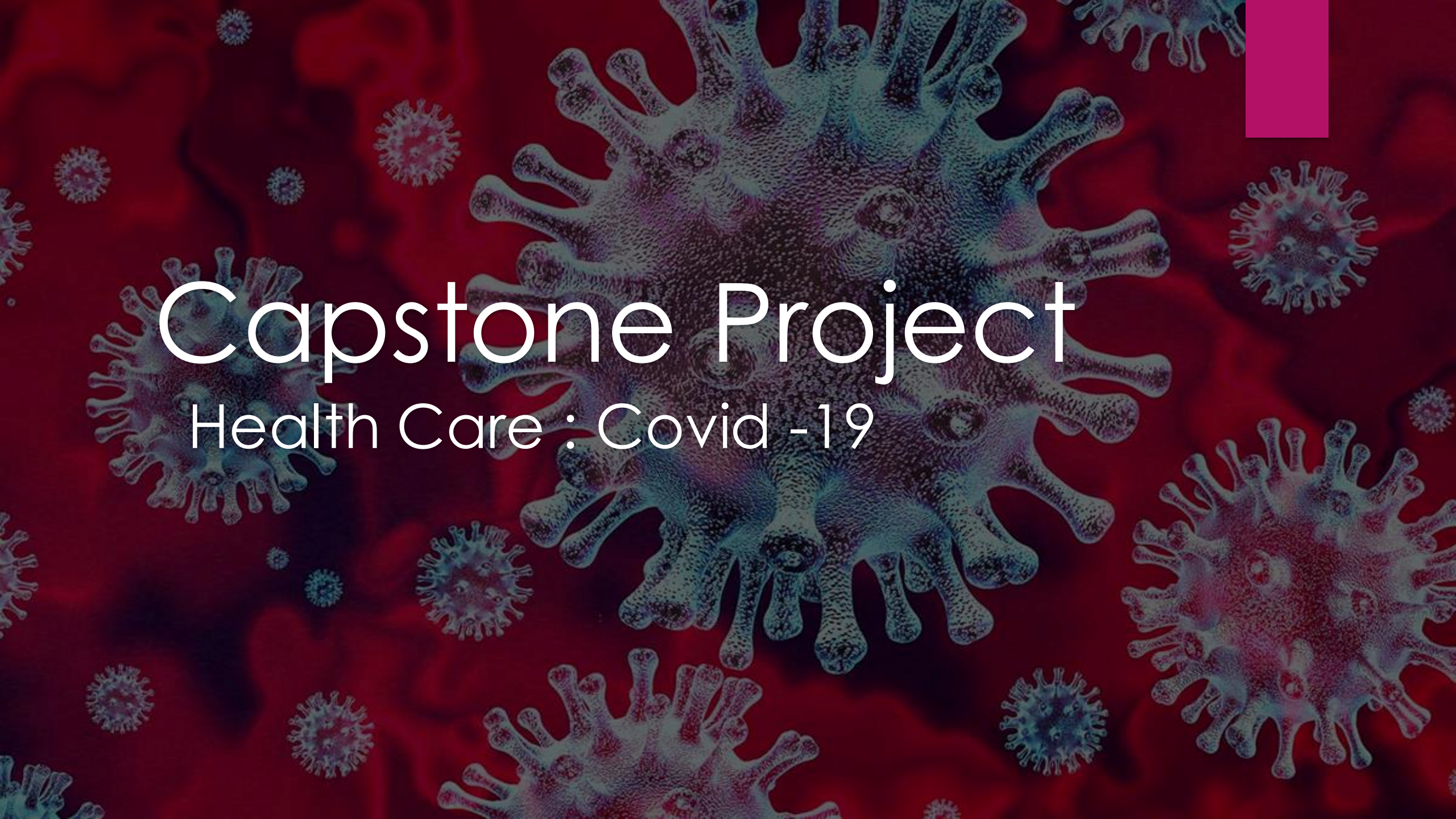


Capstone Project

Health Care : Covid -19

Business Problem

As stated by WHO,COVID-19 is now a pandemic affecting many countries globally. Most people (about 80%) recover from the disease without needing hospital treatment. Around 1 out of every 5 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Intensive care is needed if someone is seriously ill and requires intensive treatment and close monitoring, or if they're having surgery and intensive care can help them recover.

