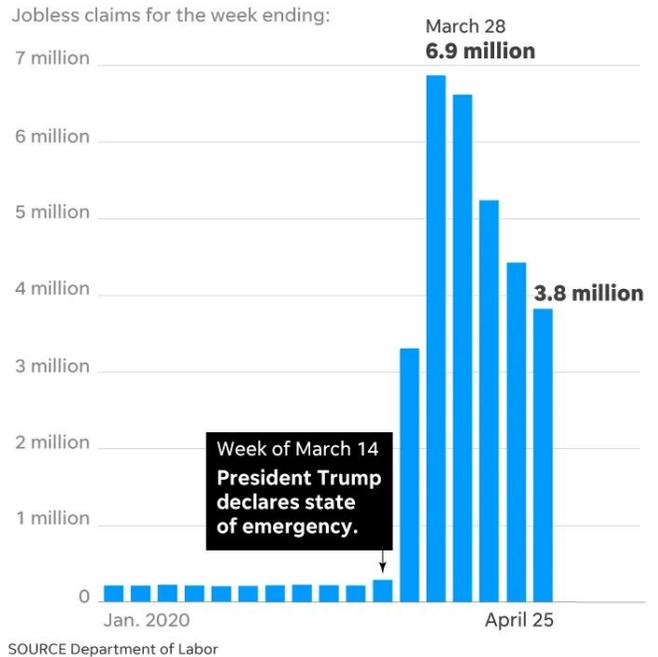
## Economic Impacts

With the COVID-19 outbreak, the USA has found itself facing a great economic crisis, even greater than the Great Recession in terms of employment rates. The Great Recession, one of the largest economic downfalls in USA history that lasted from December 2007 to June 2009, recorded unemployment rates peaking at 10%, in October 2008. COVID-19 has had unemployment rates peaking at a striking 14.7% in April 2020, a mere month after the outbreak in the US. Experts predict another recession, possibly worse than the one in 2007, that will shake the economy and a difficult, yet very possible comeback.

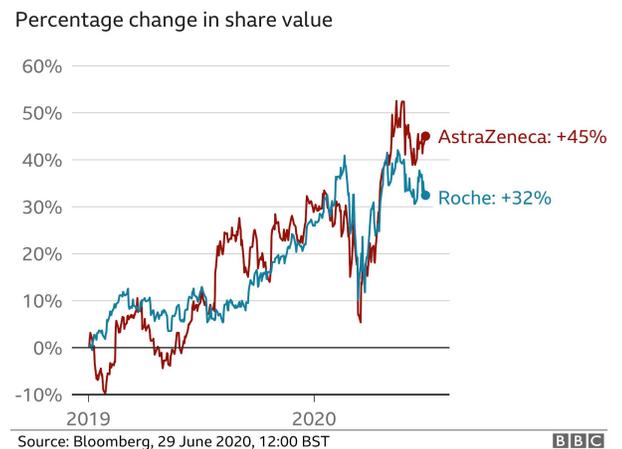
As stated in a BBC interview, *“Businesses exist to make a profit. If they can’t produce, they can’t sell things. This means they won’t make a profit, which means they’re less able to employ you.”* The quote explains the rise in the unemployment rate as well as why many businesses will go bankrupt. This is detrimental to the country's economy especially, due to the fact that many large businesses have filed for bankruptcy already such as J. Crew (May 4, 2020), Whiting Petroleum (April 1, 2020), and Diamond Offshore (April 26, 2020).

