Safety Comparison between the COVID-19 Vaccine and Previously Administered Vaccines

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May 2, 2022

Word Count: 4,090

Abstract

The current pandemic has resulted in skepticism arising regarding vaccination against the COVID-19 vaccine due to a vast spread of misinformation. Societal claims about the dangers of the COVID-19 vaccine have resulted in individuals being hesitant about getting vaccinated, as opposed to getting vaccinated for previously administered vaccines in the United States. The purpose of this study is to compare the safeness of previously administered vaccines with the safeness of the COVID-19 vaccine in order to determine whether or not the COVID-19 is more dangerous than other vaccines that many individuals receive. Through the usage of the Vaccine Adverse Events Reporting System, this study has found that the serious adverse events reported after receiving Varicella, Influenza, Hepatitis B, Measles, and Meningococcal do not significantly differ from the adverse events reported after receiving the COVID-19 vaccine. Therefore, the COVID-19 vaccine has been proven to be as safe as previously administered vaccines, proving societal claims about the vaccine's dangers to be false. Further research conducted on adverse events regarding vaccination can lead to a decrease in American distrust in the government and vaccination, resulting in improved public health across the nation.

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Introduction

A vaccine is a concoction that is injected into the body in order to stimulate an individual's body to produce an immune response for protection against a certain disease (National Center for Immunization and Respiratory Disease). Vaccination has been considered the most effective medical intervention and scientific advancement introduced and has been greatly responsible for improved global health. Subsequently, the development of vaccines and systematic immunization has addressed health inequities across the globe. Vaccines are estimated to prevent 6 million deaths annually and to save 386 million life years. Due to increased vaccination among individuals, infectious diseases that accounted for a large amount of mortality and morbidity in the United States during the 20th century have demonstrated a 90% decline in 2017. A similar pattern of infectious disease decrease has been seen globally, displaying the efficacy of safe and accessible vaccines (Rodrigues and Plotkin).

The first successful vaccine was developed in 1798 by Edward Jenne for smallpox (The Immunization Advisory Centre). As a result, smallpox and polio have been eradicated. Since the development of the first vaccine, twenty-four vaccines have been created in order to prevent infectious diseases and their devastating effects on individuals (WorldWide Health Organization). According to the Centers for Disease Control and Prevention (CDC), to ensure the positive outcomes of vaccines, the preparations are extensively tested by scientists in order to ensure the preparation’s safety and efficacy before being approved by the Food and Drug Administration (FDA).

Literature Review

Despite the multitude of benefits vaccines provide and how "vaccines have virtually eliminated the risk of many preventable diseases, there has been an increase in refusal and hesitancy over the past two decades" (Whatley & Shodiya, 2020). The COVID-19 pandemic and recent administration of the COVID-19 vaccine have led to disputes regarding the safeness and effectiveness of the COVID-19 vaccine. According to the Mayo Clinic, the circulation of myths regarding COVID-19 has resulted in individuals being skeptical about receiving the vaccine. Examples of the various societal claims include "The COVID-19 vaccine is not safe because it was rapidly developed and tested, there are severe side effects of the COVID-19 vaccines, COVID-19 vaccines will alter my DNA, and COVID-19 vaccines cause infertility or miscarriage", along with many more (Mayo Clinic Health System). Capradio states that "misinformation about the COVID-19 vaccine continues to spread on social media, with widely shared and misleading posts saying it's ineffective or even harmful" (Chris Nichols).

Despite a large amount of research and data available on the safety of the COVID-19 vaccine, 15% of Americans remain unvaccinated against COVID-19 and 42% of those individuals "don't trust the COVID-19 vaccine" (Bureau, 2021). The popular spread of misinformation has resulted in many Americans being hesitant about receiving the COVID-19 vaccines, as compared to other vaccines administered in the United States. The question that arises is: how does the safeness of previously administered vaccines in the United States compare to the safeness of the COVID-19 vaccine?