Hospitals are taking unprecedented action to increase critical care capacity to cope with the pandemic. Critical care beds are the sum of Intensive care beds, and Intermediate care beds (ICU and IMCU beds). Most people in an ICU (Intensive care unit) have problems with 1 or more organs. For example, they may be unable to breathe on their own. Critical care services rely on complex equipment such as mechanical ventilators that help patients breathe.

It was reported that the United Kingdom had approximately 8,175 ventilators at the start of the Covid-19 outbreak. As ever, delivering sufficient capacity goes beyond physical infrastructure – such as having more beds and equipment. we will analyse Hospital admissions, beds occupied, discharges from Barts Health NHS Trust, London to predict the Mechanical Ventilation beds required for Covid-19 patients, which helps hospital management for better planning.

Hospital Admissions & demand for Mechanical Ventilators could have been reduced if more tests are performed at an early stages of Pandemic, assuming people could have self isolated if tested Covid-19 Positive.

Citations:

- https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses
- *Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell (2020) - "Coronavirus Pandemic (COVID-19)".*

Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/coronavirus' [Online Resource] https://ourworldindata.org/coronavirus

- https://www.kingsfund.org.uk/publications/critical-care-services-nhs
- https://www.nhs.uk/conditions/intensive-care/

Method Selection

We will apply Multiple Linear Regression method to predict Mechanical Ventilation beds required for Covid-19 patients for the Hospital, Barts Health NHS Trust, London.

Data is collected from https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity/

We will consider data during period 27th April 2020 to 30th June 2020

Input Variables

- Admissions - Number of patients admitted with COVID-19
- Diagnoses - Total number of inpatients diagnosed with COVID-19
- Total beds - occupied by confirmed COVID-19 patients
- Discharges - Total confirmed COVID-19 cases discharged from hospital (Last 24hrs)

Target Variable

- Mechanical Ventilation beds

There is good correlation between Total beds & Discharges with our target variable, by applying these two variables regression gives the adjusted R Square 0.94 and the coefficients are

Intercept = -24.31, Total Beds = 0.38, Discharges = 0.64

- Target Variable(Mechanical Ventilation beds) = -24.31 + 0.38 * Total Beds + 0.64 * Discharges

Visualisations & Organisational Challenges

Data for Barts Health NHS Trust

Microsoft Excel Worksheet

https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity/

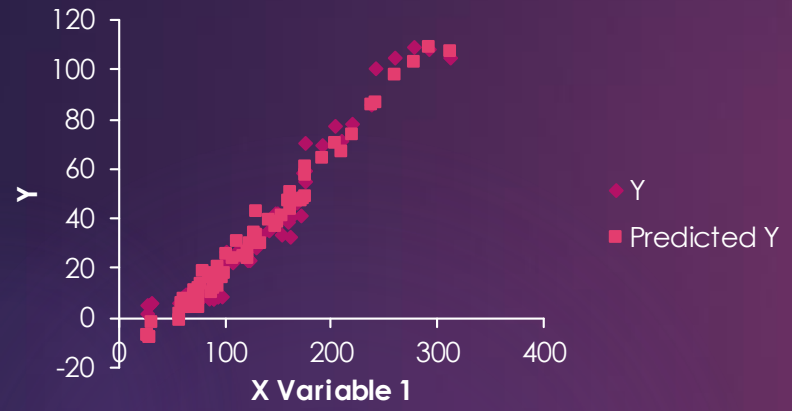


Figure1:
x Variable1: Total Beds
Y: Mechanical Ventilation beds - occupied
Predicted Y: Mechanical Ventilation beds required

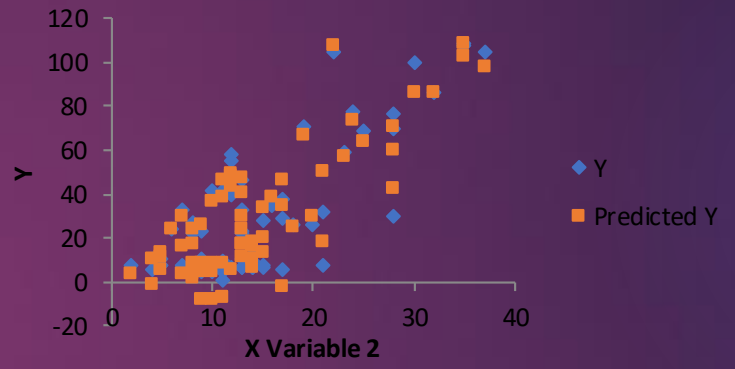


Figure2:
x Variable2 is Discharges
Y:Mechanical Ventilation beds - occupied
Predicted Y : Mechanical Ventilation beds required

