

Will Vaccination End the Pandemic?

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Abstract

The world has suffered from the coronavirus pandemic that started over a year ago, where vaccinations have only just started around seven months ago. This study aims to determine whether vaccination can end the coronavirus pandemic based on the availability, accessibility of vaccines, and vaccination rates of different countries. We used several data-driven statistical online tools to help us come up with our conclusion. Hence, the result of our analysis shows that vaccination can stop the current pandemic; however, different countries with a variety of GDP will result in a more extended timeframe of 'when' the pandemic ends. The data used in this paper is as on 30th of April 2021.

Keywords: COVID-19; Influenza; Vaccination; Coronavirus; Pandemic; Herd immunity; Disease

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Introduction

The Coronavirus pandemic started in late 2019 and since then has been very problematic to every part of the world. It has affected almost every government in the world, the global economy, and a considerable amount of the human population, from children to older adults. Considerably, 147 million lives were infected, and around 3 million lives were lost in this global pandemic.

Many people refer to social distancing, lockdowns, vaccinations, face masks as ways to prevent the Coronavirus from spreading to other people. As other pandemics have already ended, many people believed that vaccines are the most effective deterrent against viral diseases such as COVID-19. This paper will predominantly discuss two countries (one developed and one developing country) with an identical number of populations. Moreover, this paper examines the effectiveness of vaccines, availability and accessibility of vaccines, herd immunity, and how vaccination will help end the pandemic.

Main Discussion

Health is probably an essential value of our society, which enjoys an unprecedented quality of life in high-income countries and improving conditions in developing countries (Rappuoli,2011). Infectious diseases such as Cyclosporiasis and Hantavirus pneumonia can bring deathly risks to this so-called 'health'. During the past decades, vaccination has played an essential role in securing many people's health, especially when the vaccines are given at childbirth. All in all, this paper will discuss more vaccines in the following subtopics.

Vaccines react differently to many different people, precisely if we differentiate them by age group. For this specific discussion, we will be using the Influenza vaccine to determine whether vaccines are effective or not. Influenza is a contagious respiratory illness that can cause mild to severe conditions resulting in hospitalization and even death. Based on the Centers for Disease Control and Prevention (CDC), recent studies show that Influenza vaccination reduces the risk of getting infected by flu diseases by around 50% among the overall population during flu seasons (Figure 1)[1,2].

The graph above shows that influenza vaccination coverage constantly changes from the current season compared to the previous one (excluding 2015-16). This graph proves that variability in child and adult flu vaccination coverage continues to be significant[3-7].

Moreover, numerous studies have proven that flu vaccination can reduce the risk of flu-associated hospitalization for children, working-age adults, and the elderly. For instance, A 2018 study showed that from 2012 to 2015, Influenza vaccination among working-age adults reduced the risk of being admitted to an ICU with flu by 82 percent, and in recent years, flu vaccines have reduced the risk of flu-associated hospitalizations among older adults on average by about 40 percent.

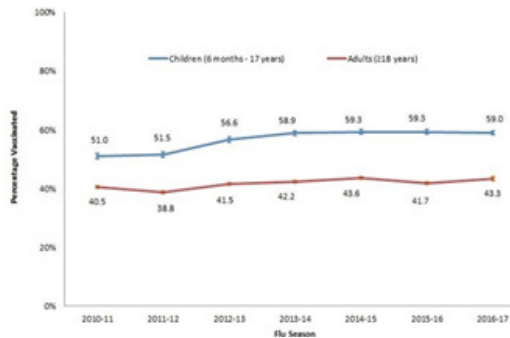


Figure 1: Seasonal flu vaccination coverage by age group and season.

Availability Accessibility of Vaccines

As previously stated, the spread of COVID-19 vaccination and the Global COVID-19 situation will be discussed with an example of two different countries, namely Indonesia as a representative of developing countries and the United States, which will be representing developed countries. Even though they both have a roughly similar number of populations, which make up approximately 8% of the whole world population, there is a significant difference in terms of daily vaccination rate, the occurrence of COVID cases, and safety measurement applied.

The pandemic started on 31st December 2019 in Wuhan, China, where the first Coronavirus disease case was recorded, and even after a year, humanity is still suffering from this invisible enemy. The first histogram below depicts the number of cases worldwide along with that second histogram responsible for the total death cases, whereas it is shown by the table that the USA makes roughly 21% of whole cases by a total of 31,835,314 with 870,419 cases. Compared to the USA, a seemingly more minor number of Coronavirus cases, i.e., 1,657,035 overall with 51,939 daily, confirmed in Indonesia. Graphical data from who.int were shown in **Figures 2 and 3**.