With this pandemic, came to light the utter ignorance within funding towards the healthcare system. The USA's healthcare system is a mix of both private and public funded patchwork of fragmented systems and programs. However, despite all the healthcare acts and insurance plans, 10.4% of the Americans remain uninsured which leads the US to lag behind other countries as they consistently rank lower compared to other countries in terms of healthcare measures. Interfaith Medical Centre, a hospital created to serve the impoverished community in Brooklyn, found itself in trouble as COVID cases increased and so did patients. They found difficulty in providing proper care to patients due to insufficient funding and staffing. The in-charge of the hospital and 2 other hospitals speaks on the meager funding, stating, “We may have five or seven days of cash on hand — we celebrate if it is more than 14.” Despite the \$175B bailout, hospitals were funded with, they have managed to find themselves running on crumbs

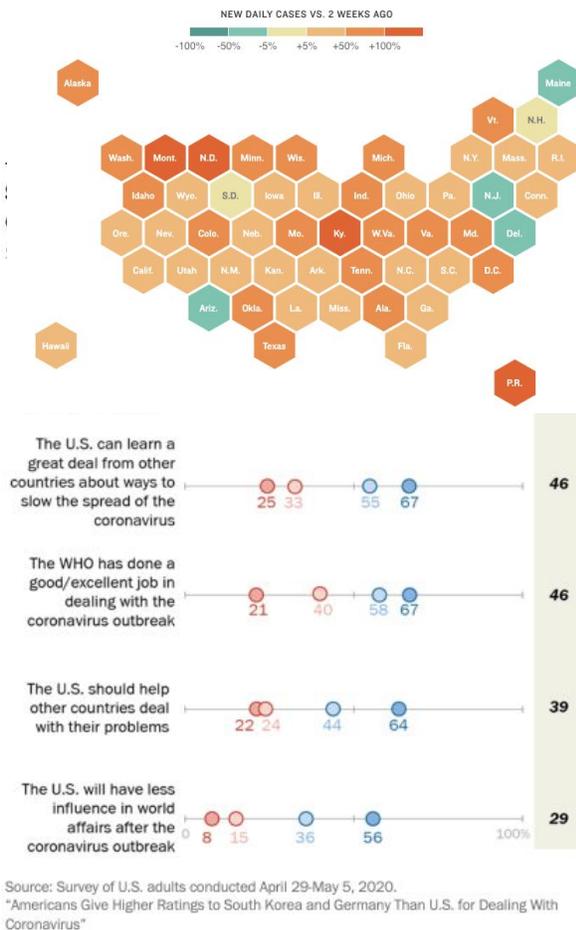
### In 6 weeks, 30 million file for unemployment



### The rise of pharmaceutical companies



with the increasing number of cases and risks in the country. This has caused officials to reconsider funding towards hospitals and, perhaps, will promote more funding towards the healthcare system. The pharmaceutical industry will also face great changes, and perhaps challenges. As the country clutches on to medical equipment and masks, these pharmaceutical companies race to develop a vaccine. A BBC article states, “AstraZeneca's share price, for example, has hit record highs. The Drug company says it will be able to produce two billion doses of a vaccine.”



## Infections and Fatality Rates

As of July 24th, there are 4,17 million cases of confirmed cases of COVID-19 in the US, with a devastating total of 147 000 deaths. Every day, records are broken as cases pile up rapidly, and the disease is progressing faster and faster throughout the country. Right now, the epicentre of this disease is located in the United States, Florida, totalling 402 000 of the nation's cases. This graph\* shows the progression of the number of cases per state over a time period of two weeks.

Based on current death certificate data, the percentage of deaths attributed to pneumonia, influenza or COVID-19 (PIC) increased from between June 27th and July 11th for the first time since mid-April. The percentage for week 29 (of SARS-Cov2) is 9.1% and currently lower than the percentage during week 28 (11.5%). According to WHO, different age demographics are subject to different rates of infection and mortality. As of February 1st to June 17th, the following table shows the deaths from COVID-19 of the US population by age\*\*,

showing that as the age increases, so does the mortality. It is true however that the proportion of infections in younger people increased in June and July compared with March and April. And young people have a much lower risk of dying than people in their 60s and older. The CDC's latest estimates of the infection-fatality rate of this disease range from 0.5 to 0.8 percent.