Looking at the trends for the target variable (Mechanical Ventilation Beds), we could see the Linear regression model predicted values closer with adjusted R Square 0.94

People who are aged over 60 years, and people who have underlying medical conditions such as diabetes, heart disease, respiratory disease or hypertension are among those who are at greater risk. Gathering data for these parameters and include in Prediction would give more confidence but there would challenges identifying if the patient's premedical history

Visualisations & Organisational Challenges

Figure 1: Medical Ventilators across the World, In United Kingdom there are around 8000 Medical Ventilators

Figure 2: Patients in Mechanical Ventilation Beds from April till date.

Figure1

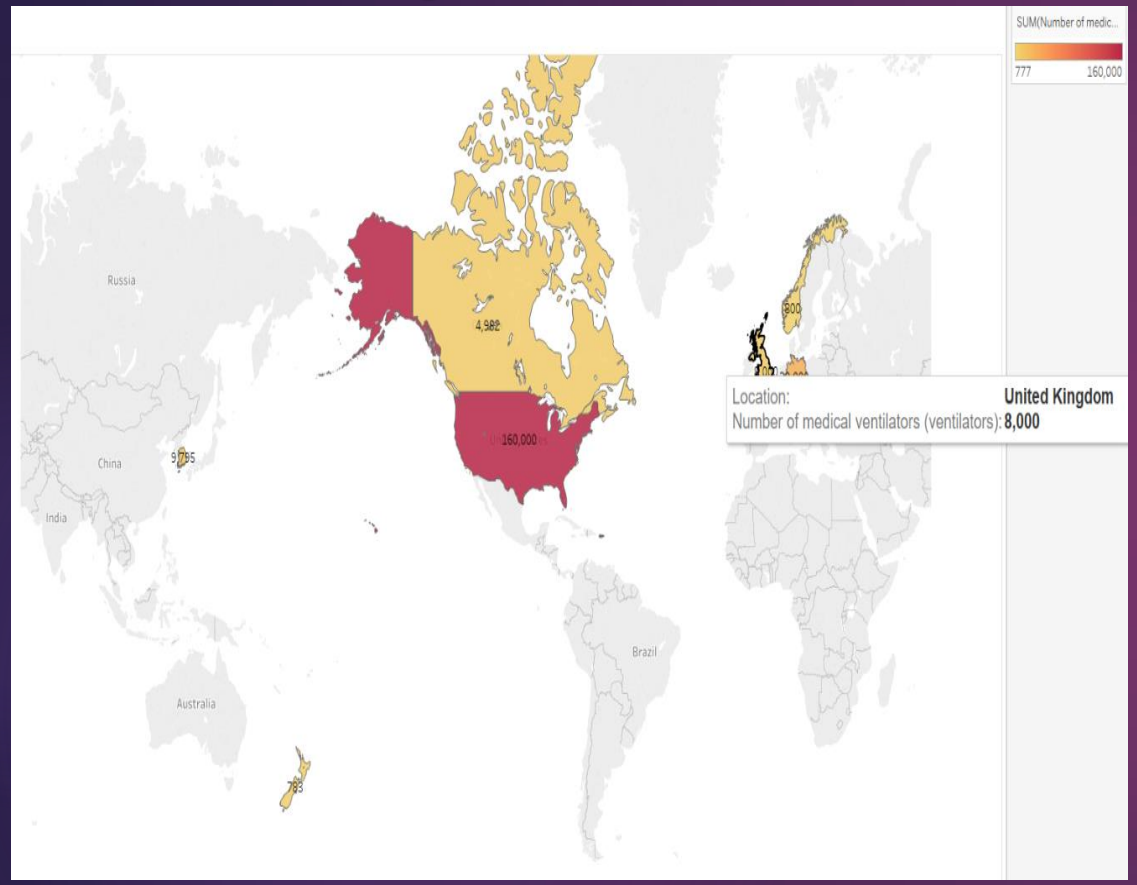
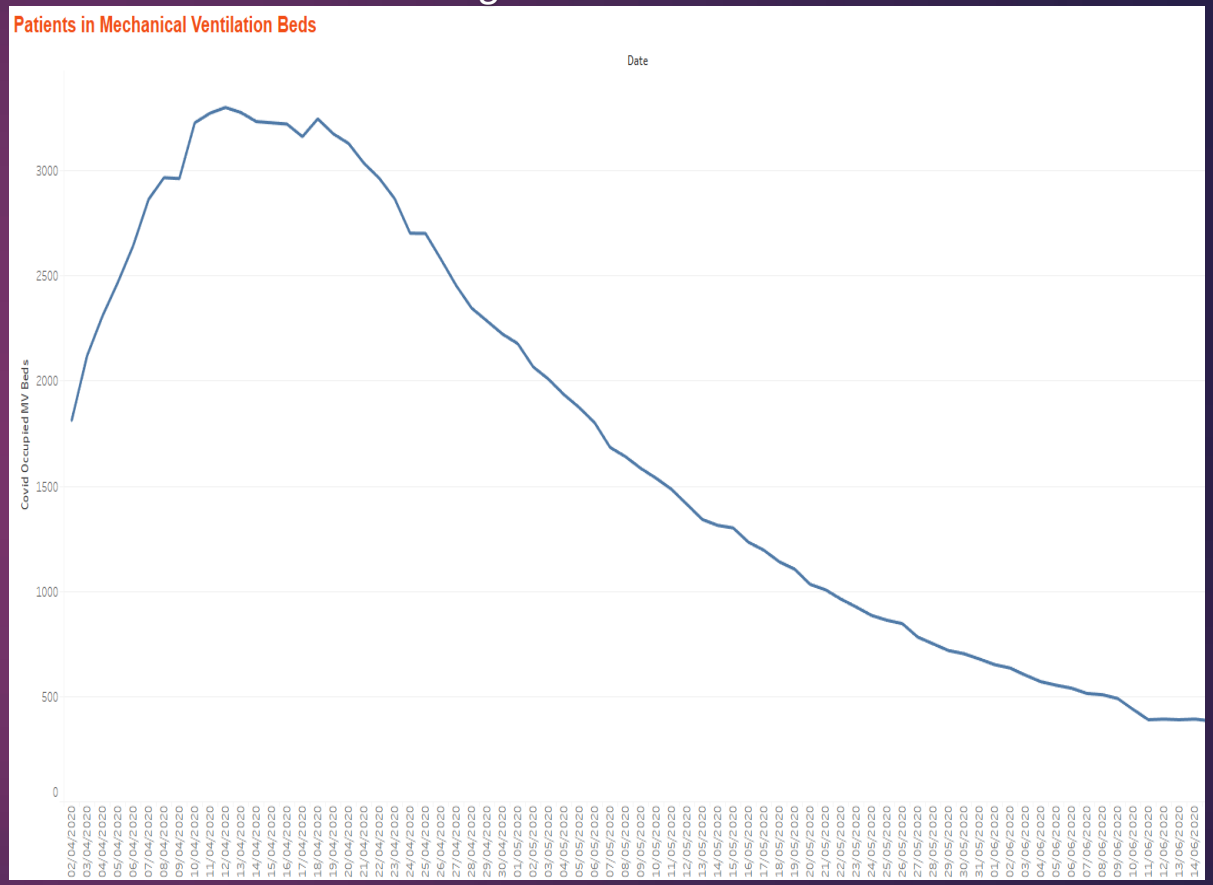


