COVID Breakthrough Visualization

Introduction.

Those who tested positive for COVID-19 after receiving their final dose of vaccinations are considered vaccine breakthrough cases. The rates of these incidents, as well as percentage protection from different variants are documented in this report for the whole world. This data was collected through World Health Organization (WHO) and Our World in Data (OWID).

If recurrent infections after vaccination constitute a significant factor in the spread of Covid, then previously recommended preventative measures, such as limiting social contact, may once again need to be taken. Instead, if Covid is spreading primarily among non-vaccinated people, it would imply that vaccinated people's actions don't matter much and that increasing vaccination rates is the most reliable way to decrease caseloads.

In this post, we will look at many sorts of visualizations created with the Tableau program. These visualizations include the percentage of people who are protected from the omicron variant by either severe or infection, the total population and total vaccinated in each country, the average percentage of people protected from the original variant, the percentage of people protected against the latest variant, data on how susceptible to breakthrough, and a dashboard that displays all visualizations that can be filtered by selecting a country.

Total Population and total vaccinated.

After several COVID-19 vaccines received emergency approval in the latter half of 2020 and the early part of 2021, the world moved on to the next stage of the pandemic, which was the distribution of these novel shots throughout the entire world. The figure below depicts a map and

the overall population of each country, as well as the total number of vaccinated people in each country.

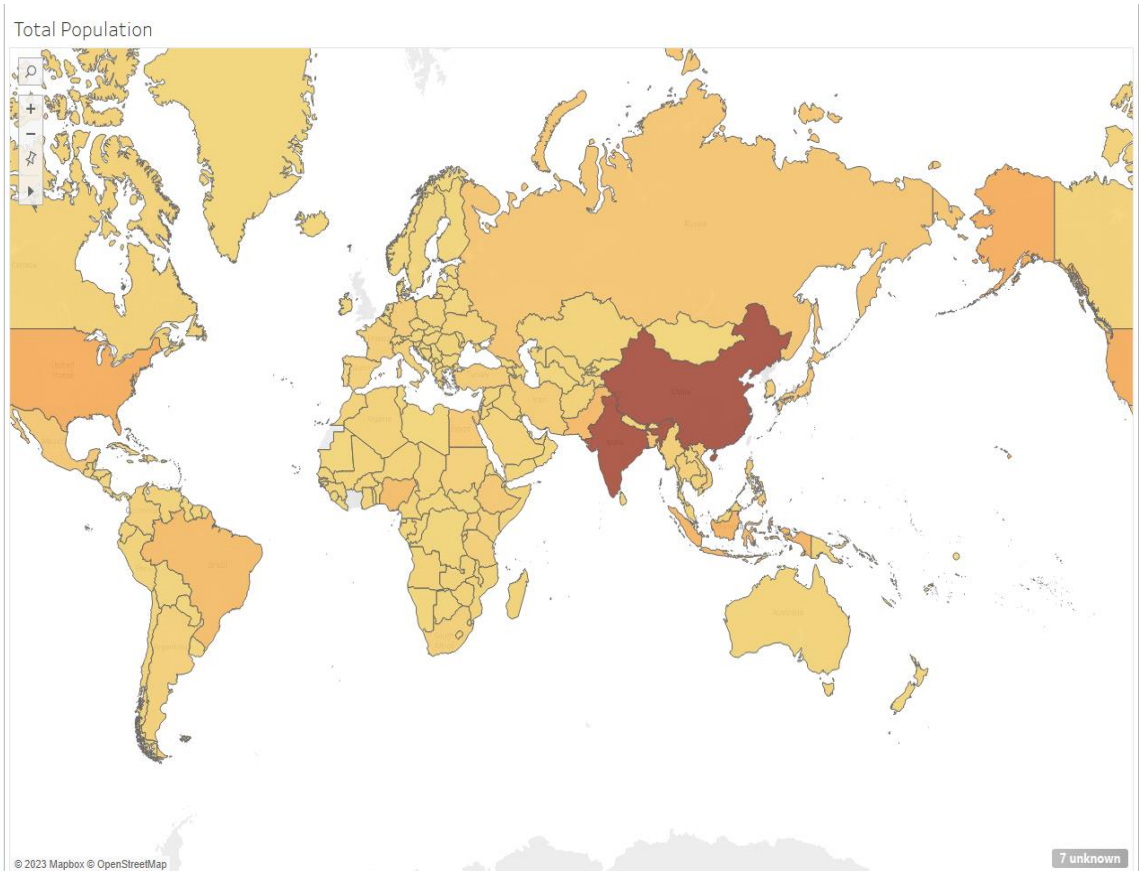
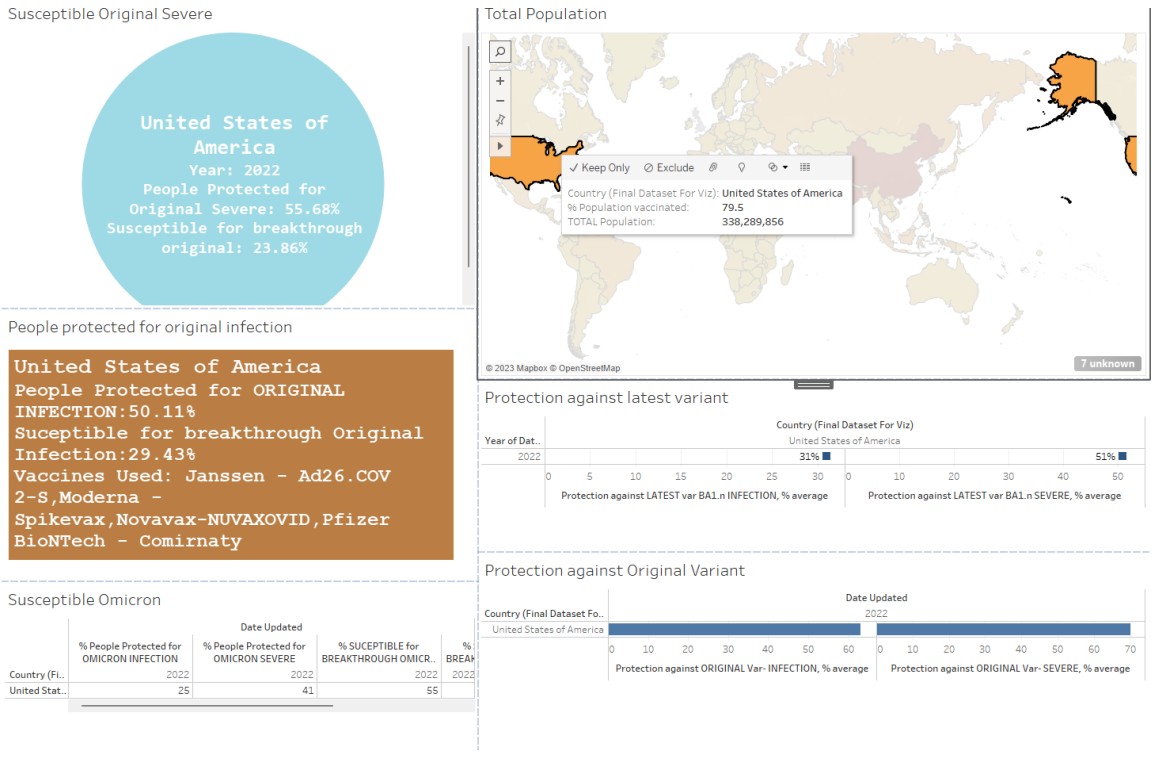