Vaccine Adverse Effects Reporting System

According to the CDC, no vaccine is 100% safe or effective due to everyone's body having varying responses to a vaccine. The Vaccine Adverse Effects Reporting System (VAERS) "is the nation's early warning system that monitors the safety of vaccines after they are authorized or licensed for use by the U.S. Food and Drug Administration (FDA)" The VAERS is co-managed by the CDC and FDA and "accepts and analyzes reports of possible health problems-also called 'adverse events'-after vaccination. (VAERS | Vaccine Safety | CDC, 2021) An "adverse event" is defined as "any undesirable experience associated with the use of a medical product in a patient" and a "serious adverse event" is defined as death, life-threatening side effect, hospitalization, disability, permanent damage, congenital anomaly/birth defect, required intervention to prevent permanent impairment or damage (devices), or any other serious medical event (Office of the Commissioner, 2016) For the purpose of this study, the term "safeness" is defined by the amount of serious adverse events related to vaccine administration.

Death is considered a serious adverse event related to vaccination when it is suspected that "death was an outcome of the adverse event". A life-threatening side effect is when one suspects "that the patient was at substantial risk of dying at the time of the adverse event, or use or continued use of the device or other medical product might have resulted in the death of the patient." Hospitalization is considered a serious adverse event if "admission to the hospital or prolongation of hospitalization was a result of the adverse event". Disability or permanent damage is reported when "the adverse event resulted in a substantial disruption of a person's ability to conduct normal life functions, i.e., the adverse event resulted in a significant, persistent or permanent change, impairment, damage or disruption in the patient's body function/structure,

physical activities and/or quality of life." A report of congenital anomaly/birth defect as a serious adverse event is reported when one suspects "that exposure to a medical product prior to conception or during pregnancy may have resulted in an adverse outcome in the child." Required intervention to prevent permanent impairment or damage (devices) is reported as a serious adverse effect if one believes "that medical or surgical intervention was necessary to preclude permanent impairment of a body function, or prevent permanent damage to a body structure, either situation suspected to be due to the use of a medical product." Other serious events are defined as when the event does not fit the other outcomes, but the event may jeopardize the patient and may require medical or surgical intervention (treatment) to prevent one of the other outcomes" (Office of the Commissioner, 2016).

The Vaccine Adverse Event Reporting System's event category includes death, life-threatening, permanent disability, congenital anomaly/birth defect, hospitalization, existing hospitalization prolonged, emergency room/office visit, emergency room, and office visit. This study will examine reports of death, life-threatening effects, permanent disability, congenital anomaly/birth defect, hospitalization, and the emergency room/office visit for previously administered vaccines in the United States and COVID-19.

Previously administered vaccines in the past decades in the United States include Varicella, Influenza, Hepatitis B, Measles, and Meningococcal. 50 states require vaccination against Varicella to enter kindergarten, 49 states require the Measles vaccine to enter kindergarten, and 44 states require the Hepatitis B vaccine to enter kindergarten (ProCon.org, 2022). In addition, The Centers for Disease Control and Prevention "recommends meningococcal vaccination for all preteens and teens" (Meningococcal Vaccination: What

Everyone Should Know | CDC, 2021). Individuals of all ages are recommended to receive the Influenza vaccine every flu season (Inactivated Influenza Vaccine Information Statement | CDC, 2021). This study has chosen to examine the five vaccines listed above due to these vaccines being the most common for individuals in the United States to receive.

Varicella

Varicella, more commonly known as chickenpox, "is a highly contagious disease caused by the varicella-zoster virus" and the CDC states that the best way to prevent being infected with chickenpox is by getting the Varicella vaccine. The Varicella vaccine became available in the United States in 1995 and "each year, more than 3.5 million cases of chickenpox, 9,000 hospitalizations, and 100 deaths are prevented by chickenpox vaccination in the United States" (Chickenpox Vaccination: What Everyone Should Know | CDC, 2019).

Influenza

Influenza, more commonly known as the flu "is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and lungs." The CDC recommends that the best way to reduce the flu risk is to get vaccinated every year (About Flu | CDC, n.d.). According to the CDC, the common influenza manufacturer are quadrivalent influenza shots and the standard doses include Afluria Quadrivalent, Fluarix Quadrivalent, FluLaval Quadrivalent, and Fluzone Quadrivalent and "these four vaccines are approved for people 6 months of age and older" (Seasonal Flu Vaccines | CDC, 2021). This study will focus on the influenza shots listed above due to a vast amount of influenza vaccine types.