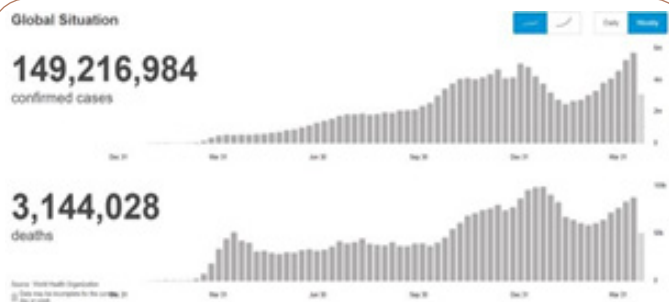


Figure 2: Global coronavirus cases and deaths.

Name	Cases - cumulative total	Cases - newly reported in last 24 hours	Deaths - cumulative total	Deaths - newly reported in last 24 hours	Transmission Classification
Global	149,216,984	870,419	3,144,028	14,886	
United States ...	31,835,314	51,939	567,971	644	Community transmission
Indonesia	1,657,035	5,241	45,116	177	Community transmission

Figure 3: Coronavirus cases and deaths respective to 2 countries.

Vaccine for Covid-19 starts to appear from the beginning of September 2020 worldwide, with Russian ‘Sputnik V’ as the first registered. According to data provided by Bloomberg, the latest rate is approximately 20.3 million doses a day, and more than 1.08 billion doses have been administered-enough to fully vaccinate 7.1% of the global population. However, the distribution is very imbalanced that only 27 wealthiest countries own 36.9% of the vaccination available globally, but all their population constitutes 10.5% of the world population.” There remains a shocking imbalance in the global distribution of vaccines.

On average, in high-income countries, one out of four people has received a COVID-19 vaccine, whereas, in low-income countries, it is one out of more than 500.”, said WHO chief Tedros Adhanom Ghebreyesus during the agency’s regular briefing from Geneva. The availability and accessibility of vaccines in countries with high or upper-middle-income receive vaccination 25 times faster than low-income countries. Based from Bloomberg.com, the subsequent map is the world map of vaccination which represents the population covered with vaccination (**Figure 4**)[8-15].



Figure 4: World map of vaccination respective to the percentage of population covered.

Currently, the US has access to 22.3% of all vaccines available, but 4.3% population of the global population. The mass vaccine roll-out program launched on 20th December 2020 in the United States; as of 29th April, 235 million doses of having been administered, including one dose of J&J and two dose of Pfizer–Biotech, Modern vaccine. The US has the highest vaccination rate after China, with 2.67 million doses on a single day. This amount of vaccine dose is enough to cover 36.5% of the country’s population, where other countries with lower GDP and huge populations were observed to have remarkably lower access to vaccines to combat the pandemic to protect their population.

The below graph is sourced from ourworldindata.org (Figure 5).

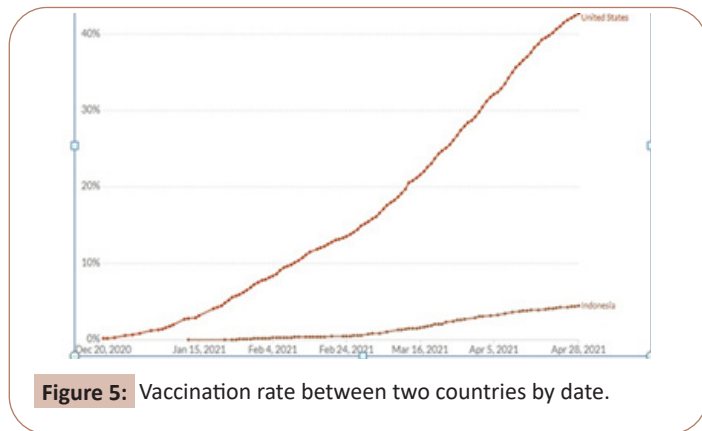


Figure 5: Vaccination rate between two countries by date.

In our case, Indonesia being the 4th largely populated country with a substantially low rate of inoculation, the line chart illustrates a clear relationship between GDP per capita and spread of COVID-19 vaccine. Furthermore, the US with more than \$54,000 GDP per capita has just over 44% population vaccinated with a sharp increase from the beginning, compared to Indonesia having \$11,189 GDP per capita represents less than 5% vaccination rate with a gradual increase from the end of February 2021[16-18].