25-34 years	699	0.676%
35-44 years	1 780	1.722%
45-54 years	4 976	4.815%
55-64 years	12 307	11.909%
65-74 years	21 462	20.769%
75-84 years	27 529	26.640%
85+ years	34 435	33.322%
Total	103 339	100.00%

Age Group	COVID-19 Deaths	Percentage of COVID-19 Deaths
Under 1 year	8	0.008%
1-4 years	5	0.005%
5-14 years	13	0.013%
15-24 years	125	0.121%

In our research, there is a data of confirmed cases and deaths over the months shown in this graph\*;

Our predictions are that as of May 1st, 23,430 people are estimated to have died out of the 8,398,748 people in NYC. This leads to a 0.28% coarse mortality rate to date or 278 deaths per 100,000 in a population. It makes it a 1 death out of every 358 persons which will grow over time as deaths and contaminations arise. The entire population group under 65 (healthy and unhealthy) have 6,188 deaths (26% of the entire deaths in every age group), 5,498 deaths (89%) in the patients with a hidden condition. The mortality rate will correspond to 6,188 out of 7,214,525 (0.09%) CMR or 86 deaths in a 100,000 population.

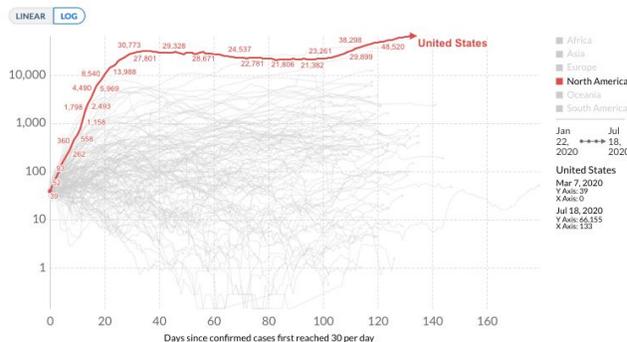
Case fatality rate of the ongoing COVID-19 pandemic

The Case Fatality Rate (CFR) is the ratio between confirmed deaths and confirmed cases. During an outbreak of a pandemic the CFR is a poor measure of the mortality risk of the disease. We explain this in detail at [OurWorldInData.org/Coronavirus](https://OurWorldInData.org/Coronavirus)



Source: European CDC - Situation Update Worldwide - Last updated 18 July, 10:06 (London time) OurWorldInData.org/coronavirus - CC BY Note: Only countries with more than 100 confirmed cases are included.

Daily confirmed COVID-19 cases: which countries are bending the curve? Because not everyone is tested the total number of cases is not known. Shown is the 7-day rolling average of confirmed cases.



Source: European CDC - Situation Update Worldwide - Last updated 18 July, 10:06 (London time)

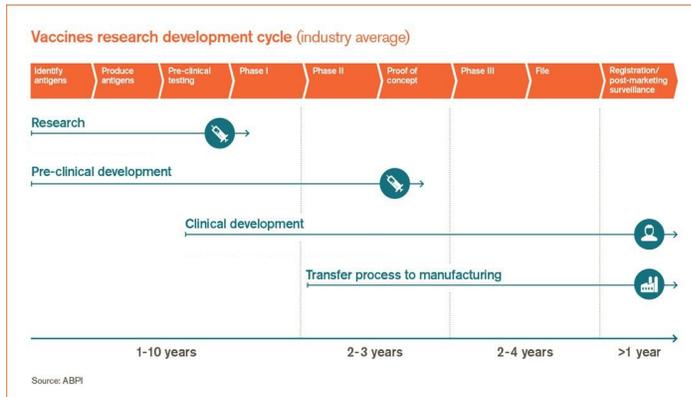


Thought experiment: 35.5 million people acquire COVID-19 in 2020 in the US (the same number to those who were infected with influenza in 2019)- 20 people then in the absence of any alleviation approaches or distancing behaviours with the supply of health care services under the usual conditions, the IFR-S estimate predicts there would almost be 500,000 coronavirus deaths in the US this year. To the range that COVID-19 is more infectious than influenza and we have no protection in the form of a

treatment or vaccine, the number of infections and since the number of deaths would be bigger in comparison to influenza. Definitely, the exercise of mitigation actions, the death toll will be smaller. An example, March 31st, White House Coronavirus Task Force calculations of 100,000 to 200,000 deaths of COVID-19 this year were made using beliefs about the success of distancing instructions and measures presently in place.