Hepatitis B

Hepatitis B is inflammation of the liver caused by the hepatitis B virus. Once again, the CDC states that hepatitis B can be prevented through vaccination (Safety Information for Hepatitis B Vaccines | Vaccine Safety | CDC, 2020). This study will be collecting data on the adverse events reported after receiving the Hepatitis B Vaccine (HEP).

Measles

Measles is a viral infection that " is a highly contagious illness caused by a virus that replicates in the nose and throat of an infected child or adult" (Mayo Clinic 2020). According to the CDC, measles can be prevented through the MMR vaccine, which protects individuals from measles, mumps, and rubella (Measles Vaccine, 2020). This study will investigate the adverse events reported after receiving the MMR vaccine.

Meningococcal

Meningococcal is "any illness caused by bacteria called *Neisseria meningitidis*." Meningococcal disease can be severe or deadly by causing infections of the lining of the brain, spinal cord, and bloodstream. However, the disease can be prevented through vaccination. The two types of Meningococcal vaccines available in the United States are Meningococcal conjugate (Menactra®, Menveo®, and McQuade®) and Serogroup B meningococcal (Bexsero®and Trumenba®) (Meningococcal Vaccination | CDC, 2021). This study will record the adverse events reported after receiving the two types of meningococcal vaccines listed above due to those being the ones administered in the United States.

COVID-19

COVID-19, also known as the Coronavirus disease "is an infectious disease caused by the SARS-CoV-2 virus" (Coronavirus, 2020). This study will record the adverse events reported after receiving COVID-19 vaccines that are approved by the U.S Food and Drug Administration. The FDA-approved COVID-19 vaccines are Pfizer-BioNTech, Moderna, and Janssen (Office of the Commissioner, 2022).

Hypothesis

The null hypothesis of this study is that there is no statistically significant difference between the number of serious adverse events reported after receiving previously administered vaccines in the United States versus the number of serious adverse events after receiving the COVID-19 vaccine. The alternative hypothesis is that there is a statistically significant difference between the number of serious adverse events reported after receiving previously administered vaccines in the United States versus the number of serious adverse events after receiving the COVID-19 vaccine.

Methodology

This study will compare the safety of the COVID-19 vaccine with the vaccines for Varicella, Influenza, Hepatitis B, Measles, and Meningococcal by using the data available from the Vaccine Adverse Effects Reporting System. The comparison will be made by recording the amounts of serious adverse events related to vaccination reported to the VAERS for each vaccine in order to determine whether or not the COVID-19 vaccine is as safe as previously administered

vaccines. For each vaccine, the number of deaths, life-threatening events, permanent disabilities, congenital anomalies/birth defects, hospitalizations, and the emergency room/office visits that are reported to the Vaccine Adverse Effects Reporting System after receiving the vaccine will be recorded.

After collecting the data on the number of adverse events reported after receiving each of the six vaccines that the study is examining, the number of individuals in the United States who are vaccinated against the six vaccines will be recorded. The population size of individuals in the United States who have been vaccinated for each vaccine will be divided by the number of individuals who experienced the serious adverse events in order to determine the percentage of individuals who experienced each serious adverse event after receiving the certain vaccine. The percentage of individuals who experienced the serious adverse events for each of the previously administered vaccines in the United States (Varicella, Influenza, Hepatitis B, Measles, and Meningococcal) will be compared with the percentage of individuals who experienced serious adverse events after receiving the COVID-19 vaccine to compare the safeness. Analysis of variance (ANOVA) will be used to analyze differences between the percentages of individuals who experienced serious adverse events after receiving previously administered vaccines and individuals who experienced serious adverse events after receiving the COVID-19 vaccine. The ANOVA test will be conducted at a significance level of $\alpha=.05$.

ANOVA

Analysis of variance, also known as ANOVA, "is a statistical method that separates observed variance data into different components to use for additional tests." In addition, ANOVA tests allow "a comparison of more than two groups at the same time to determine

whether a relationship exists between them." This study will be using ANOVA single factor analysis which is "used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups" (How Analysis of Variance (ANOVA) Works, 2021).

