

DATA VISUALIZATION PROJECT REPORT

(Project Semester January-May 2024)

ANALYZING INDIA'S COVID-19 JOURNEY: Dashboard Insights

Submitted by

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Programme and Section: B.Tech CSE and
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Course Code: INTB233

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L OVELY
P ROFESSIONAL
U NIVERSITY

CERTIFICATE

This is to certify that KARUMURI SRAVYA bearing Registration no. 12105313 has completed INTB233 project titled, “**Analyzing India’s Covid 19 journey: Dashboard Insights**” under my guidance and supervision. To the best of my knowledge, the present work is the result of his/her original development, effort and study.

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DECLARATION

I, Karumuri Sravya, student of CSE under CSE/IT Discipline at, Lovely Professional University, Punjab, hereby declare that all the information furnished in this project report is based on my own intensive work and is genuine.

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Signature

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Acknowledgment

The satisfaction that accompanies the successful completion of this project would be incomplete without the mention of the people who made it possible, without whose constant guidance and encouragement would have made efforts go in vain. I consider myself privileged to express gratitude and respect towards all those who guided us through the completion of this project.

I convey thanks to my project guide Maneet Kaur of the Computer Science and Engineering Department for providing encouragement, constant support, and guidance which was of great help in completing this project successfully.

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1. Introduction

The COVID-19 pandemic has profoundly impacted societies worldwide, presenting unprecedented challenges to public health, economies, and social well-being. Since its emergence in late 2019, the novel coronavirus, SARS-CoV-2, has spread rapidly across the globe, causing widespread illness, death, and disruption to daily life. India, as one of the world's most populous countries and a major global economic player, has been significantly affected by the pandemic, experiencing multiple waves of infections with varying degrees of severity. This report aims to delve into the complexities of India's COVID-19 journey, offering insights and analysis derived from data-driven approaches and visualization tools such as Tableau. By examining key metrics, trends, and patterns, this analysis seeks to provide a comprehensive understanding of the pandemic's impact on India's population, healthcare systems, and socio-economic landscape. The importance of understanding India's COVID-19 journey cannot be overstated, as it serves as a critical reference point for policymakers, public health officials, healthcare professionals, researchers, and the general public. By elucidating the challenges, successes, and lessons learned from India's response to the pandemic, this analysis aims to inform evidence-based decision-making, guide resource allocation efforts, and facilitate proactive measures to mitigate the spread of the virus and minimize its impact on health and society.

As the world continues to grapple with the evolving nature of the COVID-19 pandemic, India's experience offers valuable insights into the multifaceted dimensions of crisis management, resilience, and adaptation. From the initial wave of infections to subsequent surges, each phase of India's COVID-19 journey has presented unique challenges and opportunities for learning and improvement. The analysis presented in this report builds upon a rich dataset comprising official COVID-19 data from reputable sources such as the Ministry of Health and Family Welfare, Indian Council of Medical Research (ICMR), and other governmental and non-governmental organizations. By leveraging reliable and up-to-date data, this analysis ensures the validity, credibility, and relevance of the insights generated. Moreover, this report aims to shed light on the

regional variations and disparities in COVID-19 outcomes within India, recognizing the diverse socio-economic, demographic, and cultural factors that influence disease transmission and healthcare access. By examining the differential impact of the pandemic across states, cities, and communities, this analysis seeks to identify vulnerable populations and areas requiring targeted interventions and support.

2. Scope of Analysis:

The scope of this analysis is comprehensive, encompassing a multifaceted examination of various dimensions of India's COVID-19 journey. It includes an in-depth exploration of epidemiological trends, healthcare infrastructure, response strategies, and societal impacts to provide a holistic understanding of the pandemic's trajectory and implications. Tracking the temporal evolution of COVID-19 cases, including case counts, recoveries, deaths, and testing rates, to identify patterns, fluctuations, and emerging trends in disease transmission. Assessing the capacity and resilience of India's healthcare systems in responding to the pandemic, including hospital bed availability, ICU capacity, medical supply chains, and healthcare workforce dynamics. Analyzing the effectiveness of public health interventions and containment measures implemented to mitigate the spread of COVID-19, such as lockdowns, travel restrictions, testing strategies, contact tracing, and vaccination campaigns.

