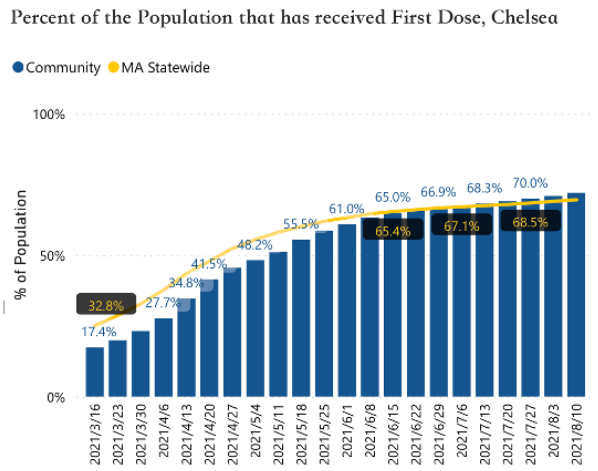
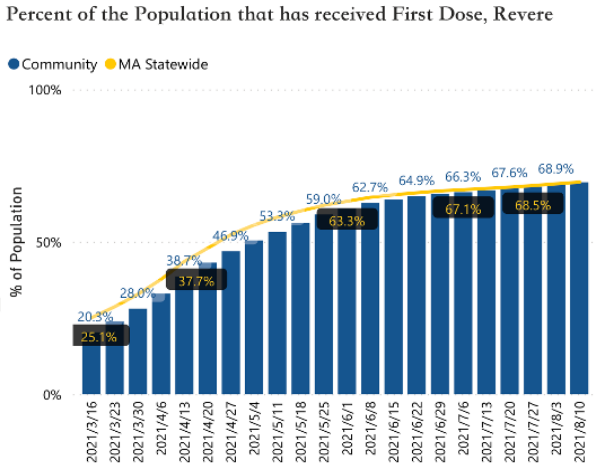
Deliverable 3 - Vaccine Equity Team 2 Report

Introduction

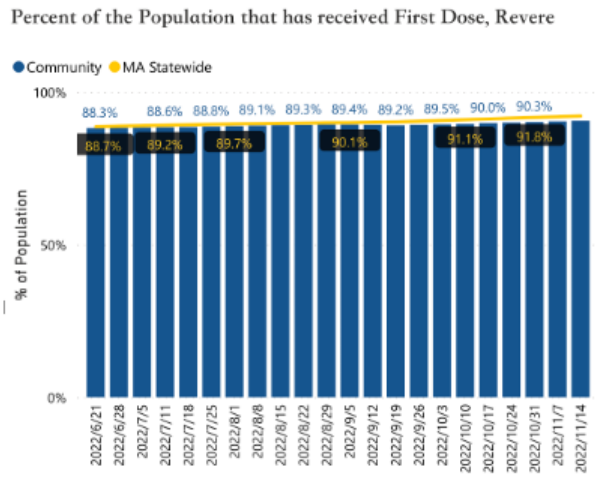
During the pandemic of COVID-19, vaccination became the most effective way to prevent people getting infected. In Massachusetts, La Colaborativa, a grassroots organization, made a great effort to help to vaccinate Latine and Black communities in Chelsea. With the help of volunteers from La Colaborativa, Chelsea became one of the communities which have the highest vaccination rates. As we can see statistics and graphs from the website of the Massachusetts government. The rates of receiving the first dose increased sharply from 17.4% which is obviously lower than the average percentage of MA Statewide, to 70% in about 4 months (As we can see from picture 1-a). Moreover, it only took three months for Chelsea to catch up with the average percentage. In comparison, Revere had a higher rate than Chelsea at the beginning, which is about 20% (As we can see from picture 1-b). However, Revere still did not reach the average rates till now, while the rate of Chelsea is almost 100% (As we can see from picture 1-c and 1-d). In this article, we would illustrate how La Colaborativa helped the Chelsea community detailly by putting emphasis on the age of Vaccination rates that includes both one dose and fully vaccinated.