P-Value

"A p-value is a statistical measurement used to validate a hypothesis against observed data." If a p-value is less than 0.05, then the alternative hypothesis is accepted and there is a statistically significant difference between the data points. If a p-value is greater than 0.05, then the study fails to reject the null hypothesis and there is no statistically significant difference between the data points (What P-Value Tells Us, 2022).

Results

Table 1: Varicella

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
157	656	632	4	2,458	25,847

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Table 2: Influenza

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
114	371	534	11	1276	3,292

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Table 3: Hepatitis B

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
913	1,109	1,385	9	3,909	18,077

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Table 4: Measles

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
240	1,035	1240	10	8,044	28,425

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Table 5: Meningococcal

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
52	266	233	3	1,067	12,909

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Table 6: COVID-19

Death	Life-Threatening	Permanent Disability	Congenital Anomaly/ Birth Defect	Hospitalized	Emergency Room/Office Visit
14,386	13,071	14,386	493	59,607	119

Note. All values were collected from the Vaccine Adverse Events Reporting System.

Tables 1-6 display the number of individuals who reported to the Vaccine Adverse Events Reporting System experiences of death, life-threatening events, permanent disabilities,

congenital anomalies/birth defects, hospitalization, and the emergency room/office visits after receiving the titled vaccine.

Table 7

Vaccine	Amount of individuals in the United States vaccinated
Varicella	299,828,092
Influenza	149,581,643
Hepatitis B	301,157,707
Measles	301,822,514
Meningococcal	259,274,847
COVID-19	350,635,524

Note. The amount of individuals vaccinated includes multiple doses.

Table 7 displays the number of individuals in the United States who are vaccinated against each of the six vaccines that the study is examining. The number of people in the United States vaccinated against Varicella, Hepatitis B, and Measles was found through the Centers for Disease Control and Prevention (FastStats, 2021). The data available through the CDC stated that in the United States the "percent of children vaccinated by age 24 months" for Varicella is 90.2%, 90.6% for Hepatitis B, and 90.8% for Measles. This study assumes the percentage of children vaccinated against Varicella, Hepatitis B, and Measles represents the percentage of the total population vaccinated against those diseases due to the assumption that adolescents and adults were vaccinated as children. The current population of the United States is 332,403, 650 (U.S. Population Estimated at 332,403,650 on Jan. 1, 2022, 2022). 90.2%, 90.6%, and 90.8% of the United States population were calculated in order to determine the numbers of individuals

vaccinated against Varicella, Hepatitis B, and Measles. The number of individuals vaccinated against Influenza was calculated by finding 45% of the United States population as "... 45% of Americans on average have been getting vaccinated yearly" (Hurst, 2021). The number of individuals vaccinated against Meningococcal was found by calculating 78% of the United States population as it was reported that 78% of adolescents in 2016 received the Meningococcal vaccine (Adolescent Vaccination Rates in America, 2018), This study is assuming that the percentage of adolescents vaccinated against Meningococcal in 2016 represents the percentage of the total population vaccinated against Meningococcal.

Table 8: Percentage of individuals who experienced adverse events

Vaccine	Varicella	Influenza	Hepatitis B	Measles	Meningococcal	COVID-19
Death	0.0000524	0.0000762	0.000303	0.0000795	0.0000201	0.0041
Life-Threatening	0.000219	0.000248	0.000368	0.000343	0.000103	0.00373
Permanent Disability	0.000211	0.000357	0.00046	0.000459	0.0000899	0.0041
Congenital Anomaly/ Birth Defect	0.00000133	0.00000735	0.00000299	0.00000331	0.00000116	0.000141
Hospitalized	0.00082	0.000853	0.0013	0.00267	0.000412	0.017
Emergency Room/Office Visit	0.00862	0.0022	0.006	0.00942	0.005	0.0000339

The percentages were found by dividing the number of individuals who experienced the certain serious adverse event by the number of individuals who have received the certain

vaccine. The value found after the division was then multiplied by 100 in order to create a percentage.

Table 9: P-Values

Varicella	0.417100113341935
Influenza	0.131594930399118
Hepatitis B	0.338173144984629
Measles	0.518824427442084
Meningococcal	0.174777795404639

Note. P-values were found by using ANOVA software.