Exploring the geographic disparities and variations in COVID-19 outcomes across different states, regions, urban-rural divides, and socio-economic strata to understand differential impact and inform targeted interventions. Investigating the socio-economic repercussions of the pandemic on livelihoods, employment, education, poverty, inequality, mental health, and well-being, considering the broader implications beyond the realm of public health. Identifying and examining the vulnerabilities and disparities faced by specific population groups, including elderly individuals, frontline workers, marginalized communities, and those with pre-existing health conditions. Assessing the implications of COVID-19 on policy formulation, governance structures, public health infrastructure, and emergency response frameworks, with a focus on lessons learned and opportunities for improvement. Evaluating the reliability, accuracy, and transparency of COVID-19 data reporting mechanisms, including challenges associated with data collection, validation, aggregation, and dissemination. By examining these key dimensions of India's COVID-19 journey, this analysis aims to provide actionable insights and evidence-based recommendations

to support informed decision-making, guide resource allocation efforts, and facilitate effective response strategies at local, national, and global levels.

3. Drawbacks or limitations of the existing system

Efforts to track and monitor COVID-19 data in India have been crucial for understanding the scope and severity of the pandemic. However, the existing system is not without its drawbacks and limitations, which warrant careful consideration in interpreting the data and drawing conclusions. Firstly, one of the primary challenges lies in the accuracy and completeness of the data. Despite concerted efforts, discrepancies and inconsistencies in reporting practices across different regions and healthcare facilities may lead to underreporting or misclassification of cases, skewing the true burden of the disease. Moreover, the timeliness of data reporting poses a significant challenge, with delays in data collection, validation, and dissemination hindering real-time monitoring and response efforts. This lack of timely information can impede the ability of public health authorities to detect and respond to emerging outbreaks swiftly.

Another limitation of the existing system is the reliance on official sources for COVID-19 data, which may not capture the full extent of the pandemic, particularly in areas with limited testing infrastructure or inadequate healthcare access. This underrepresentation of data from marginalized communities and vulnerable populations may obscure disparities in disease burden and hinder efforts to address health inequities.

Furthermore, issues related to data quality and standardization present significant challenges in data aggregation and analysis. Variations in data collection methods, definitions, and coding practices across different states and healthcare facilities can complicate comparisons and trend analysis, compromising the reliability and validity of the findings. The lack of granularity in the available data is another notable limitation, as it may hinder the ability to conduct detailed subgroup analysis and identify high-risk populations or localized outbreaks. Additionally, the absence of standardized protocols for data sharing and interoperability between different data systems further exacerbates data fragmentation and impedes efforts to integrate and harmonize disparate datasets. Moreover, the evolving nature of the pandemic and the emergence of new variants of concern pose additional challenges for data surveillance and analysis. The lack of robust genomic surveillance infrastructure and limited sequencing capacity in India may hamper efforts to track the spread of variants and assess their impact on disease severity and vaccine effectiveness.

4. Source of DataSet:

The dataset is taken from Kaggle. Kaggle is a platform that hosts a variety of datasets from different domains such as healthcare, finance, sports, and more. The datasets on Kaggle are contributed by users and organizations from all over the world.

To access datasets on Kaggle, you first need to create an account on the platform. Once you have an account, you can search for datasets using the search bar on the Kaggle homepage or browse through the datasets by category.

About: The dataset used for this analysis is sourced primarily from official repositories and reputable organizations involved in COVID-19 data collection, aggregation, and dissemination in India. These sources include the Ministry of Health and Family Welfare (MoHFW), which serves as the primary governmental agency responsible for public health surveillance and response efforts. The data is sourced from the Indian Council of Medical Research (ICMR), the apex body for the formulation, coordination, and promotion of biomedical research in India. The ICMR plays a pivotal role in coordinating COVID-19 testing and surveillance activities, providing valuable data on testing rates, positivity rates, and other epidemiological indicators. Furthermore, data may be sourced from state-level health departments and authorities responsible for managing COVID-19 response efforts at the regional level. These include state health ministries, district health offices, and other governmental and non-governmental organizations involved in data collection and reporting.