## Treatment and Vaccine Development

As COVID-19 has grown into a worldwide pandemic, the need for the treatment and prevention of this virus has also grown. Doctors and scientists around the world have been working faster than ever to impede COVID-19's escalation as well as reduce its mortality rate and this section will focus on the inner workings of these tasks.

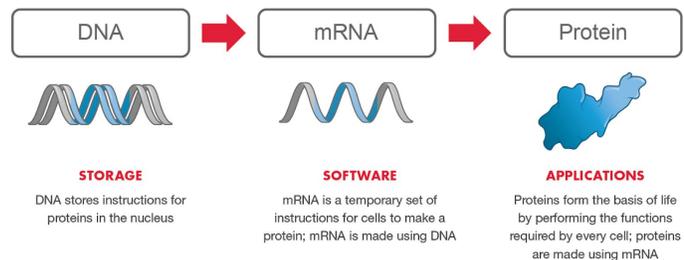


Developing a vaccine usually takes many years or even decades of testing and research, but despite that, multiple COVID-19 vaccines are already in phase III of testing within less than a year of the virus' discovery (see figure on the left).

One of these vaccines is produced by the American company Moderna. Their vaccine is particularly unique because it uses an RNA platform in which an

mRNA sequence is coded for a specific antigen and introduced into a person's body. The antigen is then produced so the immune system can recognize it and be prepared for the real thing (see figure below). This type of vaccine is a recent invention that is laboratory-produced. This is important because it allows these vaccines to be manufactured on a much larger scale, faster, and for much cheaper than traditional vaccines. These are important factors to consider when dealing with a virus of this magnitude. Not to mention, this type of vaccine can be safer than traditional vaccines because it doesn't use actual infectious elements.

Moderna began phase I of their testing on March 16th, 2020 and the results of this study were very positive. Every participant from every dosage level experienced a robust immune response to the virus and no trial-limiting safety concerns were found. This has allowed them to proceed to stage III testing which they began on July 27th, 2020. This new round of tests involves around 30,000 volunteers without COVID-19 to determine if their vaccine can offer protection from the virus and if so, how long that protection will last. A test of this calibre and scale takes time and is not estimated to be completed until October of 2022. This means that even if this vaccine will work, we won't get it anytime soon. Until then, doctors and researchers are working on drugs that may lessen the severity of COVID-19.



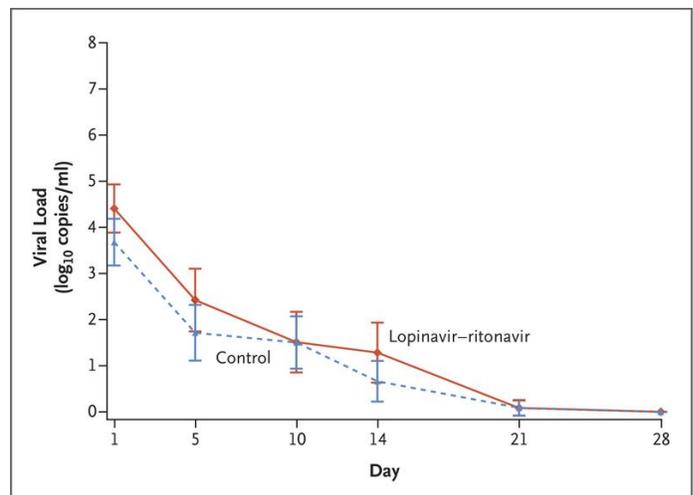
One of the drugs being tested is hydroxychloroquine (HCQ) which has immunomodulatory effects and decreases the production of major inflammatory cytokines including IL-2 and IL-6. It is often used to treat malaria, lupus erythematosus, and rheumatoid arthritis. HCQ had positive results in small scale studies and it was thought to prevent respiratory failure in COVID-19 patients. However, these results did not hold up in larger trials and HCQ has been determined to not be effective for use in COVID-19 pneumonia cases because no

evidence was found to support HCQ reducing the risk of mechanical ventilation and when patients were treated with HCQ alone, they were found to have an increased mortality risk, increased risk of adverse effects, and has even been linked to other safety issues like liver failure, kidney injuries , and blood and lymph system disorders.