Herd Immunity

According to BBC, the massive vaccination COVID-19 program already began in many countries (179 to be precise), and daily doses are more than 20 million globally (this rate increases every day). Simultaneously, the number of cases keeps rising; thus, countries fail to control the disease. The data below provided by worldometer.info supports this statement and illustrates the occurrence of weekly cases (Figure 6) [19-22].

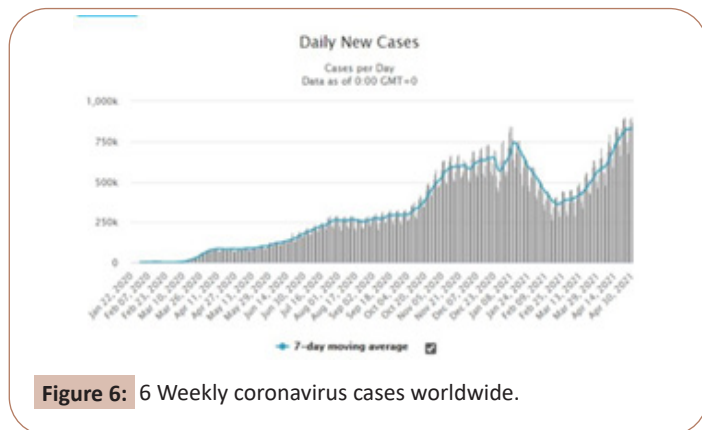


Figure 6: 6 Weekly coronavirus cases worldwide.

While this can be viewed that vaccines are not effective enough to reduce the spread of the disease, the AstraZeneca vaccine is one of the most commonly utilized vaccines in 140 countries and is considered 100 percent efficient against severe disease after the second shot. This event can be explained by the term 'Herd Immunity'.

Herd Immunity is a threshold that such proportions of the population develop immunity from a particular infection or disease so that vulnerable groups of people are protected from infection and spread equally; hence, the occurrence of

disease cases are reduced significantly. The immunity threshold differentiates by disease, and it can be achieved by either massive vaccination or direct contact with the disease. Nevertheless, the latter can overwhelm the health care system and the country's whole economy, resulting in extreme cases and deaths.

Vaccination against COVID-19 requires two shots in most cases with different time intervals, and thus it takes a significant amount of time to fully vaccinate a particular proportion of the population to reach herd immunity against the current pandemic. Within that time, it is difficult to prevent the spread of infection. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, suggested that it will take 75-80 % coverage of the population to return to normal. The particular period to reach the threshold varies significantly from country to country, depending on its financial ability.

The case of two different countries in our research can serve as supporting evidence to this statement: in the US, the latest vaccination rate is 2,548,207 doses per day, and with this pace, it is estimated that it will take another three months to cover 75% of the country population. Whereas in Indonesia, the vaccination rate is ten times slower than in the US; correspondingly, it takes about another 4.2 years to cover 75% of the whole population, according to data provided by Bloomberg. Crucially, this estimation can change over time. For instance, a vaccine manufacturing expansion can result in increased availability and vaccine equity[23].

Conclusion

Health is an essential aspect of human life. Since 31st December 2019, humanity has faced global pandemic towards a deadly and imminent disease, called the Coronavirus. The Coronavirus pandemic keeps getting worse if every citizen worldwide keeps ignoring the government's fundamental health protocol. These protocols relate to the use of face masks, social distancing, area lockdowns, and vaccinations.

For the past decades, multiple studies have proven that vaccination is the most effective method of dealing with viral diseases, such as Coronavirus itself. Hence, to answer the question 'Will Vaccination End the Pandemic?' is an easy and straightforward 'Yes'. However, the question of 'when' and 'how' will the pandemic ends is another different aspect. Based on the current vaccination rate, it will take a significant amount of time to administer these vaccines to a whole population fully, and depending on the country, the amount of time it takes will vary from one to another.

We took the example of two different countries with roughly a similar population count, although including distinct GDPs, and with the correct data, we can conclude that countries with higher GDP will result in a higher vaccination rate, therefore, less time to reach 'herd immunity'. As a concluding point, vaccination is our best chance of surviving this pandemic. However, different countries will have different durations (some faster and some slower), and it will take humanity a significant amount of time until we can return to our everyday lives."

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