In addition to governmental sources, data may also be obtained from reputable international organizations such as the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and academic institutions conducting research on COVID-19.

The dataset comprises a wide range of COVID-19 indicators, including but not limited to case counts, testing data, vaccination statistics, demographic information, and healthcare infrastructure indicators. These data elements are collected, compiled, and updated regularly to

ensure the accuracy and reliability of the dataset.

It is essential to note that while efforts are made to ensure the integrity of the dataset, there may be limitations and challenges associated with data collection, validation, and reporting.

Discrepancies in reporting practices across different regions and healthcare facilities may impact the consistency and completeness of the dataset.

- Name: Adidas Sales in United States
- Link: <https://www.kaggle.com/datasets/sudalairajkumar/covid19-in-india>
- Format: CSV
- No. of data sets: 1
- Number of Rows: 18111
- Number of columns: 9
- Size: 50.4 MB
- Date Fields:
 - i. Date
 - ii. Time
 - iii. State/Union Territory
 - iv. ConfirmedIndianNational
 - v. ConfirmedForeignNational
 - vi. Cured
 - vii. Deaths
 - viii. Confirmed

5. ETL process

The Extract, Transform, Load (ETL) process involved in preparing the COVID-19 dataset for analysis encompasses several stages. Firstly, data is extracted from multiple sources and consolidated into a unified format suitable for analysis. This involves cleaning the data to remove

errors, inconsistencies, and missing values, ensuring data integrity and accuracy. Next, the data is transformed and structured to facilitate analysis, including aggregating metrics, creating new variables, and formatting for visualization purposes. Finally, the prepared dataset is loaded into the Tableau platform, where it can be visualized and analyzed to derive actionable insights..