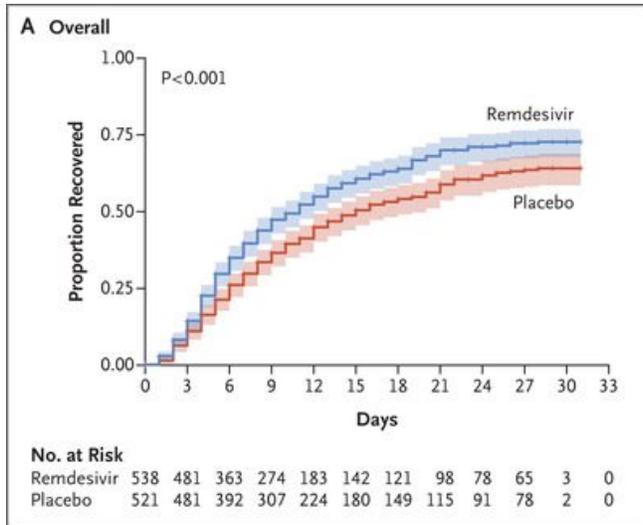
Another drug that has been considered is azithromycin (AZM) which has significant antiviral properties and works against a large number of viruses including Ebola, Zika, and Influenza. Both in vitro and in clinical studies, it showed antiviral properties against COVID-19 both in conjunction with hydroxychloroquine and alone. The reason for this effect is that AZM decreases the virus entry into cells and can enhance the immune response by upregulating the production of type I and type III interferons and genes involved in virus recognition. In addition, it decreases the number of major inflammatory cytokines such as IL-8. The major difference between AZM and HCQ is that HCQ decreases IL-2 levels while AZM doesn't and AZM decreases IL-8 levels but HCQ doesn't. IL-2 is a cytokine involved in the host's immune response by inducing T-lymphocyte proliferation and differentiation. IL-2 production is enhanced by the native response to COVID-19 to maintain a sufficient production of T-cells. IL-8 is involved in neutrophil chemotaxis facilitating the lung infiltration and macrophage activation-like symptoms that some severe patients have. The inhibition of the IL-8 cytokines is most likely a good thing for COVID-19 but the decrease of IL-2 cytokines would not be. This could explain why hydroxychloroquine has not been very effective against COVID-19 but azithromycin has.

Azithromycin also has an antibacterial effect that can be useful in preventing or treating bacterial co-infection of COVID-19. Recent data suggests that anaerobic bacteria of lung microbiota may be involved in the pathogenesis of COVID-19 and AZM could be a treatment for these bacterial infections that aid the virus. AZM is approved in the United States for adults and children over 6 months of age and it's tolerance is well known. It has some adverse reactions such as nausea, vomiting, diarrhea, or abdominal pain, but these are all mild and reversible. Morbidity rates have been promisingly lower in COVID-19 patients who were given AZM and more studies should be done to test its effectiveness.

Thirdly, a combination of lopinavir and ritonavir has been tested to decrease recovery time. A study was done by the New England Journal of Medicine to determine if lopinavir and ritonavir given in a 1:1 dose would have any effect on the time to clinical improvement. The study concluded that lopinavir and ritonavir do not have any effect on the treatment times for COVID-19 patients (see figure on the right). Also, many patients were unable to complete the trial because of significant adverse effects. Another study conducted by The World Health Organization confirmed these results and found that lopinavir and ritonavir produced no reduction in the mortality rates of patients.



