A Comparative Study of the Effects of the COVID-19 Vaccine on Global Politics in China and the United States

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

In late December 2019, health authorities in the Wuhan province of China detected several pneumonia cases from an unknown source with links to the Huanan Seafood Market, which led to a strict 76-day lockdown throughout China and ultimately the outbreak of a global COVID-19 pandemic. To date, over a year after its inception, the novel coronavirus has resulted in 156,000,000 cases and 3,260,000 deaths worldwide; the United States alone, has had 32,600,000 cases and 580,000 deaths (John Hopkins University, 2021).

My STS topic examines COVID-19 vaccines as a political artifact through the lens of a comparative study between China and the US. Both of these countries are world powers seriously impacted by the COVID-19 pandemic with significant discrepancies in development, arrangement, and deployment of COVID-19 vaccines, which makes them the ideal points of comparison. For instance, China and the US have incredibly varying preventative strategies, such as wearing a mask, social distancing, etc., and public adherence to these strategies.

Furthermore, the issue of COVID-19 vaccinations is more than just a technical issue: it is a wicked problem. Therefore, Winner's framework is the perfect STS framework to analyze COVID-19 vaccines as political artifacts in both China and the United States. In the United States, a capitalist country, socioeconomic status plays an integral role in vaccine awareness and procurement since the government does not centrally regulate vaccine distribution. Whereas, in China, a communist country, vaccinations are centrally regulated by the government and socioeconomic status plays no role in vaccine awareness and procurement.

In order to properly compare China and the United States' development, arrangement, and deployment of COVID-19 vaccines, I will be using a multi-method analysis of first-hand

interviews, surveys, as well as, document analysis. The unique perspectives of a US Food and Drug Administration (FDA) employee, Chinese health code developer, and Chinese university students, will allow for integration of unique perspectives and more in-depth analysis. The research questions for investigation include*: How have COVID-19 vaccines impacted domestic politics in China in terms of development, arrangement, and deployment? How have COVID-19 vaccines impacted domestic politics in the United States in terms of development, arrangement, and deployment? How have COVID-19 vaccines impacted international politics for China in terms of development, arrangement, and deployment? How have COVID-19 vaccines impacted international politics for the United States in terms of development, arrangement, and deployment?*

Literature Review

Development

In the past, human infection associated with bird influenza viruses such as H1N1 has raised concern regarding pandemic potential. Vaccination remains the primary tool against combatting and eliminating bird influenza viruses. An emerging pandemic results in a surge in worldwide vaccine demand and new approaches for immunization strategies to optimize vaccine development. For avian influenza viruses, inactive strains are utilized to create viruses (Stephenson et al., 2004). Another method used to create viruses is antigens. More importantly, "pandemic-like" vaccines need to be developed and tested in clinical trials prior to distribution. These trials will involve pharmaceutical companies to coordinate internationally (Fedson, 2005). Additionally, a comprehensive approach is needed to finance vaccines. For instance, in the case of SARS-CoV-2 vaccines, investors increased pandemic vaccine development by directly

investing in vaccine development technology research and pharma. For future infectious diseases, where vaccine research can help fight against other related pathogens with pandemic potential. Therefore, vaccine development should be reflective of the social value associated with increasing global preparedness than addressing individual preparedness (Monrad et al., 2021).

Arrangement

After a vaccine is developed, a global action plan (GAP) is formed in order to augment the supply of pandemic influenza vaccines. For instance, for the H1N1 pandemic, a GAP was developed by the World Health Organization to diminish the anticipated gap between vaccine demand and supply (Partridge et al., 2010). A UK study tested the effects of omission bias for the H1N1 vaccine, error rate among parents unwilling to vaccinate their children. The data from the study suggests that of the sample of children studied, the unvaccinated children were disadvantaged due to their parents' reluctance to get them vaccinated (Brown et al., 2010). This can be applied to the COVID-19 pandemic when formulating vaccination plans some parents may not want to vaccinate their children, and the repercussions of this omission error need to be taken into account.

