

A Comparative Analysis of Public Policy Regarding Vaccination in America and China

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Author Bio:

Daisy Lin is a senior studying at Stuyvesant High School in New York City. She first heard of the coronavirus outbreak through relatives living in China during late 2019 and has since been interested in the different ways that the pandemic has been handled. In the United States alone there is strong rhetoric either supporting or opposing preventative measures like vaccines, lockdowns, quarantine, and more. After researching the vaccination policy for the United States of America and the People's Republic of China, she realized the stark difference between the two. In the future, she hopes to continue studying various illnesses along with how they are controlled and treated in different regions.

Abstract

COVID-19, originating from Wuhan, China, quickly spread around the world over the course of a few months during late 2019 and early 2020 and has become a worldwide pandemic. Since then, nations have been in search of numerous viable treatments for nearly two years, including vaccinations. This comparative analysis of second-hand documents published by the United States of America and the People's Republic of China reveals the differences between the two nations in regard to their public policy regarding coronavirus vaccination. China has taken a more strict, direct approach, while the United States has relied on more lenient methods. These differences are likely due to the nations' distinct social and political environments. Given the stark contrasts in these procedures, it is crucial to further explore the reasoning behind the variation and efficacy of each technique to gain relevant insight on the way future pandemics should be handled to minimize their spread and devastation.

Keywords: Coronavirus, COVID-19; Vaccine, Vaccination; Public Policy; Herd Immunity; Delta Variant; Covid America vs China; Government Covid Regulation; Vaccine Policy in America; Vaccine Policy in China

Introduction

Coronaviruses are a group of viruses covered in spike proteins resembling the shape of a crown, or “corona” in Latin. Specifically, coronavirus disease 2019 (COVID-19) is a contagious, airborne disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first identified in Wuhan, China in December 2019. In an attempt to protect their citizens from infectious disease, countries like the United States of America and China have launched mass immunization programs intending to vaccinate large numbers of people at different locations over a short period to establish herd immunity. Currently, the three main vaccines being administered in the United States are Pfizer, Moderna, and Johnson & Johnson, and in China, there are two main vaccines, the CoronaVac and Sinopharm.

Methodology

Information in this article comes from secondary sources published through online articles that use both quantitative and qualitative data accessed either through Google Scholar or Jstor with keyword searches including “coronavirus,” “herd immunity,” “covid vaccine efficacy,” “American vaccine policy,” and “Chinese vaccine policy.” Certain issues arose during the research process. For example, there was difficulty finding information from the Chinese perspective, specifically a lack of official government publications, when compared to the American, which may lead to certain gaps of knowledge. However, this was largely substituted with anecdotal accounts from Chinese citizens and the analysis of laws enforced by their government. By using both government and citizen accounts from the United States of America and the People’s Republic of China, a better understanding of public policy and the people’s response may be achieved.

Herd Immunity

The main reason why vaccines are an important public health tool is due to their ability to provide herd immunity. Herd immunity refers to resistance against the spread of a virus within a population based on pre-existing immunity in a high proportion of individuals either by vaccination or previous infection. The basic reproduction number, or R_0 , is an indicator of how infectious disease may be and what percentage of the population must be vaccinated for herd immunity to be achieved. A higher basic reproduction number would mean that an illness is highly transmittable while a lower number would indicate a lower risk of transmission. It is generally accepted that once 75-80% of the population is immune, herd immunity will be preserved². Herd immunity is most vital for those who are the most vulnerable as certain individuals may be barred from getting a vaccine due to their age or previous health conditions, increasing their susceptibility to infection. This idea is also applicable to the current pandemic since certain groups remain prone to COVID-19. To effectively protect the entire population, governments in the United States and China need to be strategic with the distribution and administration of vaccines to prevent another wave of the virus from spreading.