6. Analysis of DataSet

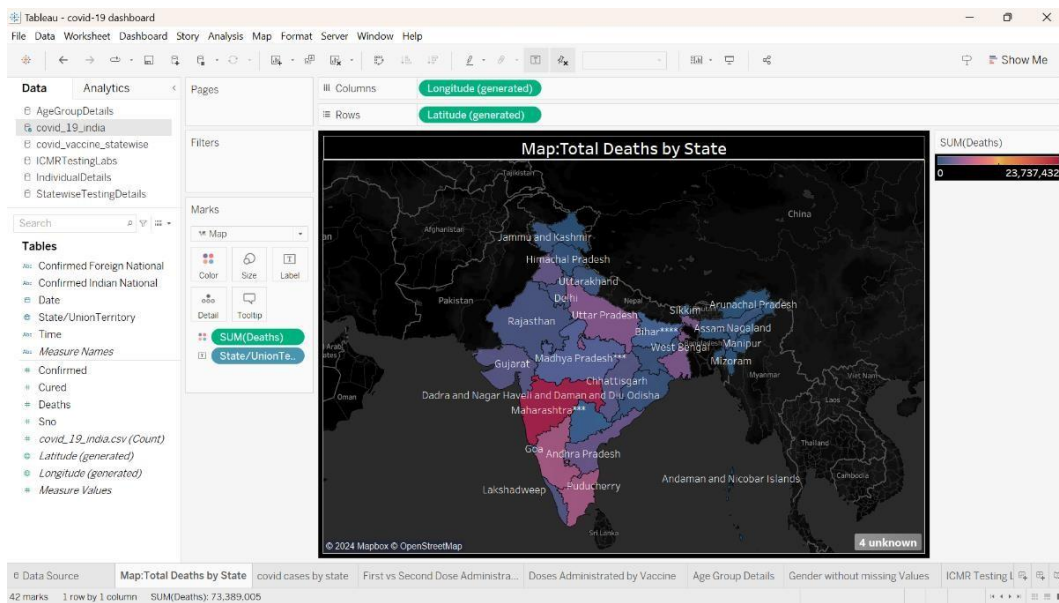
6.1. Total Deaths by State

- i. **Introduction:** The analysis of total deaths by state provides crucial insights into the regional impact and severity of the COVID-19 pandemic across India. By examining the distribution of fatalities across different states and union territories, patterns of mortality rates and disparities in healthcare outcomes can be identified and analyzed. This analysis enables stakeholders to understand the geographic variation in COVID-19 mortality, highlighting areas with higher mortality burdens and potential areas for targeted intervention and resource allocation. Additionally, trends over time in total deaths by state reveal the trajectory of the pandemic within each region, including peak periods of mortality and fluctuations in mortality rates. By correlating total deaths with other epidemiological indicators such as case counts, testing rates, and healthcare capacity, the analysis provides valuable insights into the effectiveness of response efforts and the strain on healthcare systems.
- ii. **General Description:** The analysis of total deaths by state provides a comprehensive overview of the mortality burden of COVID-19 across different regions of India. It encompasses a detailed examination of the number of fatalities recorded in each state and union territory throughout the duration of the pandemic. This data is instrumental in understanding the geographic distribution of COVID-19 mortality and identifying areas with higher mortality rates or disproportionate impacts.
- iii. **Analysis Result:**
The analysis reveals significant variations in total deaths by state, reflecting disparities in healthcare infrastructure, socio-economic conditions, and response measures. Certain states may exhibit higher mortality rates due to factors such as population density, healthcare access, and prevalence of underlying health conditions. Conversely, states with robust healthcare systems and proactive public health interventions may experience lower

mortality rates.

Furthermore, trends over time in total deaths by state provide insights into the trajectory of the pandemic within each region. Peaks in mortality rates may coincide with surges in case counts or strain on healthcare facilities, highlighting the need for targeted response measures and resource allocation. Additionally, disparities in mortality rates among different demographic groups, such as age, gender, and socio-economic status, may underscore underlying health inequities and vulnerabilities. Overall, the analysis of total deaths by state offers valuable insights into the impact of COVID-19 on India's population and healthcare systems, informing evidence-based decision-making and guiding proactive response efforts at both regional and national levels.

iv. Visualization:



6.2. Age Group Trends

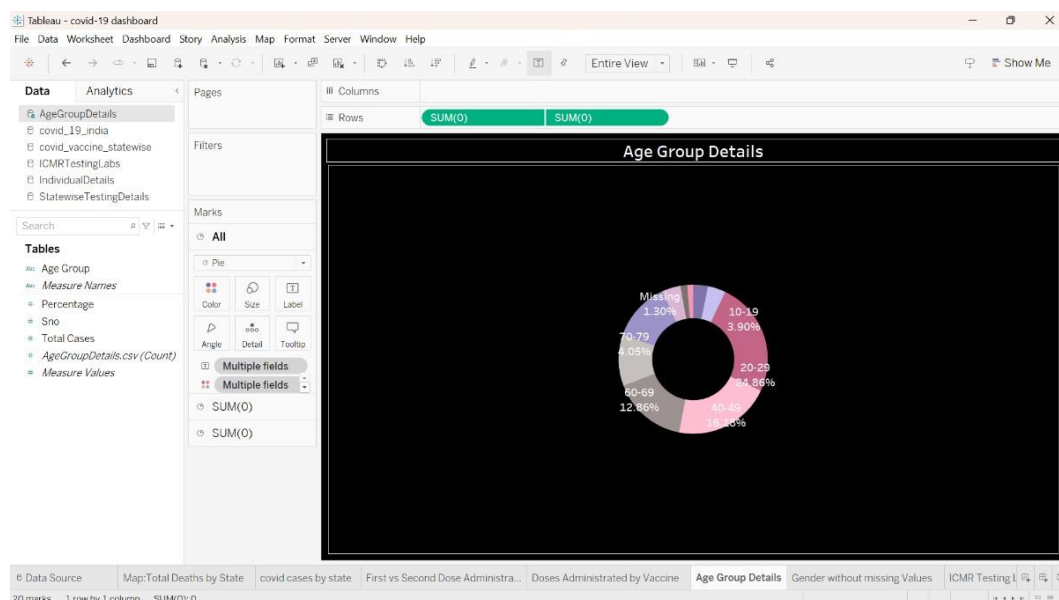
- Introduction:** Understanding age group trends in COVID-19 cases is vital for assessing vulnerability and implementing targeted interventions. This section examines how the distribution of COVID-19 cases varies across different age groups, providing insights into which populations are most affected by the virus.
- General Description:** The analysis of age group trends in COVID-19 cases reveals patterns in disease incidence across various age cohorts. It provides a breakdown of cases by age group, allowing for the identification of age-specific trends and disparities. By categorizing

cases into different age brackets, such as children, adolescents, adults, and the elderly, it becomes possible to assess the relative risk of infection and severity of outcomes among different age groups.