Deployment

Deployment is the most vital step in thwarting a pandemic. Considering ethical issues associated with vaccine distribution during an influenza pandemic, it is imperative to understand the role of vaccines in a pandemic. Some important factors include the vaccine availability rate, the vaccine producer and "owner", vaccine administration, and priority vaccination groups (Hadler, 2005). Among high-risk groups include senior citizens and children who are more susceptible to contracting the virus (Longini & Halloran, 2005). Additionally, past pandemic vaccination plans such as the 2009 H1N1 pandemic vaccination campaign can be utilized for

future reference (Russo, 2012). Developing countries with less access to vaccination and distribution resources also need to be taken into consideration in a global vaccination plan (Boeck et al., 2020). According to a study done in Kentucky hospitals during the H1N1 pandemic, 95% of participating local health departments (LHDs) reported using a risk protocol to convey information to their healthcare providers. However, only 52% of surveyed physicians and 16% of pharmacists said they received any information from an LHD (Dearinger et al., 2011). For a multi-faceted, effective vaccination distribution plan, all the aforementioned elements need to be accounted for.

STS Frameworks and Methods

By utilizing Winner's framework, I analyzed COVID-19 vaccines as political artifacts. Winner's framework studies an object as a political artifact amidst a wicked problem, which means that since the solution of the problem is dependent upon how the problem is framed, stakeholders have radically different world views and different frames for understanding the problem, the constraints that the problem is subject to and the resources. In order to investigate how the vaccine serves as a political artifact, multiple methods including document analysis, interviews, and surveys were used for analysis. The goal of Winner's framework is to differentiate between domestic and international politics in China and the US for the development, arrangement, and deployment of COVID-19 vaccines.

Table 1: Domestic and International Politics of the COVID-19 Vaccine in China and the US

	Domestic Development	International Development	Domestic Arrangement	International Arrangement	Domestic Deployment	International Deployment
China	Use of inactive vaccine strains	Sinopharm vaccine patent is the first approved	Vaccine design is primarily government-regulated	Cooperation to find the most effective vaccine	Centralized, government-regulated vaccine distribution	Alliance with other countries such as Turkey and Hungary to provide them with Chinese vaccines
United States	mRNA technology	Pfizer BioNTech patent is the first approved vaccine	Vaccine design is primarily delegated to pharma	Race to find the most effective vaccine	Decentralized vaccine distribution	Concerned about vaccinating US population first

Data Analysis

Domestic Politics

Development/Arrangement: The intention behind the vaccine is to mitigate the symptoms of COVID-19 to either completely eliminate or lessen its effects, as well as, prevent the spread of the coronavirus upon contraction. China and the US both have very different stances towards the invention and design of a vaccine. The US government has speed up their testing process for vaccine development to deploy and distribute to the American public as soon as possible. The US has issued EUAs for two vaccines, Moderna and Pfizer, that utilize mRNA technology to combat COVID-19.

The Coalition for Epidemic Preparedness Innovations (CEPI) worked with global health facilities around the world to develop COVID-19 vaccines. The majority of potential vaccines are being developed by private industries; however, academic, public, and non-profit sectors were also involved in the production of vaccines. For instance, in the United States, BioNTech and Moderna were the two-pharma involved in the production of the vaccines. The organization of vaccines on a large scale is slowly being achieved, but the organization differs within the various aforementioned sectors.

The United States has two vaccines that utilize mRNA technology, Pfizer BioNTech and Moderna that received Emergency Use Authorizations (EUAs) from the FDA for use. Pfizer has an efficacy rate of 95% against the transmission and contraction of COVID-19, whereas, Moderna has an efficacy rate of 94.1%.

In China, the Food and Drug Administration of China on February 25th approved the two companies' vaccine registration applications. So far, the vaccines that have been approved in China, include three inactive virus vaccines: two of which are from Sinopharm Group and one of which is from Beijing Kexing; one adenovirus vector vaccine, developed by Kang Xinuo and Chen Wei. Contrary to the US' mRNA technology the inactive virus does not have the pathogenic ability, however, it can still boost the immune system and help produce antibodies. Inactive viruses are slightly outdated technology and are not as effective as mRNA technology.