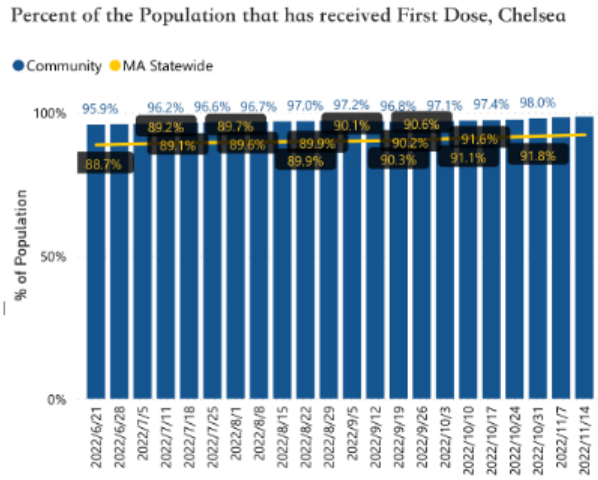
1-a



1-b

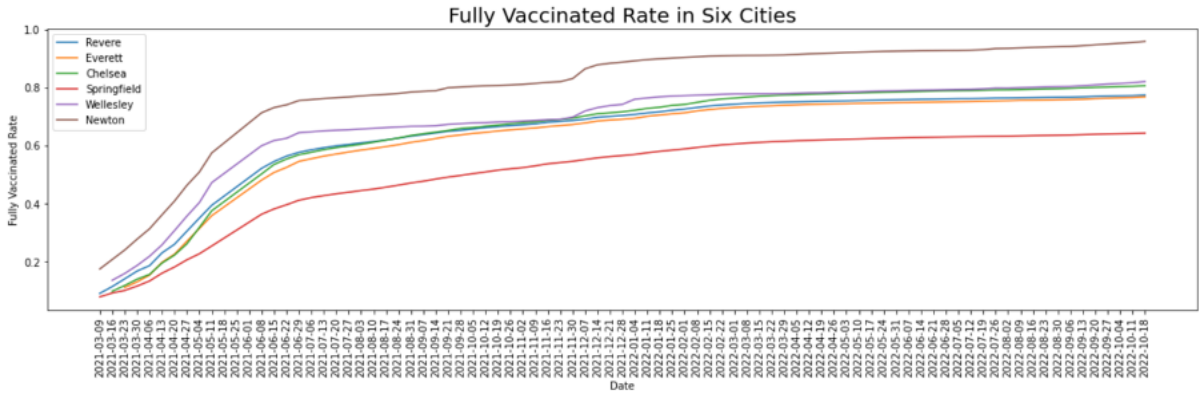


1-c

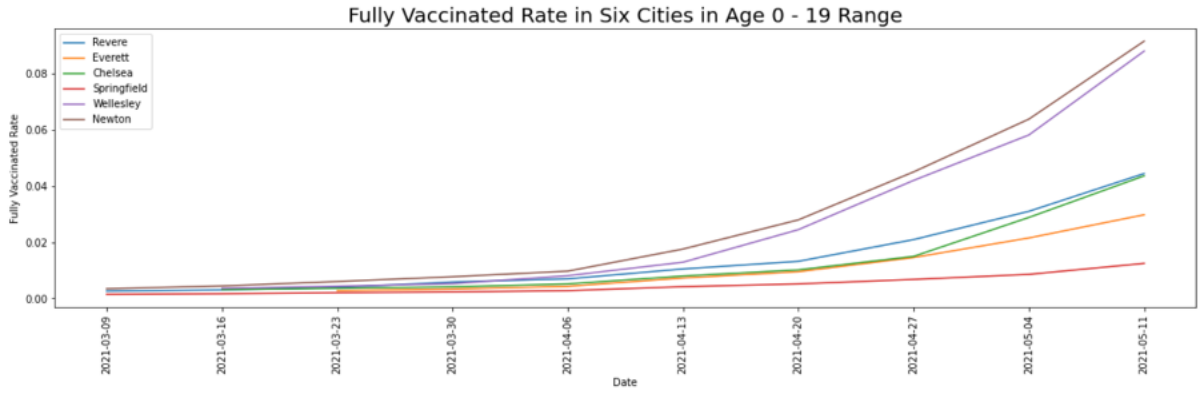


1-d

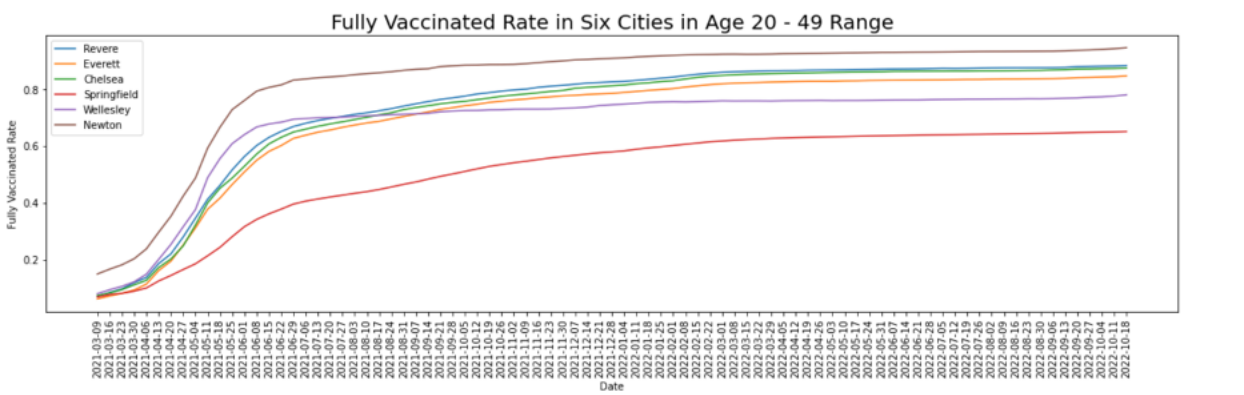
Analysis of the Fully Vaccinated Rate at Different Ages



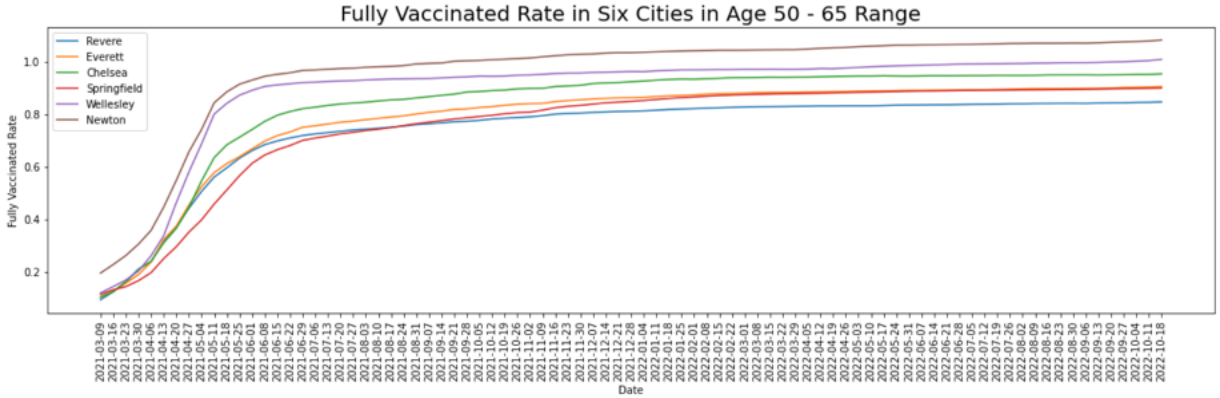
"Fully Vaccinated Rate in Six Cities" plot presents the fully vaccinated proportion in six cities (Revere, Chelsea, Springfield, Everett, Newton, and Wellesley).
Based on this plot, June 2021 is a turning point, the date from which the growth rate of fully vaccinated starts to slow down, especially for Revere, Everett, Chelsea, Wellesley, and Newton. Overall, Newton had the highest fully vaccinated rate and Springfield had the lowest fully vaccinated rate. Chelsea's fully vaccinated growth rate was slightly higher than Everett, Wellesley, and Revere's.