2020-2021 Vaccines

The Pfizer-BioNTech COVID-19 vaccine (BNT162B1) and Moderna COVID-19 vaccine (mRNA-1273) were approved through an emergency use authorization (EUA) in the United States on December 11, 2020, and December 18, 2020³, respectively. The Pfizer vaccine is recommended for individuals 12 years of age and older and has an efficacy rate, or a measure of how much the vaccine lowered the chance of an individual getting sick, of 52% after the first dose and 95% after the second dose, while the Moderna vaccine is recommended for individuals 18 years of age and older and has an efficacy rate of 50.8% after the first dose and 94.1%

¹ https://wwwnc.cdc.gov/eid/article/25/1/17-1901_article

² <https://www.sciencedirect.com/science/article/pii/S1074761320301709>

³ <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/Pfizer-BioNTech.html>

⁴ <https://www.healthline.com/health/vaccinations/pfizer-vaccine-efficacy#real-world-efficacy>

after the second dose⁴. Both vaccines rely on recently developed mRNA technology to provide immunity to patients. Unlike the flu shot which introduces a weakened version of the virus to the immune system, mRNA vaccines contain messenger RNA that encodes the antigen. Once introduced to the body, the mRNA is translated into antigen by the same process that cells use to create their proteins. The antigen is then moved to the cell membrane where it is exposed to immune cells which then analyze these harmless covid spikes and begin the formation of antibodies that will be required to combat the virus during infection. These antibodies have the unique ability to tag the coronavirus for degradation through a process known as phagocytosis, which involves immune cells ingesting the pathogen⁵. Certain mRNA vaccines also contain additional mRNA which codes for an enzyme that once replicated, can generate copies of the antigen-encoding mRNA, amplifying the production of antigen, increasing the efficiency and effectiveness of the vaccine. mRNA vaccines have proved to be promising for the future of immunology because they are developed in a cell-free system that is easier and safer to use, reduces the risk of contamination from other infectious pathogens, and lowers the risk of integration in the host genome. Initially, requirements for the transportation of mRNA vaccines made it difficult to guarantee effective administration of the vaccine as it required uninterrupted refrigeration at extreme temperatures. Originally it was believed that the Pfizer vaccine needed to be stored at -70°C and the Moderna vaccine at -20°C; however, recent studies have proved that the vaccines may be stored using regular refrigeration for over twenty days and maintain their properties. While both the Pfizer and Moderna vaccines have been effective, other vaccines with emergency authorization have faced allegations of serious side effects of which the general public was unaware.

The Jansen COVID-19 vaccine (JNJ-78436735) was approved through an emergency use authorization (EUA) on February 21, 2021, and is recommended for individuals 18 years of age and older though distribution has since been halted due to claims that the vaccine has led to blood clots in women under 50. After an investigation was launched, it was found that there was no connection between the clotting and vaccine, which led to the resumption

of its administration on April 27, 2021⁶. Unlike the Pfizer and Moderna vaccines which rely on mRNA technology, the Johnson & Johnson, also known as Jansen, vaccine relies on adenosine virus viral vectors with the original viral matter removed to hinder its ability to replicate and cause disease in the patient. The coronavirus gene is then added to the viral vector and injected into the body and once injected, the virus will deliver the spike gene into the nucleus directly where antigen will be coded for. The newly coded antigens are then presented to Helper T cells which direct the immune system to create the antibodies needed to fight the virus after infection. Similar to mRNA technology, the viral vector technology uses the body's cells to create antigens rather than having them be injected artificially, reducing the risk of the patient falling ill with the disease after the administration of the vaccine.

The two leading coronavirus vaccines in China are the Sinovac COVID-19 vaccine (CoronaVac) developed by the Chinese company Sinovac Biotech and Sinopharm COVID-19 vaccine (BBIBP-CorV) developed by Sinopharm's Beijing Institute of Biological Products. Unlike the vaccines being distributed in the United States, both are conventional vaccines that use inactivated viral matter delivered in two doses⁷. These inactive vaccines contain viral particles that have been grown in culture then killed to bar their ability to replicate but the inactive particles still encourage the production of T cells. Once the proper T cells have been produced, they are stored as immune cells and can be used during an actual infection of the coronavirus. Since these vaccines contain inactive viruses, they cannot cause disease, hence they do not have to be stored at cooler temperatures, easing transportation and distribution⁸. Recently, a new vaccine produced in China trade-named Convidecia (AD5-nCOV) that may be administered using only one dosage has been introduced. Like the Johnson & Johnson vaccine, Convidecia is a viral vector vaccine that has a 65.7% efficacy rate in preventing COVID-19 symptoms and a 91% efficacy rate in preventing other types of serious illnesses⁹. One of the major benefits of single-dose