A new type of vaccine that China has developed is the adenovirus vector vaccine, which attaches a nucleic acid fragment of the virus into the adenovirus that is then injected. The immune system then familiarizes itself with the viral antigen and optimizes its response to gain immunity towards the coronavirus. Feng Duojia, the president of the China Vaccine Industry Association, said that the principles and preparation methods of the two vaccines are different, but the immune response is very similar (People's Daily Health Client, 2021).

In my interview with Professor Mao, I was able to gather that the Chinese Alibaba health codes are used to monitor individuals' status and risk: red indicates the highest risk, yellow represents a general risk, and finally green represents low risk. In addition to public reception, there aren't many datasets made publicly available on behalf of the Chinese government for me to conduct data analysis, such as sentiment analysis. Since China has much more governmental

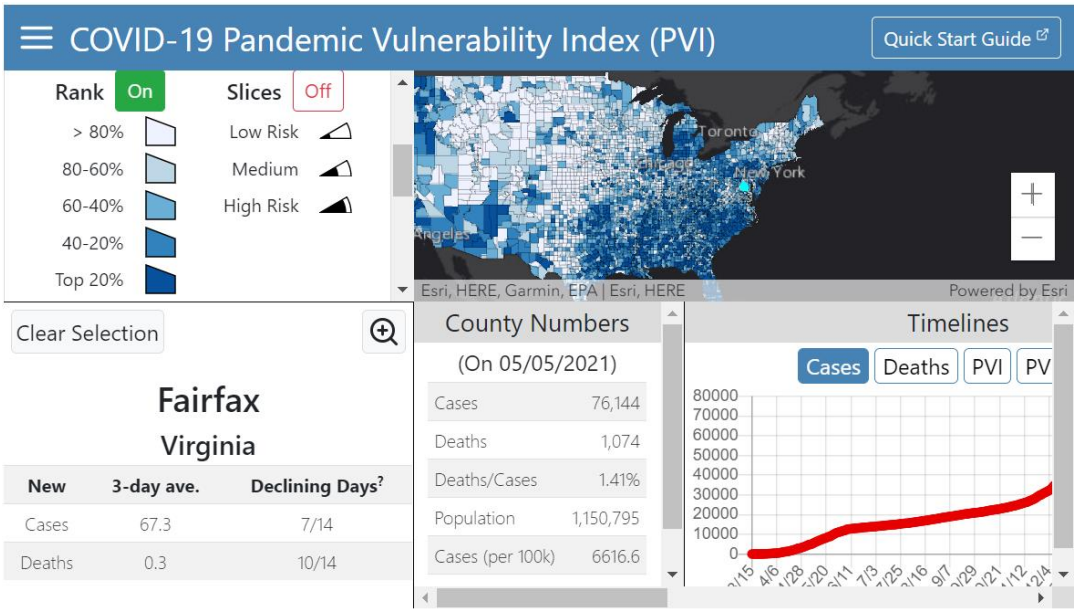
regulation of the digital data and information publicly available in comparison to the United States, my vaccine related data analysis is disproportionate and the role of censorship of information must be taken into account in my research.

Deployment: As mentioned in the previous section, the deployment of COVID-19 vaccine is typically regulated by governmental health agencies such as the FDA and the CDC and local state governments. Since there is no uniform healthcare system in the United States, there have been varying availabilities and deployment processes depending on the vaccination phase a state is in. The vaccine technology most certainly reconfigures social order and power. This leads to social unrest with respect to statements made by governmental health agencies and the American public. In China, as aforementioned, deployment isn't a primary concern due to proper containment of the COVID-19 pandemic and proper compliance with social distancing/preventative measures.