Additionally, researchers have decided to seek out alternate methods in the race to create a vaccine. To serve an international customer base, companies must be ready to manufacture the treatment at any time. For a profitable and effective solution, many have turned to advocate the medical practice of drug or treatment repurposing. By engineering, editing, and improving pre-existing antivirals, the production process can be sped up tenfold. There are currently three promising candidates undergoing rigorous testing in the U.S.A.



Remdesivir was created over ten years ago and although it failed clinical trials against Ebola in 2014, there have been promising results for the fight against COVID-19. It has blocked the growth and spread of other coronaviruses and diseases such as MERS (often developed because of the viruses). The drug was approved for emergency use by the FDA on May 1st and continues to rise in demand. A late-stage study found that 74.4% of remdesivir-treated patients recovered within a fortnight. This rate is significantly higher than their standard treatment counterparts. Another similar study was done to test remdesivir's

effectiveness also found that recovery time for treated patients was significantly shorter than the placebo group (see figure on left). Furthermore, clinical trials that were published in the New England Journal of Medicine discovered that certain patient groups (black or under 65) had positive responses to the drug. These patients did not receive biological treatments to handle internal cytokine storms and required less oxygen, despite breathing complications that COVID-19 causes. Although remdesivir is considered a 'band-aid drug' to create a temporary stabilization while a vaccine is developed, it continues to undergo testing. If it manages to succeed, remdesivir (or a variation of it) will be the internationally accepted drug for SARS-CoV-2.

Emory University in Atlanta, Georgia owns a non-profit biotech company that is creating a promising antiviral. Given the name EIDD-2801, little information about it is accessible to the public. Research conducted on mice found that it reduces replication and spread of multiple coronaviruses. That list of viruses includes COVID-19. Researchers deem this drug to be a convenient option compared to Remdesivir because it can be administered orally. That fact lets the public know EIDD-2801 can be produced and administered easily. The group will continue forward with trials in the upcoming weeks.

Finally, a treatment using blood plasma transfusion has gained traction within the medical community. Endorsed by the FDA, this experimental procedure uses blood plasma from recovered COVID-19 victims. Its presence in a new body increases the ability to recover because the plasma contains antibodies targeted at SARS-CoV-2. During May, 19 out of 25 people with the coronavirus treated with convalescent plasma transfusions improved in their condition. Eleven people were quickly discharged from the hospital. Despite its benefits, this solution targets marginalized groups and second or third world countries that cannot perform the

transfusion. Recovered patients denying the use of their blood plasma will lead to a shortage in the resource. With questionable effectiveness and factors outside of government control, the transplants are a limited solution to a growing problem.

Many scientists are attempting to find a solution to this worldwide issue and so far, they have been progressing exceptionally quickly. We can estimate having a vaccine in less than 2 years, and in the meantime, researchers are working on finding the most effective drug to reduce mortality rates and recovery time for those already infected. Their work will mean saving the lives of countless people and refusing to let the malignant plagues of the past repeat themselves.

## **Mitigation Efforts**

As the Covid-19 virus cases are growing rapidly, the United States of America is finding ways to mitigate the effects of the virus. Mitigation efforts seek to slow the spread of the virus, improve healthcare for affected patients and provide patients with the right healthcare. The US government also plans to expand testing capabilities and tailor self-isolation to limit the spread of the virus. As the economy is reopening it is becoming harder and harder to find ways to mitigate the efforts of Covid-19. As malls, movie theatres and eventually schools are opening it would be harder to contain the virus. The government is implementing ways for a full return of the US economy. This will most probably lead to more cases. Each state is handling the reopening differently, with different restrictions. Rules also vary store to store, for example in Macy's (the nation's largest department store chain) you are not allowed to try on makeup or dress shirts. There also no ear piercings or alterations, either. Covid-19 rules are ever-evolving as more information is found out or given. These regulations are to protect the employees from the customers and vice-versa. If employees refuse to wear a mask, employers are supposed to find an alternative covering for them, such as face shields.