⁶ <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/janssen.html>

⁷ <https://www.bmj.com/content/373/bmj.n912>

⁸ <https://www.sciencedirect.com/science/article/pii/S09747174203000023>

⁹ https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1885-642X2021000100016

⁵ <https://www.future-science.com/doi/full/10.4155/tde-2020-0129>

vaccines is their relief on the administration process as it effectively prevents the situation of individuals receiving only partial immunity if they received only one of the two doses. The promising benefits of the Convectia vaccine have granted it a EUA in certain countries outside of China in Asia, Europe, North America, and South America.

While vaccines administered in both America and China have made tremendous strides towards decreasing COVID transmissions, the American vaccines have had higher efficacy rates, meaning the Pfizer, Moderna, and Johnson & Johnson vaccines are more effective compared to CoronaVac and Sinopharm. This is likely due to the extended period of time used to study and develop the American vaccines. Additionally, this may mean that Pfizer, Moderna, and Johnson & Johnson are more effective at preventing another outbreak caused by COVID-19 variants.

Though the aforementioned vaccines have played a key role in the decreased transmission of COVID-19, new variants of the disease have been detected that cannot yet be fully protected against. On November 5, 2020, the UK had enforced a lockdown to control rising coronavirus cases, which seemed to work. However, there was still an increasing rate of infection in Kent, an area outside of London. It was later discovered that a new, more transmissible and deadly strain of the coronavirus, B. 1. 1. 7, also known as the Alpha variant, had mutated in Kent and has since become the dominant form of COVID-19. Since the discovery of this strain, other variants of the SARS-CoV-2 virus named the Variants of Concern by the World Health Organization, have been identified: B. 1. 1. 7 (Alpha variant), B. 1. 351 (Beta variant), P. 1 (Gamma variant), and B. 1. 617. 2 (Delta variant)¹⁰. Since these variants all have spike protein mutations, it is more likely that they can be transmitted and reinfect those who have already had COVID-19. Recent studies have proved the Delta variant to be the most dangerous as it is twice as infectious as the other variants and is now the leading COVID-19 virus in the United States, with those infected showing the most severe symptoms¹¹. Though it is unlikely that any current form of the virus will be able to completely evade vaccines, it is not impossible¹². Given enough

time and replicative cycles, the virus may evolve to bypass current medical technology. It is important to note that as long as the virus is still spreading, new strains will be forming, making it crucial that vaccines are administered to decrease the amount of time that SARS-CoV-2 has to mutate.

Vaccine Policy in the United States of America

Although being vaccinated is highly recommended in America, the Centers for Disease Control and Prevention (CDC) claim that vaccines approved under a EUA cannot be mandated as they are technically still in experimental trials. However, this claim has yet to be tested in court making the recent COVID vaccines, like many other vaccines in the United States, voluntary. This is not true in all cases as it is important to note that private-sector employers are generally allowed to use whatever criteria they deem fit for hiring, including an individual's vaccination status. For example, many essential workers were highly recommended by their employers to get vaccinated and due to their employer, they were considered first for the vaccine, followed by the elderly. Currently, this has yet to pose a threat to many as most employers are expected to find "reasonable accommodations," even in a high-risk job such as healthcare, unless it causes "significant difficulty or expense." Additionally, Title VII of the Civil Rights Act of 1964 prohibits any discrimination in the workplace based solely on religion, which may protect some individuals from vaccinations¹³. While the individual may not be a member of a major religious group like Christianity or Buddhism, there must be a religious reason rather than personal beliefs to be protected by Title VII¹⁴. Generally, citizens are encouraged to educate themselves on the vaccination process and make the decision that is right for them, though this idea has led to the clashing of anti-vax and pro-vax groups.