In the United States, individuals have been receiving the vaccine in stages of priority of health conditions and jobs that require interaction with individuals: stage 1a – vaccines for medical professionals and frontline workers, 1b – high-risk senior citizens and other patients, 1c – individuals with vulnerable medical conditions such as asthma, heart conditions, obesity, etc., 2 – eligible individuals 16+. However, due to poor regulation of distribution vaccine deployment has been very slow. Currently, 44.1% of the total US population has received one dose of the vaccination and 30.9% of the population is fully vaccinated. President Biden has mandated that all fifty states make vaccinations available to all eligible residents (16+) starting May 1st. In the US, vaccines are in high demand and are not currently meeting demand: finding a vaccine appointment has been challenging for a plethora of US residents.

During our interview, I asked Mr. Kennedy questions regarding how the United States had handled vaccine deployment and distribution affected vulnerable populations, groups the vaccine has not been tested on, and the general public. For vaccine deployment of vulnerable populations, Mr. Kennedy utilizes the CDC's region-based vulnerability index calculator. Additionally, he referred me to the White House protocol for reaching vulnerable populations. I found it interesting that of the factors that the CDC utilized for the vulnerability index, including region, population, income, access to healthcare, and medical history, that population of the region was also utilized in calculation. Initially, I was confused, however, upon the realization that vaccine distribution is not only based on the amount available but also based on the stage that a specific county/region is in and the number of people in the area, this significantly affects whether vulnerable populations will have access to getting the vaccine.

Figure 3: CDC Pandemic Vulnerability Index (PVI) Calculator



For groups the vaccine hasn't been tested on such as children under the age of 16 and pregnant women, the FDA issued an Emergency Use Authorization (EUA), which ensures that

the vaccine is biologically safe for these groups. Furthermore, the FDA is closely tracking the data on these individuals who have received the vaccine and tracking any short- and long-term symptoms. Since the COVID-19 vaccine is the only vaccine that the FDA has issued an EUA for, I think that the uncertainty surrounding the effects of the vaccine is one potential reason for individuals not wanting to take the vaccine.

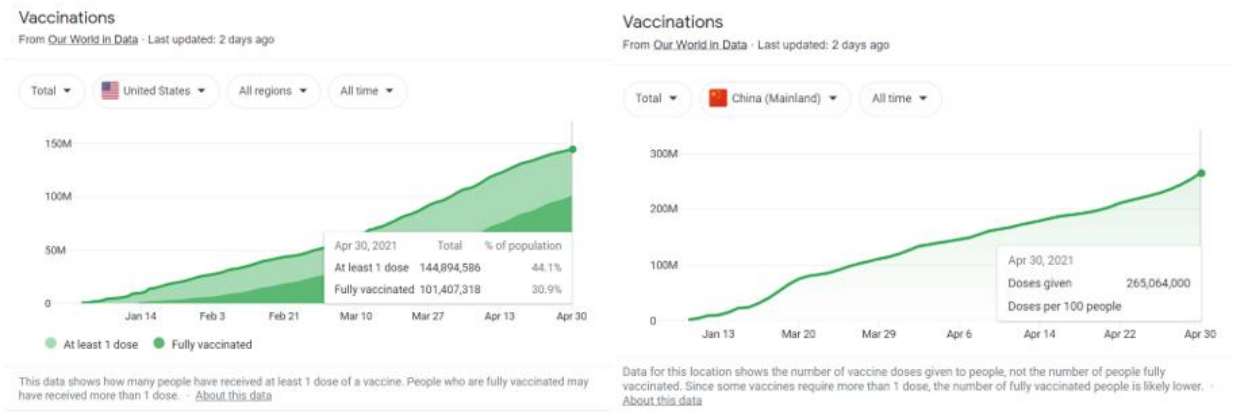
In contrast, the director of the Chinese Center for Disease Control and Prevention, Gao Fu, stated that "current vaccines offer low protection against the coronavirus and mixing them is among strategies being considered to boost their effectiveness. As of now, China has distributed many doses of COVID-19 vaccines to residents. However, in comparison to mRNA vaccines, China's vaccines have not been as effective. Fu has even stated that China is working on global cooperation to improve vaccine efficacy rates and obtain mRNA vaccines (McDonald & Wu, 2021).