The US government has required insurance companies to cover the cost of Covid-19 tests.

The U.S. Food and Drug Administration (FDA) approved the first new rapid test kit from Cepheid that uses the GeneXpert technology and machines used to diagnose tuberculosis.

However, they plan to charge double the cost to use in COVID-19 for the same cartridges used for TB. The FDA has also approved the use of a 15-minute coronavirus test from Abbott Laboratories since it is the fastest available molecular point-of-care test to detect the novel coronavirus (COVID-19) delivering positive results in as little as 5 minutes and negative results in 13 minutes. The best part about these portable tests is that these can be taken in the physicians' office or urgent care clinics, instead of inside a busy hospital.

Some of the community-based measures to mitigate the spread of coronavirus include (but not limited to):

### **Hand Hygiene and Respiratory Etiquette**

- Washing hands with soap and water for 20 seconds or using an alcohol-based hand sanitizer.

- Frequent handwashing reduces viral transmission across a variety of settings by up to 44%
- Avoid touching one's eyes, nose, and mouth with unwashed hands.
- Individuals should cough or sneeze into a tissue, or the bend of the arm, not their hand.
  - Tissues should be disposed of as soon as possible in a lined waste container and hand hygiene performed immediately.

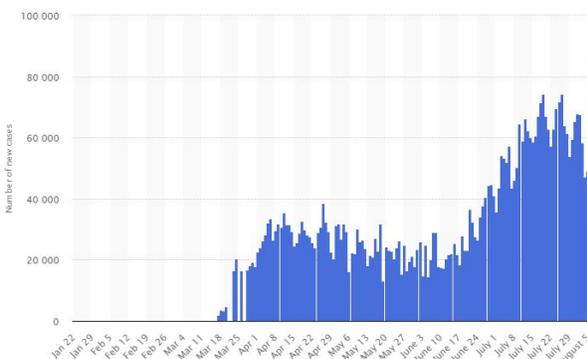
### Personal practices

- Staying informed, being prepared and following public health advice.
- Practicing good hygiene (hand hygiene, avoid touching face, respiratory etiquette).
- Staying at home and away from others if symptomatic/feeling ill - not going to school/work.
- Maintaining physical distancing as much as possible when outside of the home (i.e. from non-household members).
- Cleaning and disinfecting your surfaces and objects.
- Staying at home as much as possible if at high risk of severe illness.
- Wearing a medical mask, or a cloth face covering, if in close contact with others or going out.
- Reducing personal non-essential travel.

### Cleaning the home and co-living setting

- Daily disinfection and cleaning of frequently touched areas such as toilets, bedside tables, light switches and door handles.
- In households with children, toys and objects that are frequently touched by children should also be cleaned and disinfected daily.
- High-touch electronic devices such as keyboards, tablets, television remotes and smartphones may be disinfected with alcohol (e.g., alcohol prep wipes) daily.
- Increasing ventilation (e.g., opening windows when weather permits) may help to reduce transmission.

You can stay safe from the coronavirus, but the best way to be sure is to get tested. Covid-19



tests can cost anywhere from \$20 to \$850. A typical list price of a test is about \$127, but one in five tests cost more than \$200. Although half of the hospitals charge between \$100 to \$199. The White House has acknowledged that there are not enough testing kits, as the disease has ticked upwards on both coasts. Individuals without insurance may get testing at CDC or State facilities. About 8.5% of the population or about 27 million people. If they can't get free testing there they may have to pay for their tests.