Due to the freedom granted to the American people in terms of optional vaccines, there has been the formation of various groups that either support

¹⁰ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7825912/>

¹¹ <https://www.cdc.gov/coronavirus/2019-ncov/variants/delta-variant.html>

¹² <https://www.nature.com/articles/s41577-021-00556-5>

¹³ <https://heinonline.org/HOL/LandingPage?handle=hein.journals/umijlr12&div=21&id=&page=>

¹⁴ <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2020.306166>

the vaccine, pro-vax, or oppose the vaccine, anti-vax. Despite pro-vax groups being larger in number, there are still advantages in anti-vax groups as there is generally a greater presence of anti-vax individuals in groups who are undecided, allowing them to easily spread their influence. Qualitative analyses have also shown that anti-vax groups tend to offer a wide range of potentially attractive narratives regarding safety concerns, conspiracy theories, alternative health and medicine, and potential substitutes to traditional vaccines, and these narratives have garnered large amounts of support, particularly during times of crisis¹⁵. Yet, despite these supposed advantages, over half of the adult population in the United States is fully vaccinated and many others are in the process, calling into question the influence that anti-vax groups have over the general population. When comparing the opinions of the American people with the opinions of the Chinese on optional vaccinations, there has been a large disparity.

Vaccine Policy in the People's Republic of China

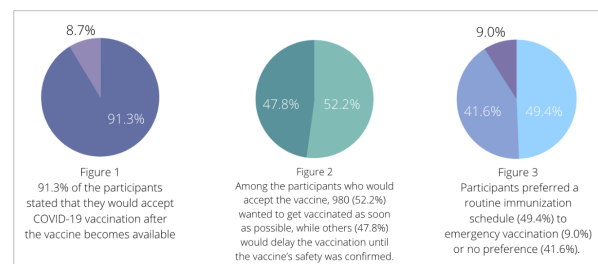
China seems to be generally less divided regarding its attitudes towards vaccines and, beginning in the early 2000s, there have been many advancements in vaccination. With the introduction of the diphtheria, tetanus, and acellular pertussis vaccine, pneumococcal conjugate vaccine, Hib vaccine, Enterovirus 71 vaccine, and HPV vaccine, the standards of healthcare have also been expanded to now meet World Health Organization requirements¹⁶. The vaccine has also become more accessible to the general population with the passing of laws such as the "Vaccine Distribution and Vaccination Regulation" which stipulates that all national-level EPI vaccines be paid for by the government and the new essential public health service package includes 11 service categories including vaccinations, making them more accessible¹⁷. Based on a study conducted by Peking University, a member of the elite C9 League of

Chinese universities showed overwhelming support for vaccines. 91.3% (Figure 1) said they would accept the COVID-19 vaccination after it was made available to the public. Of this 91.3%, 52.2% (Figure 2) wanted to get vaccinated as soon as possible, demonstrating the positive attitude of the Chinese toward vaccine improvements¹⁸. In fact, 49.4% are in favor of scheduled vaccine appointments and have already begun the application process. Chinese Citizens on the Coronavirus Vaccines: Statistics Found in a Study by Peking University.

Figure 1. Chinese Citizens Accepting Vaccination (DL, 2021).

Figure 2. Chinese Citizens Preferred Vaccination Time (DL, 2021).

Figure 3. Chinese Citizens Preferred Method of Vaccine Administration (DL, 2021).



