

Healthcare industry

COVID-19 RESOURCES ALLOCATION



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*Subject Code: DATA6000*

*Subject Name: Capstone: Industry Case Studies Assessment Title: Industry Review*

*Assessment Type: Individual written report*

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# Executive summary

This problem of understanding where COVID-19 tests are going and how to allocate resources to better fit the needs of the people is tackled in this report by looking at regional differences and the tendency of positive tests per day. Data employed in the paper has been retrieved from authentic source, Healthdata.gov, it integrates descriptive and predictive analysis by using exponential smoothing.

**Business problems**

1. Optimize testing resources by analysing daily variations in test results to ensure efficient distribution of kits and personnel.
2. Predict daily testing demand trends to better manage resources and reduce inefficiencies.

3. Identify patterns in positive test results to enhance public health responses and targeted interventions.

# Industry background

Health services incorporate all the treatments implemented to enhance health and prevent illness, ranging from medical treatment, drugs, biotechnology, and health insurance. It comprises hospitals, clinics, laboratories, and other related structures that have emerged due to technological developments in the healthcare sector, demographic pressure, and a growing consciousness concerning health in the global society. (Team, 2024).

# Existing Analysis and Methodologies:

**Optimize Testing Resources**

One significant challenge faced in healthcare industry is hard to allocating limited resources during Covid-19. By leveraging data analytics, hospitals and government can develop predictive models to identify the distribution of the test resources, and determine the daily fluctuations in the tests and results, and correctly allocate the kits and the people needed for the test. By avoiding overuse or underutilization of testing resources, this optimization improves the overall efficacy of testing operations(Akhtar,2020).

A graph of a number of people

Description automatically generated with medium confidence

Figure 1 Covid-19 cases in each state

The above chart shows the COVID-19 cases in each state. According to the above chart it can be easily seen that there are the highest Covid-19 cases in “California” and the least cases are in “Guam” (Tableau, 2024).

A graph of different colored bars

Description automatically generated

Figure 2 State fips for each region

The above chart shows the distribution of the number of flips over each region. According to the above chart, it can be easily seen that Region 8 has the highest value at approximately 1,083,334 then Region 2 with 985,948. Region 7 has the lowest value at approximately 416,935. This highlights significant regional variations in State FIPS totals (Tableau, 2019).

**Predict Daily Testing Demand:**

During Covid-19 it is very hard to assume how many case will come next day and how many covid test will be perform. Using predictive model we can make a accurate decision regarding the personnel schedule, stockpiling of covid-19 testing kits, and managing staff and doctors. Planning for the number of tests that may be carried out on particular days can help minimize wastage by estimating the amount of testing kits and people that will be needed in advance.

A graph showing the value of a stock market

Description automatically generated with medium confidence

Figure 3 Trend for total new cases and reported results

The above chart shows the trend for the total new results and total reported results. According to the above chart, it can be easily seen that the total cases were negligible at the start of Jan 2020 then cases increased over time and were highest in Jan 2022. After vaccination, cases decreased and at end of the May 2023 cases were negligible. The overall trend is decreasing (Singh, 2021). In further, predictive analysis, the Exponential smoothing method is used for forecasting in Tableau. ‌(Shaikh, 2021)

**Identify Patterns in Positive Results:**

After completing the testing task, the major problem is predict how many positive and negative cases will come in the future? By analysis of Covid-19 data across various regions and comparing the trend for positive and negative cases by region easy give facilities to targeted lockdowns, or enhanced protective measures in high-risk areas. Interpreting positive tests improves the response to public health problems by helping to target the treatments and tests in high-incidence areas to prevent spread.

A pie chart with numbers and a red circle

Description automatically generated

Figure 4 Total cases for overall outcomes

This chart shows the comparison of overall outcomes according to the total COVID-19 diagnostic laboratory. There are three types of outcomes “Positive, negative and inconclusive”. From these three types of outcomes, there are more cases for negative cases and fewer cases for inconclusive (Tableau, 2024).

A group of colorful circles with black text

Description automatically generated

Figure 5 Covid cases in each region

The above bubble chart shows COVID-19 cases across FEMA regions with each bubble's size representing the case count. Region 9 has the highest cases then Region 5 and Region 4. Region 7 has the lowest cases.

To decide on the distribution of the test resources, and determine the daily fluctuations in the tests and results, and correctly allocate the kits and the people needed for the test. In the study of public healthcare, analyze trends for a more effective detection of positive tests. Region 8 is the highest in FIPS while on the other hand region 7 has the lowest. The adverse effects are more common, and COVID-19 incidence reached a high in Jan 2022 but reduced after immunization.

# Data Sources

The dataset is collected from the “Healthdata.gov” site. This dataset site provides an authentic and reliable dataset for health services. This platform ensures accurate and comprehensive data, essential for conducting thorough analyses and making informed decisions in the healthcare industry.

**Dataset link:**

<https://healthdata.gov/dataset/COVID-19-Diagnostic-Laboratory-Testing-PCR-Testing/j8mb-icvb/about_data>

Explore data from Healthdata.gov for COVID-19 test results and regional distributions. Use descriptive analytics like trend analysis and regional comparison charts and predictive analytics such as exponential smoothing for forecasting testing demand. These techniques will optimize resource allocation and enhance public health interventions.

# Selecting Business Problem

**Business Question:**

How can testing resources be optimized to ensure efficient distribution of kits and personnel while predicting daily testing demand trends?

This above problem is chosen as a further business problem because the allocation of testing resources and kits and personnel effectively because it is an immediate issue in public health management. It is essential to optimize the utilization of the resources to achieve quick and effective testing and reduce virus transmission in areas with fluctuating demands and disparities in the outcomes of the test across the regions.

A screenshot of a graph

Description automatically generated

Figure 6 Covid-19 analysis

The implications of the study are detailed, of which one identifies the fact that testing resources need to be well utilized since varying levels of utilization are recorded across regions with region 8 using more resources than in Region 7. The analysis of COVID-19 cases through the method of exponential smoothing of predictions reveals a decrease in the incidence by 2027, which indicates a decrease in the demand for regenerative testing equipment. Descriptive analysis reveals that California is in the highest position in case numbers and requires special attention (Tableau, 2024).

**Data Source:** The data shall be collected from ‘‘Healthdata Gov” due to its reliability in providing health-related information. This dataset integrates those with corrective actions, and positive and negative daily COVID-19 test results broken down by outcome and FEMA region.

**Dataset link:**

<https://healthdata.gov/dataset/COVID-19-Diagnostic-Laboratory-Testing-PCR-Testing/j8mb-icvb/about_data>

**Methodologies:** Descriptive analytics will be used to compare the results between the regions, categorize them, and look for a pattern. Thus, to predict future testing demands, scientific methods of data analysis, such as exponential smoothing will be employed here under predictive analytics. These methodologies will give the necessary information about the effective usage of resources and the proper demand for testing (Velu, et al., 2022, p. 1248).

**Originality of Contribution:** This analysis is novel as it covers both descriptive and predictive methods to use the limited resources effectively, as well as manage the demand for COVID-19 tests during the pandemic. Unlike previous studies, this approach offers a system design and synthesis of both aspects which allows for presenting a multi-faceted strategy to enhance the effectiveness of public health facilities’ responses and operational productivity due to the fluctuating demand for tests (Healey, et al., 2022, p. 100).

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