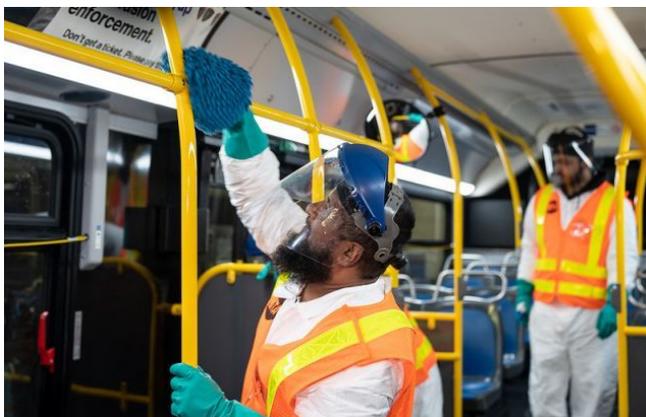
As schools will start to reopen and workplaces are already open, many efforts to stop Covid-19 have started. When schools reopen, teachers are said to wear a N-95 mask, a surgical mask and a face shield. If possible they should also wear a hairnet. They should have 5 of these setups for the 5 days of the week. As it will take a full week for the germs and bacteria to leave. There is no definite way schools are opening. For example in Ontario, Canada half of the school is going to

be online, meanwhile, the other half is going to be in school. Different countries have different systems for reopening, for example, in New South Wales they started with one day a week on May 11. Meanwhile, in Taiwan students and teachers are required to wear masks. The government provides children with ten masks for two weeks and provides teachers with nine masks. Masks are a daily part of their life now.

Teachers are recommended to wear a face mask and face shield. They are also recommended to wear a hairnet for maximum protection. They should have five for a rotation for the five days of the week. Surgical masks are not closely fitted but can prevent coronavirus from spreading. Cloth masks are better or you can make your own mask from scarves, bandannas or other thicker pieces of clothing. When you are buying a mask you should be looking for a mask with two layers of fabric. Many care teams when taking care of Covid-19 patients wear face shields for extra protection. Masks are very important to stop Covid-19, and they should be worn all the time to prevent the spread of Sars-CoV-2.

As essential businesses continue to operate during the COVID-19 pandemic while following stringent public health rules. Early evidence suggests that the risk of transmission in the workplace depends on the type of activity, the physical proximity of workers and the number of people who attend work despite being ill. While most workplace infections have occurred in health care settings, tourism or transportation, a few clusters have been identified in an office setting. In the latter setting, all cases had contact with infected individuals who spent time in an enclosed environment (e.g., meeting room). As employees head back to their workplaces, companies and employers are expected to abide by mitigation strategies such as have employees use non-medical masks or cloth face coverings, continuing telework arrangements wherever possible and feasible, especially for individuals at risk of severe disease, implement adjustments to working arrangements to reduce physical contacts, such as flexible work hours, staggered start times, use of email and teleconferencing, increasing the spatial separation between desks and workstations as well as between individuals (e.g., employees, customers) from each other, using visual cues to encourage a two-metre separation (e.g., floor markings), and many more. For retail settings, it is recommended to modify the service delivery approach to prevent or limit contact between employees and customers and also restrict the number of customers. For restaurants/food service and bars, implementing take/out or delivery options only and having wide table spacing or patio sitting as they slowly reopen for dine-ins.

Public transportation (e.g., taxis, rideshares, buses, subways, rail and ferries) is an essential



service that helps to keep communities functioning. Limiting the availability of public transit disproportionately affects parts of the population that rely on it to get to school, work or to access essential goods or services. Some people with disabilities rely on specialized services, like modified buses to serve their needs whereas others use regular public transportation but may need help getting in and out of the vehicle. Two areas of public transportation pose a risk to further COVID-19 transmission are the large crowding of passengers in

enclosed vehicles and increased risk of infection for public transit staff. Employers and operators of transportation companies must also consider guidelines like minimizing shared rides in vehicles, practicing physical distancing in queues and waiting areas, encouraging passengers to sit apart from each other on buses, subways, trains and ferries if there is space, installation of plexiglass shields for service staff at booths, ensuring proper ventilation in closed waiting areas and vehicles at all times, having riders enter a bus through the back doors to avoid proximity to the driver and providing a hands-free collection of fares and tolls if feasible.

In this research paper we looked at different aspects of the pandemic and how the US approached them. Even though we can see many faults have been made in managing hospital resources and growth of cases by the US, they have made great strides in trying to develop a vaccine.

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