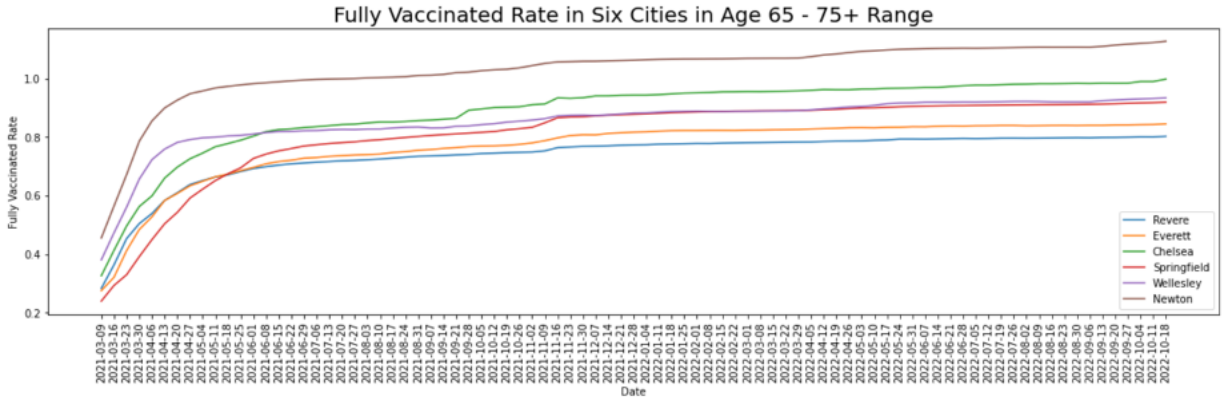
This graph shows the change in the proportion of fully vaccinated children and adolescents (aged 0-19) in six cities. From this graph, we can see that around April 10, 2021, the proportion of people aged 0-19 in Wellesley and Newton who are fully vaccinated suddenly increased. Around April 25, 2021, Revere, Chelsea and Everett had a significant increase in the proportion of fully vaccinated people aged 0-19. But in general, the proportion of people aged 0-19 who were fully vaccinated by May 2021 is less than 1%, which is very small.



This graph presents the change in the proportion of fully vaccinated adults aged 20-49 in six cities. During April 2021 to June 2021, except for Springfield, the fully vaccinated proportion in other five cities has increased significantly. Only Wellesley's percentage of fully vaccinated people remained basically the same after that, and did not continue to increase. After June 2021, Newton, Chelsea, Everett, and Revere continued to keep a slow increase in the proportion of fully vaccinated.



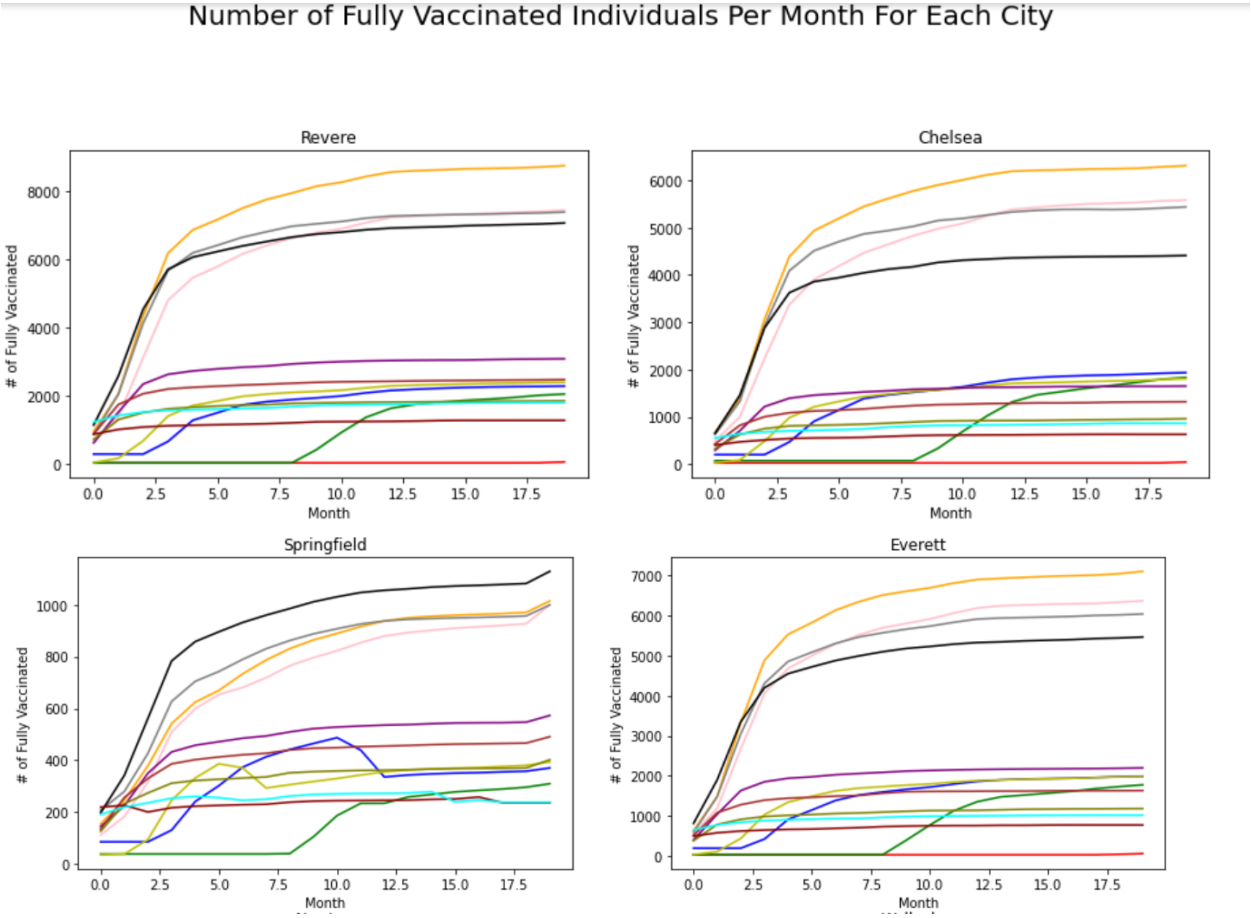
From the “Fully Vaccinated Rate in Six Cities in Age 50 - 65 Range” graph, we can see that from April 2021 to May 2021, the proportion of fully vaccinated in these six cities has increased significantly. Springfield has a higher growth rate than the other five cities after June 2021.