On December 15, 2020, China officially launched a vaccination program for the winter-spring period targeting several key groups, including essential workers who handle cold-chain products, customs officers, medical workers, transportation drivers, and market workers¹⁹. The second round of vaccines was offered to young, working-age people who were more able to contribute to society than the elderly. While the general trust in the vaccine and the vaccination process was ranked of high importance, with 81.9% agreeing or strongly agreeing that the vaccine is safe and 90% of respondents agreeing or strongly agreeing that vaccination was very important, there have been individuals who showed hesitancy towards getting the vaccine. To convince these individuals to get vaccinated, the Chinese government has implemented a system of benefits and punishments around the vaccine. They have included a variety of perks such as cash bonuses and store credits and in some cases, eggs and fresh produce were also gifted²⁰. On the other

¹⁵ https://www.nature.com/articles/s41586-020-2281-1?fbclid=IwAR3Z_Q2x2Xc--1zJ9-W6v5A-VIwaeWUZGU7wWlMB07_ZEi8NdnaeENHHks

¹⁶ <https://link.springer.com/article/10.1007/s42533-021-00066-y>

¹⁷ <https://www.sciencedirect.com/science/article/pii/S0264410X18313574>

¹⁸ <https://www.mdpi.com/2076-393X/8/3/482>

¹⁹ <https://link.springer.com/article/10.1186/s12916-021-01923-8>

²⁰ <https://www.proquest.com/docview/2508215061/56E880EC928C4C4CPQ/1?accountid=36166>

hand, those who choose to not get vaccinated may face serious repercussions. For example, employers may choose to fire those who are unvaccinated and individuals may lose a variety of social privileges. Therefore, despite there being no specific law mandating vaccines for Chinese citizens, there is heavy coercion for them to do so²¹.

Differences Between Policies from American and China

Though it has long been apparent that the United States of America and the People's Republic of China are distinct nations with varying forms of government, this difference has been additionally highlighted by the coronavirus situation along with vaccine administration and distribution, namely with reference to the different groups who are prioritized in both nations for vaccines and the role that the government plays in the vaccination process. In the United States, the elderly were prioritized for vaccines because they tended to exhibit more severe symptoms after infections and have the highest mortality rate. On the other hand, China prioritizes the working-age people to better keep the economy afloat and allow those who are required to be in social situations to do so. This was also an attempt to protect the elderly as those who are younger tend to travel more, which may increase the rate of transmission. The decision from the governments on which groups should be vaccinated underscores the unique way in which each government operates. The United States of America is a more idealistic country where morals and abstract ideas are highly valued, even when it contradicts reason. China, on the other hand, is a more pragmatic nation where realism is favored.

There is also a distinction between the two nations regarding the level of government involvement during the vaccination process. In America, individual states are allowed to make unique decisions regarding the intensity of their immunization programs. Even when vaccinations are available, officials tend to take a hands-off approach with vaccines where civilians are allowed to analyze the ethics and effectiveness of

the vaccine before deciding to either get vaccinated or not. In China, however, there is a larger presence of the government throughout the vaccination process and individuals are heavily influenced by government incentives to receive the vaccine. This process parallels the government structure in the two nations: the United States of America has a two-party system where debate and conversation are encouraged while China has a one-party system where people are expected to be supportive of government decisions. Regardless of these differences, both nations have taken large strides in producing vaccines and getting large percentages of their population vaccinated.

In addition to the distribution of vaccines, the research and developmental stage for the vaccines also differs in the two countries. The USA focused primarily on a market-oriented model. While there were various government agencies involved in Operation Warp Speed (OWS), a public-private partnership initiated by the United States government to expedite the development and distribution of the COVID-19 vaccine, the project was largely upheld by private corporations. For example, binding agreements like Advanced Purchase Commitments, which guarantee a viable market for a product prior to its creation, generated monetary incentives for companies like Pfizer and Moderna to create a product that consumers desire. In contrast, China focused on a state-driven collaborative model. This method partitions roles to both market and the government during the vaccine development period. Like the market-oriented model, private companies under the state-driven model also have monetary incentives. Due to potential market failures created during public health crises, vaccine companies are more likely to act immediately to minimize its effects and maximize profits. The government in China also has a large role in the development process by strategically funding and concentrating resources to any particular policies deemed important. In the case of the Beijing municipal government, they agreed to fund Sinovac's manufacturing plant unconditionally to ensure that the company can produce at least 300 million doses of the COVID-19 vaccine annually. By working together, government and market are able to encourage collaboration across private and public sectors²².