Figure 1: World Map and its population

According to Wolf et al., By 2021, the vast majority of people in high-income nations would have received their initial vaccination. At the same time, low-income countries' GDP growth rate was hovering around 1%. Well over a year later, the same pattern holds true for booster doses: as of November 2022, over 60% of people in high-income countries had received a booster dose, compared to only 1.4% of those in low-income countries (Wolf et al).

Susceptible for breakthrough (Original variant).

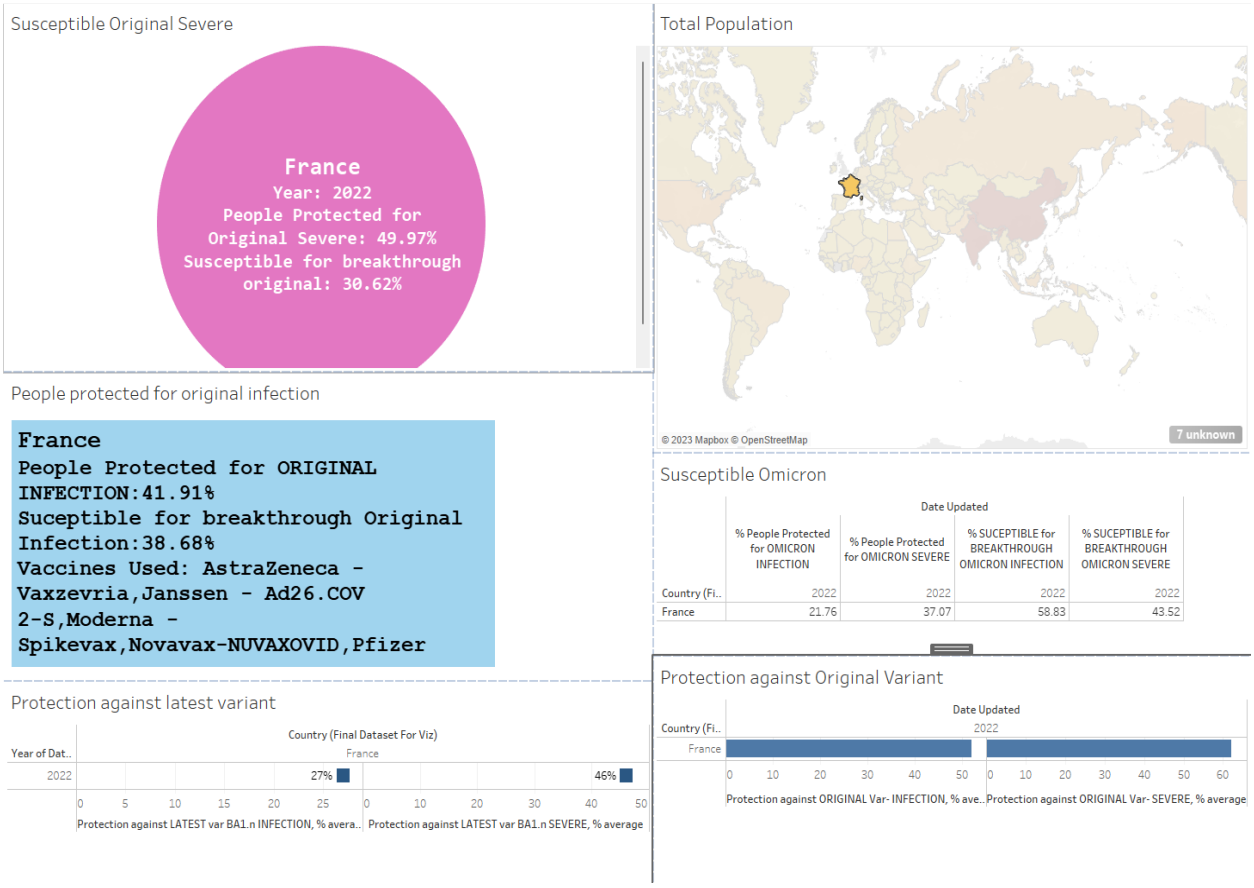
In clinical tests, the COVID-19 vaccines have been shown to be extremely effective in protecting those who have received the entire vaccination against the coronavirus SARS-CoV-2. These vaccines are currently being disseminated across the country. It seemed sense to explore for solutions to emerging infections in Israel. Most people in the country who were able to get the Pfizer/BioNTech vaccine had done so at least once. Clinical trial results were similar to those of an earlier study conducted in Israel, which found that the vaccination provided a significant percentage of protection against illness across age groups. However, it did not investigate whether or not there were significant differences in infection rates with newly emerging variants after vaccination.



Surprisingly, findings revealed that people were somewhat more likely to suffer breakthrough infections with the original variety after getting the first dose of vaccine compared to those who had not gotten the vaccine. After applying some filters to the visualization data, we can see that 79 percent have received the vaccine and that 23.86 percent are at risk of a