Figure2

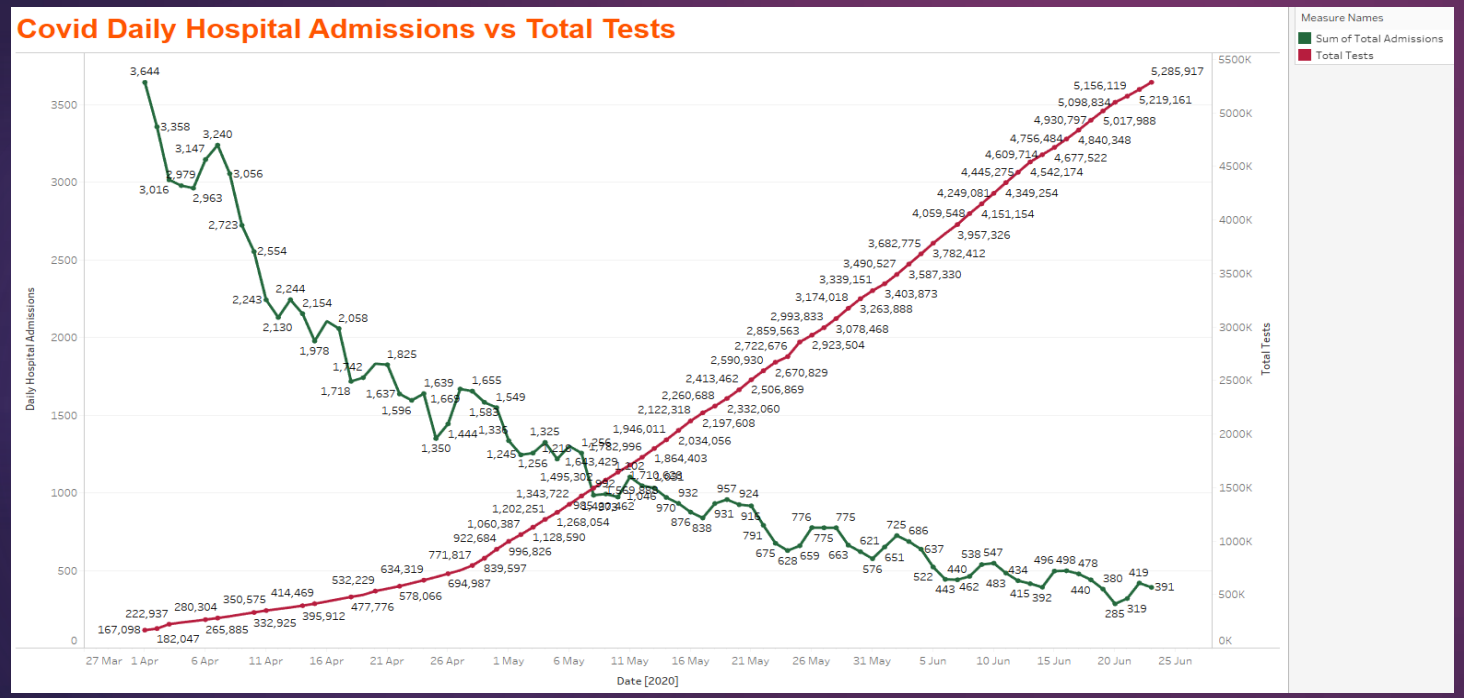


Citation

- *Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell (2020) - "Coronavirus Pandemic (COVID-19)". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/coronavirus' [Online Resource]* https://ourworldindata.org/coronavirus
- https://coronavirus-staging.data.gov.uk/healthcare