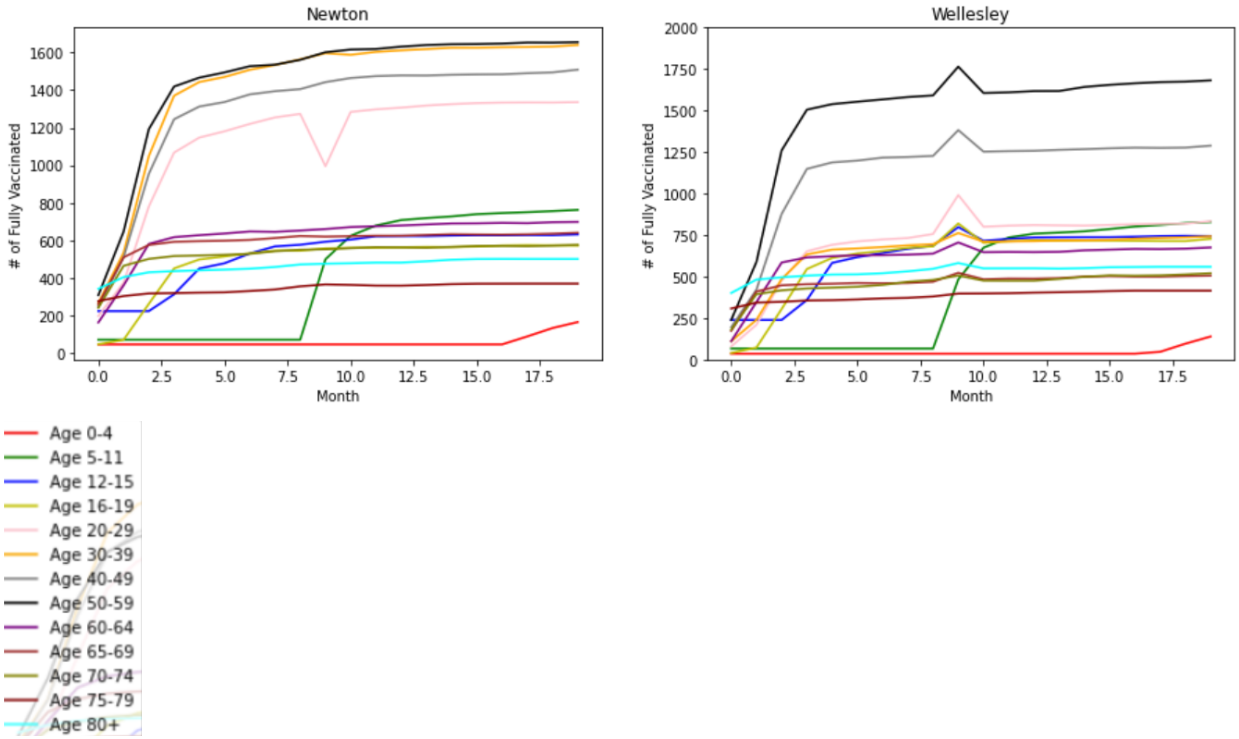


This graph shows the change in the proportion of fully vaccinated people aged 65-75+ in six cities. From March 2021 to April 2021, the proportion of fully vaccinated in all cities has increased significantly. Springfield and Chelsea have higher growth rates than the other four cities after April 2021.

By separately analyzing the growth and changes in the proportion of complete vaccinations in the four age groups, we can clearly find that people in the 65-75+ age group will receive a large number of vaccinations from March 2021 to April 2021, and people in the 50-65 age group received a large number of vaccinations from April 2021 to May 2021. In the May and June of 2021, a large number of people in the 20-49 age group were vaccinated in mid-June 2021. Across the age groups, Newton had the greatest percentage of complete vaccinations among the six cities, and Springfield had the lowest percentage of complete vaccinations. However, the vaccination rate of 50-75+ older people in Springfield is the highest among the six cities. Chelsea and Revere have similar fully vaccinated rates and growth rates, but in the 65-75+ age group, Chelsea have higher rates of complete vaccination and growth rates than Revere.

Analysis on Fully-vaccinated people at different ages in different cities





We can look into each city for different ages. Focus on 0-4 ages, we can find that for Revere, Chelsea, and Everett, none of 0-4 age people had vaccinated, and Springfield's data were lacking–we have no data about 0-4 ages' data. However, in Newton and Wellesley, after 16 months, about 200 people at that age had fully vaccinated when the data ended. Based on the data we have collected, small children (0-4 years old) are not paid attention to for vaccination, and that may be caused by the shortage of vaccination at the beginning of the pandemic, or the reason may be the beginning vaccination are not tested that can be taken by infants or small children.

Focus on age 5-11, after 8 months, children at that age started to be vaccinated. This situation may be caused by the vaccines not allowed to be taken on children at that age.