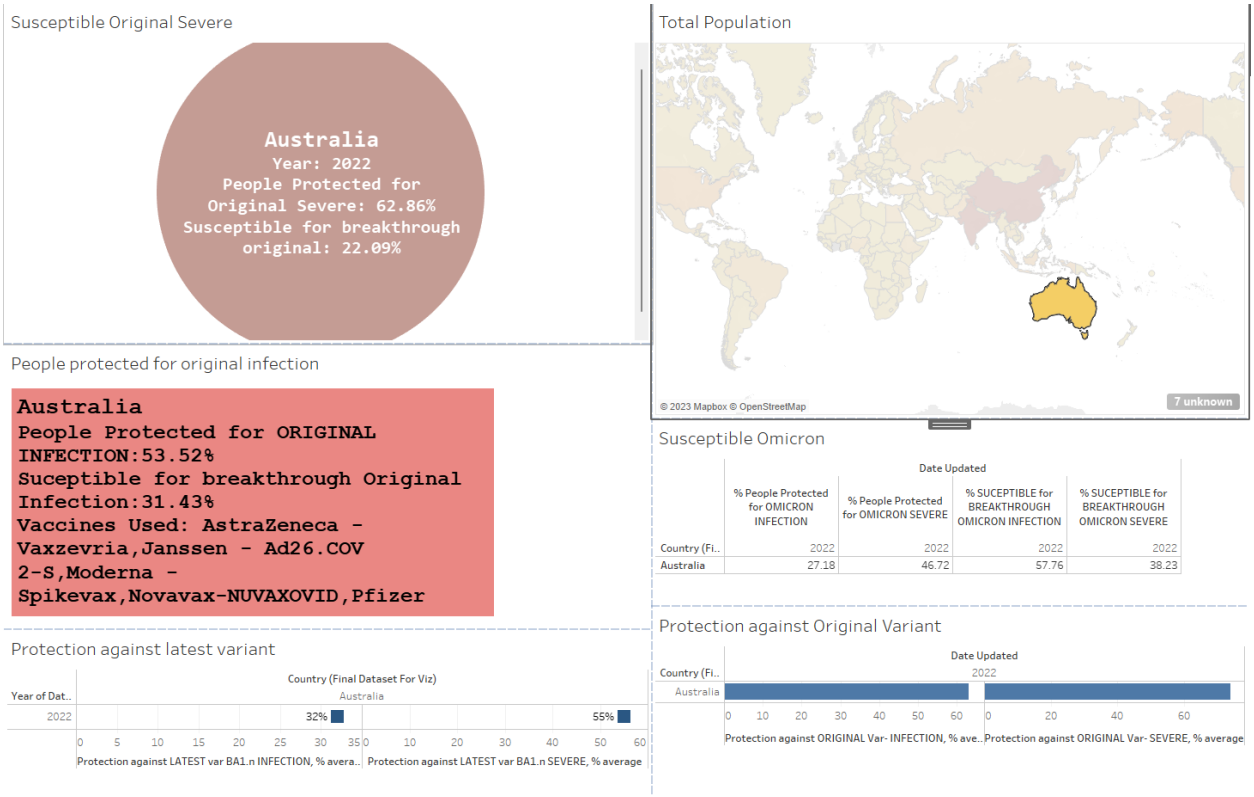
breakthrough of the original variant. Additionally, the data demonstrates that countries with a high vaccination rate also tend to have a slightly higher rate of susceptible breakthrough of the original variant. This can be seen in the figure above.

Susceptible for breakthrough (Omicron variant).



Since it has the molecular hallmarks of being highly transmissible, it can at some point, spread globally. The figure above shows that it is comparable to the Delta variant, which has the ability of high transmissibility (i.e., it can be spread very easily), the Omicron variant is essentially the successor to the Alpha variant as the dominant strain of the virus. It also shows that the percentage for both susceptible for breakthrough on omicron by either infection and severe are very high.

People protected from different variants.



Infection with the virus COVID-19 provides some natural protection or immunity against reinfection. This protection or immunity can last for years. Infection with COVID-19 or obtaining the vaccine against it is associated with a considerably reduced chance of contracting the disease again for some months.

Filtering the data for Australia reveals that very good protection is provided against the original variation for a country where 85% of the population has been vaccinated. Protection against Omicron and the latest variant, whether through severe or infection, is thus also indicated to be high. This is likely the result of herd immunity. According to WHO, herd immunity can be achieved when a large enough percentage of the population has received a vaccine and has generated antibodies that provide protection against the disease. Vaccines can generate immunity without generating illness or the difficulties that come with it, unlike natural infection methods (*Coronavirus disease (covid-19): Herd immunity, Lockdowns and covid-19*).

Conclusion.

The majority of people who contract COVID-19 will increase an immune response during the first few weeks after infection. There is continuing active research into the longevity and efficiency of that protection. Some organizations are also probably trying to figure out if people's immune responses vary in strength and duration depending on how severe their sickness is. Even in those who show no outward signs of illness, an immune response appears to be at work. Without a deeper understanding of COVID-19 immunity, we cannot anticipate how many people in a population are protected against the virus or how long that protection will continue. In the end, we still don't know for sure whether or not the great majority of individuals in most countries are still vulnerable to this virus, but as a result of data collected by WHO and OWID, we have a much better understanding.

References.

"Coronavirus Disease (Covid-19): Herd Immunity, Lockdowns and Covid-19." *World Health Organization*, www.who.int/news-room/questions-and-answers/item/herd-immunity-lockdowns-and-covid-19. Accessed 30 Apr. 2023.

Wolf, C., Matthews, A. L., & Alas, H. (2022, November 7). *Covid-19 vaccination rates by country*. COVID-19 Vaccination Rates by Country. Retrieved from https://www.usnews.com/news/best-countries/articles/covid-19-vaccination-rates-by-country