In the graphic below, the residents vaccinated in both China and the United States are depicted. The United States has far more data available on vaccinations of the population. Although China has more vaccinated people by roughly 2 million, the United States currently has more vaccine effectiveness among the vaccinated population.

China and the United States have had varying approaches to dealing with the privacy regulation and internet governance of data and information regarding the COVID-19 vaccine. For instance, in my interview with Mr. Andrew Kennedy, New Era Technology Team Leader at the FDA, he was able to provide me access to many of the datasets, he utilized for his research in tracking the impact of the COVID-19 vaccine since it was publicly available through the CDC. One such dataset was a Vulnerability Index Calculator that the CDC created to track different groups' susceptibility to the coronavirus and their need for being vaccinated. Additionally, Mr.

Kennedy was able to answer all of my questions by referring me to articles published by the FDA and even gave me his personal opinion regarding how he viewed certain actions that the FDA had taken towards vaccine deployment and distribution. He even explicitly stated that he believed that state and county governments were doing a terrible job of distributing vaccines and many vaccines were going to waste. I was taken aback by his degree of candor and elaboration to the questions I had asked him.

Figure 1: Vaccination Rates in China and the United States



Finally, for the general public, the FDA is closely monitoring short- and long-term effects of the vaccine through mobility, health insurance, self-reported, and CDC data. Since the long-term effects of the vaccine and the nature of the pandemic are unknown, I think data monitoring and utilization of machine learning algorithms to track and model the progress of vaccine distribution and deployment is imperative. Additionally, the United States moved up its vaccination timeline, claiming that with the new order of vaccines there are enough vaccines for all Americans to be vaccinated by June 2021. After my interview with Mr. Kennedy, he told me that while this may be true, this information should be taken with a grain of salt since distribution varies by county/region. Considering that the United States began vaccinating individuals in December of 2020, the pace of vaccination is quite slow depending on the region. For instance, I

reside in Fairfax County, Virginia, and both of my parents who are FDA employees and work in healthcare have been registered to get vaccinated since mid-January, but due to Fairfax County still being in the 1b stage of vaccine distribution and my parents being in 1c, they are unsure of when they will be vaccinated. On the other hand, my parents' coworkers who reside in Montgomery County, Maryland have all been vaccinated since Montgomery county is in the 1c distribution stage. The United States' lack of a national vaccine distribution schedule and individuals' reluctance towards getting a vaccine and disregard of COVID-19 preventative measure is incredibly detrimental towards the United States' progress towards achieving pre-pandemic normalcy and attaining herd immunity.

In addition to interviewing Mr. Kennedy, I was also able to interview Professor Mao, a developer of the Chinese Alibaba health codes. I learned that China utilizes health codes and mobility tracking to assess the risk levels of Chinese residents and visitors. Red indicates a high threat level, yellow indicates a potential threat level, and green indicates little to no threat. For instance, if someone is traveling to China, they will have a red code until they are done with their two-week quarantine period in a government-regulated hotel. Furthermore, mobility tracking and machine-learning algorithms are utilized for supplemental data tracking of the long-term risks of the coronavirus.

As for China's vaccine distribution plan, community vaccination of the approved vaccines is occurring in many parts of the country. Currently, individuals 60+ are eligible. Additionally, free vaccination is available to all eligible Chinese residents. According to the Beijing Health Public Welfare Hotline, individuals are vaccinated by their unit or community unified organization.