For people at the age of 12-15, all cities had a small number of children who were fully vaccinated at the beginning, and after two months, the number started to increase. However, there may be outliers to make the data in Springfield abnormal–over months 10 to 12, the number of fully vaccinated children decreases about 150. Since other cities' data does not have this problem, this may be caused by children's death or fake data or other reasons.

For people at the age of 16-19, similar to that of 12-15, increased after the first month for fully vaccinating. Moreover, a similar problem also occurs. From 5 to 7 months, numbers of children also decreased, and this may also be caused by children's death.

For other ages, data is similar and all of them increase all the time (the first five months grows faster). However, something goes wrong in Wellesley and Newton. In Newton, there is an abnormal concave (in month 9) in the graph of 20-29, and this may be caused by wrong data since except the concave, the rest of the data is normal and month 8&10's data is similar to each other. Similarly, in Wellesley, for all graphs about age over 20, there are convexes in month 9, and in month 8 and 10 are similar. That may also be caused by wrong data.

Conclusion

Based on the graphs provided, we can draw many conclusions as to how different age groups were affected by vaccine rate. We can see that in general much younger age groups (i.e 0-4 years old) tended to have much lower rates of vaccination when compared to other much older age groups. This stark disproportionality can be attributed to less data provided for lower age groups as compared to older age groups. This result also correlates with common perception that those of older age groups are the only ones vulnerable to disease and thus the only ones who require a vaccination, when in fact the data does not show much the corresponding discrimination that would suggest that conclusion. Currently, our model consists of basic statistical inferences as to fill in missing data with values that match the general positive proportional relationship between age group and vaccination rate. As such, additional considerations such as normalization, implementation of additional machine learning algorithms, such as clustering or neural networks, will be heavily considered to eliminate bias and tighten the data so that more accurate conclusions may be discerned.