The P-values were found by using the percentages displayed in Table 8, using the ANOVA single factor analysis software. The percentage of individuals who experienced adverse events after receiving previously administered vaccines was individually compared with the percentage of individuals who experienced serious adverse events after receiving the COVID-19 vaccine. The percentage of individuals who experienced each of the six serious adverse events were examined together as a whole when conducting the ANOVA single factor analysis test. The p-values for each of the five vaccines compared with the COVID-19 vaccine were found after conducting five ANOVA single factor analysis tests.

Discussion

Based on the data collected from the Vaccine Adverse Events Reporting System, Varicella, Influenza, Hepatitis B, Measles, Meningococcal, and COVID-19 have reports of individuals experiencing death, life-threatening effects, permanent disabilities, congenital

anomalies/birth defects, hospitalization, and the emergency room/office visits after receiving the vaccine. Tables 1-6 display how each vaccine has reports of adverse events occurring after receiving the vaccine, indicating how every vaccine has risks associated with it. This is due to the fact that not every vaccine is completely safe and effective since everyone's body has varying reactions after being vaccinated.

By looking at Table 6 and comparing the numbers in Tables 1-5, the assumption may be made that the COVID-19 vaccine is significantly less safe than previously administered vaccines in the United States due to the number of adverse events reported after being vaccinated against COVID-19 appear to notably larger than the number of adverse events reported after receiving previously administered vaccines in the United States.

In order to determine whether or not there is a significant statistical difference between the percentages of individuals who experienced adverse events after receiving previously administered vaccines and the COVID-19 vaccine, five ANOVA single factor tests were conducted. Table 9 displays the p-values that were calculated through the ANOVA single factor analysis for each of the previously administered vaccines compared with the COVID-19 vaccine.

Table 9 displays the p-values that were calculated for each of the previously administered vaccines compared with the COVID-19 vaccine. All of the five p-values were found by conducting the ANOVA single factor analysis tests. The significance level of this study was $\alpha=.05$. Each of the p-values is greater than 0.05, which indicates that there is no statistically significant difference between the percentage of individuals who experienced serious adverse events after receiving the Varicella, Influenza, Hepatitis B, Measles, and Meningococcal vaccine

and the percentage of individuals who experienced serious adverse events after receiving the COVID-19 vaccine.

Limitations

A limitation of this study is that not every vaccine administered in the United States is being examined and compared to the COVID-19 vaccine. Therefore, the question of how the safeness of previously administered vaccines compares to the safeness of COVID-19 does not fully account for all vaccines in the United States, resulting in a limitation and gap in the research. Another limitation that is present is that anyone can report to the Vaccine Adverse Events Reporting system, resulting in some reports of adverse effects not being accurate or the adverse effects not being directly correlated with vaccination. In addition, the VAERS states that "The Vaccine Adverse Event Reporting System (VAERS) database contains information on unverified reports of adverse events (illnesses, health problems and/or symptoms) following immunization with US-licensed vaccines. Reports are accepted from anyone and can be submitted electronically at www.vaers.hhs.gov." Therefore, a report to the Vaccine Adverse Reporting System does not mean that the vaccine caused the adverse effect, but that the symptom occurred after vaccination. Furthermore, the VAERS only contains reports from 1990 to the present, making the amount of data available limited due to data on adverse events prior to 1990 not being available. There is also a limitation present regarding the number of individuals in the United States vaccinated against Varicella, Influenza, Hepatitis B, Measles, and Meningococcal. There is no data that contains the exact number of individuals vaccinated against previously administered vaccines. Therefore, the numbers displayed in Table 7 for the number of individuals vaccinated for previously administered vaccines were calculated by making the

assumption that a certain percentage of children are vaccinated for a vaccine, then the overall population is vaccinated against a vaccine within the same percent. This assumption was made when calculating the number of individuals vaccinated for Varicella, Measles, and Hepatitis B. Another assumption that was made was that if a percentage of individuals were reported to be vaccinated for a vaccine in a certain year, then that is the overall percentage of the population that is vaccinated for that particular vaccine. This assumption was made when calculating the number of individuals vaccinated for Influenza and Meningococcal. The assumptions result in creating a limitation in the study due to the number of individuals being vaccinated for a particular disease not being completely accurate. The last limitation of this study is that not every type of vaccine was examined when looking at the adverse events of a particular vaccine. Only the vaccine types that are the most prevalent and common were examined. This results in a limitation in the study due to not every adverse event for each vaccine being reported since not all vaccine types were studied.