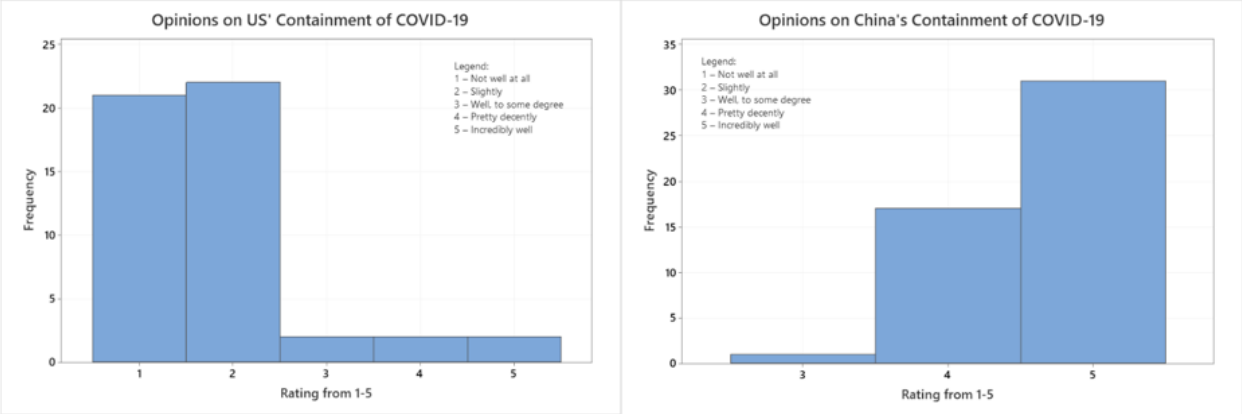
Only one vaccine is allocated to each vaccination site, which is convenient for observing post-vaccination reactions. If community members want to know which types of vaccines are available in their community, they can go directly to the vaccination site. Currently, vaccinations across regions are not possible. For individuals who need to travel internationally and need to be vaccinated prior to travel, they can expedite their vaccination process with proper proof. T

Li Tong, the deputy chief physician of the Department of Infectious Diseases of Beijing Youan Hospital, said that the launch of new vaccines will optimize both production capacity and worldwide vaccination rates. He stated that, "We should establish the concept of vaccination as soon as possible and vaccination as soon as possible, as long as the physical conditions are met, what to fight against, and build an immune barrier as soon as possible" (People's Daily Health Client, 2021).

Public Opinions: I was extremely fortunate to be able to administer a survey to university students in China surrounding their opinions regarding the COVID-19 vaccine. My survey questions were aimed at comparing the effect of the COVID-19 vaccine in China and the United States. The questions I asked were: basic demographic questions and Likert-scale questions about how the pandemic had affected the student's life, whether he/she would take a COVID-19 vaccine if one were available and why, how well he/she thought China had handled preventing the spread of COVID-19, and how well he/she thought the United States had handled preventing the spread of COVID-19. I gauged that the vast majority of Chinese students would take a vaccine if it were available to them, they trust the Chinese government, and the COVID-19 pandemic has had little to no negative impact on their lives. In contrast, most survey respondents said that they thought the United States had handled preventing the spread of the coronavirus poorly. In addition to the constant monitoring of potential COVID-19 threats, the

public trust and cooperation with the government in China, has resulted in China containing COVID-19 far more effectively in comparison to the United States.

Figure 2: Chinese College Student's Opinions of China and US' Containment of COVID-19



As seen in Figure 2, of the Chinese university students surveyed most (~63%) rated China's containment of COVID-19 as a 5 or incredibly well, ~33% rated China's containment as a 4 or pretty decently, and ~4% rated it as a 3 or well to some degree. Taking into account, China's strict lockdown policies and use of health codes to efficiently track COVID-19 cases the survey data accurately reflects China's containment of the coronavirus.

On the other hand, as seen in Figure 2, of the Chinese university students surveyed most (~87%) rated the US's containment of COVID-19 as a 1 not well at all or a 2 slightly well. This also supports the argument that the US' lack of containment measures restrictions protecting against COVID-19 have resulted in poor overall containment of COVID-19.

Through document analysis, I was able to gain additional insight into the public perception of the COVID-19 vaccine in China and the US. I started off by researching the American public's receptiveness towards getting the COVID-19 vaccine. Researchers found that 69% of participants were willing to get a COVID-19 vaccine. Additionally, participants were more likely to be willing to get vaccinated if they thought their healthcare provider would

recommend vaccination or if they were moderate or liberal in their political leaning. Participants were also more likely to be willing to get vaccinated if they reported higher levels of perceived likelihood of getting a COVID-19 infection in the future (Katz et al., 2020).