²¹ <https://www.ctvnews.ca/health/coronavirus/china-ramps-up-vaccination-drive-with-incentives-such-as-free-eggs-other-goods-1.5389907>

²² <https://academic.oup.com/jtm/article/28/4/taab026/6149495?login=true>

Over the course of the coronavirus pandemic, several countries have been competing to offer international leadership in vaccine diplomacy. Notably, China and the United States have been actively donating millions of vaccines to developing countries. Throughout the past few years, the international view of China has been extremely volatile ranging from scrutiny due to the belief that the virus was leaked from a lab in Wuhan to sympathy for the large number of casualties. However, this resentful and pitiful attitude towards the nation largely changed in April 2020 when China launched an international campaign to brand itself as a global health leader, which began by sending masks, medical teams, and testing kits overseas²³. This strengthened China's public image as the "Health Silk Road" was able to provide aid to countless countries in need. The majority of these donations went to countries in Central and South America, Africa, South Asia, the Middle East, and Eastern Europe. Now, Chinese president, Xi Jinping, vows to provide the world with 2 billion doses of the COVID-19 vaccine and donate \$100 million to COVAX by the end of 2021²⁴. Likewise, President Joe Biden has made a pledge that the United States will donate 600 million vaccines to developing countries by the end of 2021 through boosting the rate of vaccine production in the United States, India, and South Africa. There has also been a proposed deal to purchase 500 million additional doses of the COVID-19 vaccine from²⁵. Currently, the countries receiving the most vaccine donations from America include Pakistan, Bangladesh, the Philippines, Colombia, South Africa, Vietnam, Indonesia, Guatemala, Uzbekistan, and Nigeria. Though it is true that vaccine diplomacy is crucial for a nation's international perception, hence why the United States and China are likely competing to be leaders in this field, it is important to realize the impact that donated vaccines will have, especially for those living in impoverished conditions. It is therefore crucial for these wealthy nations to work together in order to produce the estimated 11 billion vaccines still needed to ensure global immunity.

²³ <https://link.springer.com/article/10.1057/s41254-021-00224-4>

²⁴ <https://www.nytimes.com/2021/08/06/world/china-vaccine-donations-2-billion.html>

²⁵ <https://www.nytimes.com/2021/09/20/us/politics/biden-covid-19-vaccines.html>

²⁶ <https://www.pennmedicine.org/coronavirus/frequently-asked-questions-about-covid-19/additional-covid-questions#tab-1o>

Additional Methods to Prevent the Spread of COVID-19

Over the past few months, COVID-19 infection rates have been on a downward trend, with upward trends of vaccinations making large contributions to this. However, there are additional steps that could be taken to further stop the spread of the virus such as the investment of better cleansing of public transportation. Specifically, the inclusion of UV lights as a part of the standard disinfectant procedure for air purification has shown promising results for inactivating the virus²⁶. Like most viruses, COVID-19 spreads more efficiently in heavily populated areas, meaning that those who live in metropolitan areas of both the United States and China are at increased rates of infection. As public transportation tends to be a hotspot for infection, better cleansing would likely reduce transmission rates and with additional investments in antimicrobial goods, transmission rates should continue on a steep decline. With the investment in antimicrobial goods and surfaces in public spaces, the spreading of viruses may be reduced as people tend to unknowingly often be in contact with surfaces that may be riddled with germs and viruses.

Conclusion

While the emergence of the COVID-19 virus has led to many casualties, it has also forced many governments to reevaluate their attitudes towards public healthcare and their handling of public health matters. The initial difficulties faced during the distribution of vaccines have allowed both the United States and China to rethink healthcare to make it more effective, while also demonstrating the importance of public health and vaccine awareness. Though both nations have been inflicted with similar situations, the variation in governance has led the two to handle the situation extremely differently. Additionally, the massive funds provided for vaccines have pushed scientific breakthroughs such as mRNA technology which was previously difficult to actualize. With all of these advancements in vaccine research and distribution as well as the growing awareness of the general public towards the importance of public health, both the United States and China will be making large strides to better protect their citizens if future pandemics were to arise.

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