Conclusion

The p-values being greater than 0.05 for Varicella, Influenza, Hepatitis B, Measles, and Meningococcal vaccines when being compared to the COVID-19 vaccine indicate that there is no statistically significant difference between the percentage of individuals who experienced serious adverse events from receiving previously administered vaccines and the percentage of individuals who experienced serious adverse events from receiving the COVID-19 vaccine. Furthermore, the p-values being greater than 0.05 display strong evidence to reject the alternative hypothesis of the study which was the following: there is a statistically significant difference

between the number of serious adverse events reported after receiving previously administered vaccines in the United States versus the number of serious adverse events after receiving the COVID-19 vaccine. P-values greater than 0.05 also mean that the study fails to reject the null hypothesis which was the following: there is no statistically significant difference between the number of serious adverse events reported after receiving previously administered vaccines in the United States versus the number of serious adverse events after receiving the COVID-19 vaccine.

The rejection of the alternative hypothesis and the failure to reject the null hypothesis indicate that the safeness of previously administered vaccines in the United States does not significantly differ from the safeness of the COVID-19 vaccine. The conclusion displays that those who claimed that the COVID-19 vaccine is not safe and refuse to receive the vaccine due to the amount of serious adverse events reported failing to consider that the number of serious adverse events reported after receiving Varicella, Influenza, Hepatitis B, Measles, and Meningococcal do not statistically significantly differ from the number of serious adverse events reported after receiving the COVID-19 vaccine. In other words, the COVID-19 vaccine is not more dangerous than previously administered vaccines in the United States.

Future Implications

By conducting more research on serious adverse events, individuals may begin to trust medicine and the government regarding not only vaccines but also pharmaceutical drugs. As stated before in this study, vaccination among individuals in the United States is estimated to prevent 6 million deaths annually, save 386 million life years, and have resulted in a 90% decline in mortality and morbidity. Further research conducted on serious adverse events regarding

vaccines and pharmaceutical drugs may encourage individuals to get vaccinated and accept pharmaceutical drugs to improve their health, potentially increasing the 90% decline in mortality and morbidity.

To make the results from this study more accurate, further research can be conducted to find the accurate number of individuals vaccinated against Varicella, Influenza, Hepatitis B, Measles, and Meningococcal due to this study finding the number based on educated assumptions. With the accurate number of individuals vaccinated, the percentage of individuals who experienced adverse events will be more precise. Furthermore, this study did not compare the safeness of all previously administered vaccines with the safeness of the COVID-19 vaccine as only the five vaccines stated above were examined, Additional research can be conducted on previously administered vaccines that were not examined in this study and that are common to receive such as Human Papillomavirus, Tetanus, and Shingles in order to elaborate on the safety comparison between the COVID-19 vaccine and other vaccines available in the United States.

While conducting this study, it was extremely difficult to find all the data in order to determine the safety of the COVID-19 vaccine compared to previously administered vaccines. There is an immense amount of skepticism regarding vaccination due to misconceptions that are a result of a lack of information. In order to reduce the distrust individuals have regarding vaccination, there should be available and easy to access data on all vaccines, especially common vaccines such as Varicella, Influenza, Hepatitis B, Measles, Meningococcal, and more. There should be open data regarding the adverse events related to the vaccines that children are required to receive, the number of individuals who have experienced those adverse events, and the number of individuals vaccinated against the infectious disease. The availability of all of this

data will result in those who distrust medicine to alleviate their distrust due to the facts being presented in front of them. In addition, more research conducted and available to United States individuals will lead to the reduction of misconceptions regarding the dangers of vaccination and pharmaceutical drugs. A reduction in misconceptions regarding the dangers of vaccines, particularly the COVID-19 vaccine, could result in the disease's eradication, similar to how Polio and Smallpox were eradicated through vaccination. The vast amount of future research found on adverse events will result in the population of the United States believing that vaccines and pharmaceutical drugs are safe, leading to improved public health across the nation.

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