Transitioning to the federal government and pharmaceutical industry, the federal government and the pharmaceutical industry continue to push for the rapid distribution of a COVID-19 vaccine despite some public doubts. One such study examined the perception of bioinformatics and information published by public health officials. Similar to the US federal government's rapid deployment strategy, this study examines how the development and deployment of a COVID-19 vaccine was essentially a race for a safe and effective vaccine. The author also discusses how pharmaceutical formulation science plays an essential role throughout the development, manufacturing, distribution, and vaccination phases of a COVID-19 vaccine. Large pharmaceutical companies' race to develop a vaccine and the FDA's use of an Emergency Use Authorization (EUA), as well as, pressure from former President Donald Trump resulted in the approval of the Pfizer and Moderna COVID-19 vaccines (Cui et al., 2020).

Overall, I discovered that the attitude towards a potential COVID-19 vaccine varies a lot by social group. For instance, the public seems hesitant and even skeptical towards the vaccine while the US government and public industry have an agenda to distribute the vaccine as soon as possible. In complete contrast to the US, China's control of the COVID-19 pandemic has been strict and well-regulated. Restrictions in China are similar to those in place in the US, however widespread public adherence is the key difference. A system of health codes is woven into the fabric of everyday life such as assigned color-coded designations based on a person's health status, masks, temperature checks, and mass testing. The Chinese government has been scrutinized for a lack of candor and negligence since the inception of the outbreak. Former

President Trump has been one of the most vocal critics, accusing Beijing of early failures that intensified the spread of the virus (Jaworsky & Qiaoan, 2020). Despite criticism, China has done a phenomenal job of regulating and containing the spread of the virus, and unlike the US, is not relying on a potential COVID-19 vaccine to act as a "magic bullet." Based on China's stricter regulations and protocol during the pandemic, the Chinese government's strategy is entirely different from the US government's strategy.

Discussion

Both Winner's perspective and ethical culture are very applicable to my research topic: a comparative study of the domestic and international politics of the COVID-19 vaccine in China and the United States. Due to the ubiquity of technology and the fact that online media such as social media, news, and statements issued by the government are the primary sources of information about the COVID-19 vaccine, ethical culture has significantly impacted the perception of the vaccine. In conducting my research, I have found that privacy regulation and internet governance have been integral aspects of how digital ethics ties into the COVID-19 vaccine.

In the United States, the decentralization of vaccine distribution and individualistic culture result in varying ranges of compliance with public health standards and vaccinations. Whereas in China, the centralization of vaccine and collectivist culture, as displayed in the cartoon below, result in full public compliance with both COVID-19 preventative measures and vaccinations. In the graphic below, a public health worker, construction worker, military personnel, firefighter, and monk are all wearing masks and upholding COVID-19 preventative measures for the greater good. The US government has had less autonomy over controlling

COVID-19 cases and deaths since many individuals care more about their own opinions and are skeptical of vaccinations and preventative measures.

Conclusion

Since its inception, the novel coronavirus epidemic has resulted in widespread adversity across the world. The juxtaposition of the vaccine being treated as a “magic bullet” in the United States and a secondary measure in China has significantly affected each respective country’s progress towards the elimination of COVID-19. In the United States, over half a million Americans have passed away due to COVID-19. However, the emergence of COVID-19 vaccines has monumentally changed the course of the pandemic and has indicated that there is indeed a light at the end of the tunnel. mRNA technology utilized in US vaccines has significantly decreased COVID-19 contraction, hospitalization, and fatality rates. Additionally, China’s use of health codes and preventative methods enforced by the government has led to a decline in overall COVID-19 cases. When examining the dichotomy of domestic and

international politics among China and the United States, it is interesting to note how unique the two world powers' vaccination development, arrangement, and deployment strategies were.

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