Conclusions and anticipated Results

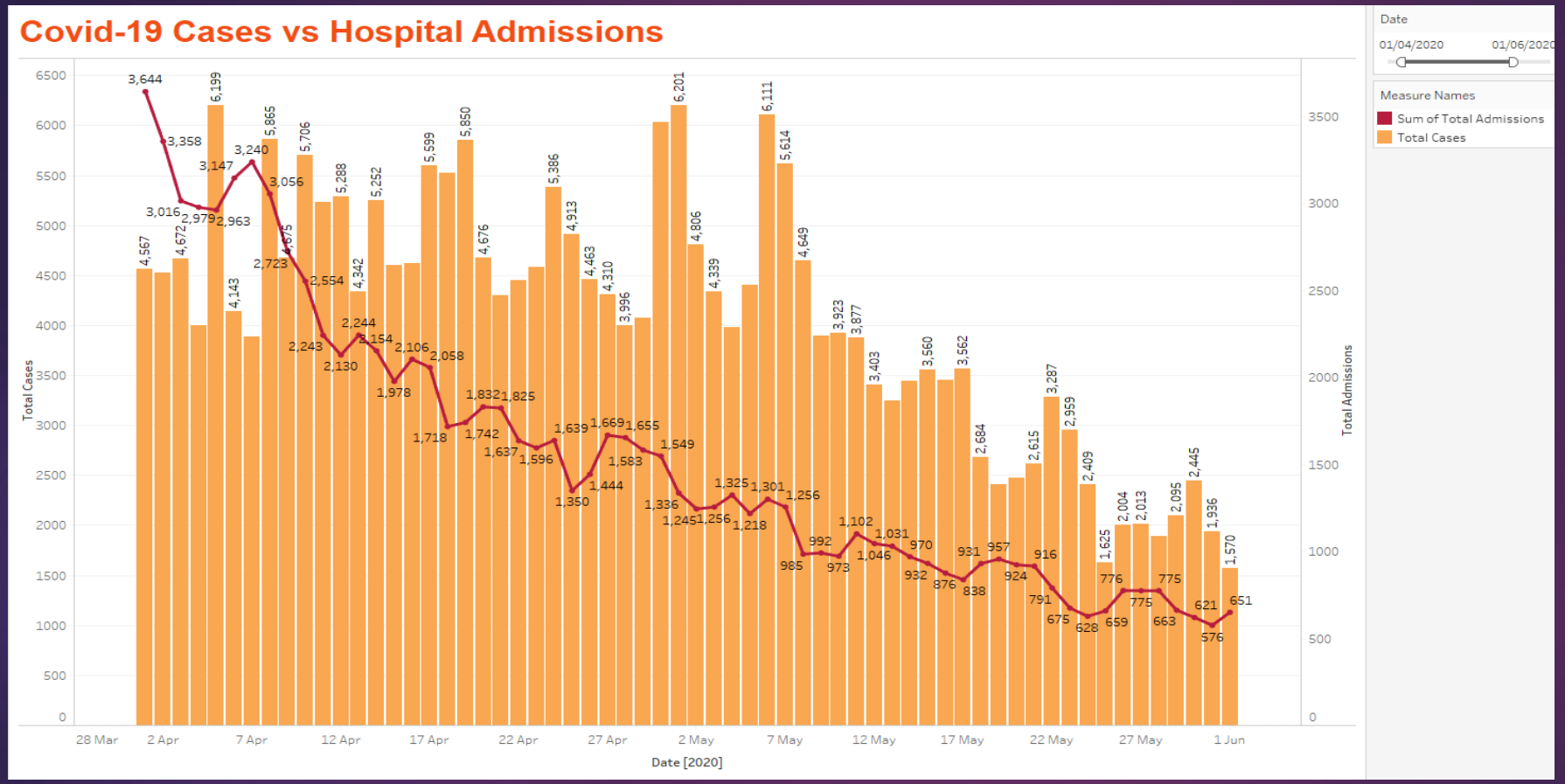
In United Kingdom, Hospital Admissions could have been reduced if more tests are performed at an early stages of Pandemic, since there is a decline in hospital admissions for New cases when more tests are performed. No Testing data available until 30th March, where 19,000+ total cases & 1600+ total deaths were reported. The demand for Mechanical Ventilators can be reduced with Wider measures, such as asking the public to stay at home, were also announced by the government to reduce the spread of Covid-19 and reduce the peak amount of patients who would require critical care support at any one time.
A country is not testing adequately when it is finding a case for every few tests they perform. Here it is likely that the true number of new cases is much higher than the number of cases that were confirmed by tests.



- *Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell (2020) - "Coronavirus Pandemic (COVID-19)". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/coronavirus' [Online Resource]* https://ourworldindata.org/coronavirus

Conclusions and anticipated Results

Lifting restriction step by step, increase in testing & tracing, travel restrictions, better distancing measures & Facing covering might have reduced the total number of cases which will result in less number of Hospital admissions



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- https://coronavirus-staging.data.gov.uk/healthcare
- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/884760/Our_plan_to_rebuild_The_UK_Government_s_COVID-19_recovery_strategy.pdf

Follow-up Questions

- If there is a chance for Covid-19 second wave, does this prediction model can be used to calculate number of Medical Ventilators.
- What parameters can be likely to be added for consideration to predict the number of medical ventilators for the patients diagnosed positive more than once