iii. Analysis results

The analysis of age group trends in COVID-19 cases reveals several key findings. Firstly, there is evidence of age-related disparities in disease incidence, with certain age groups experiencing higher rates of infection compared to others. For example, while older adults tend to have higher case rates and mortality rates, younger age groups may also be disproportionately affected, particularly in the context of community transmission and outbreaks in educational settings. Furthermore, the analysis highlights temporal trends in age group distribution, showing how patterns of infection may change over time in response to evolving epidemiological dynamics, vaccination efforts, and public health interventions. For instance, shifts in age group distributions may occur as vaccination campaigns prioritize certain age cohorts or as behavioral changes affect transmission dynamics among different demographic groups.

iv. Visualization



6.3. Covid Cases-statewise

- i. Introduction: The COVID-19 pandemic has had a profound impact globally, with each country and region facing unique challenges in managing the spread of the virus and

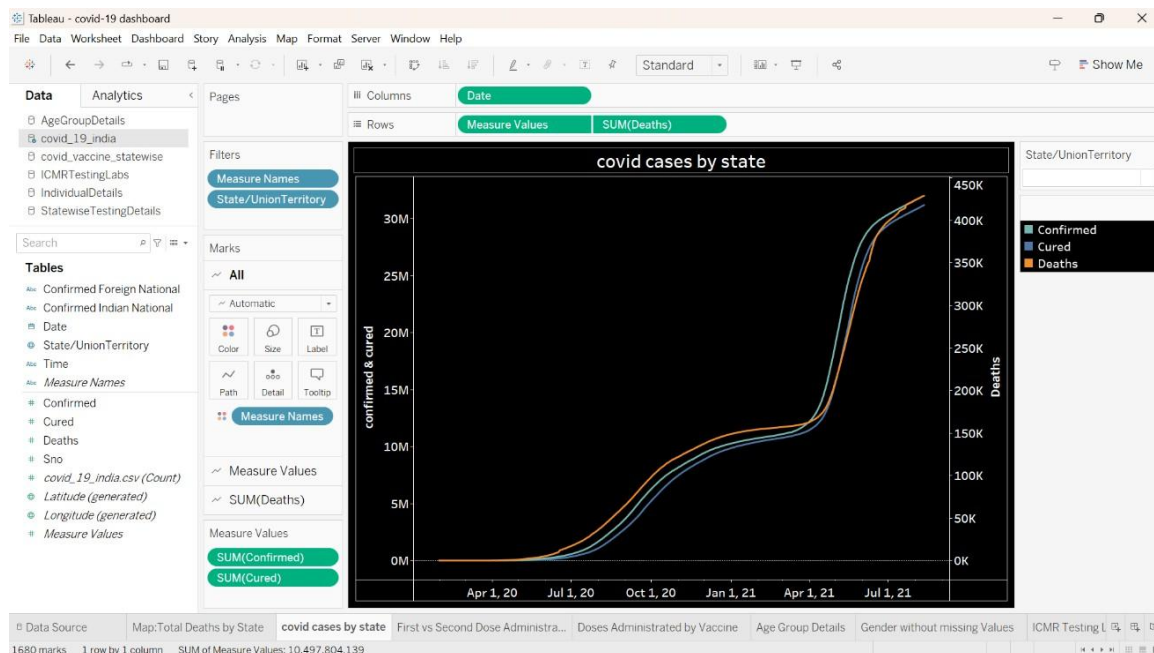
mitigating its effects on public health and society. Understanding the distribution of COVID-19 cases at the state level is crucial for guiding targeted interventions, resource allocation, and policy decisions. In this analysis, we delve into the statewise distribution of COVID-19 cases in India, aiming to provide insights into the geographic variation, trends over time, and factors contributing to the spread of the virus across different states and union territories.

- ii. General Description: The dataset used for this analysis comprises COVID-19 case data reported from various states and union territories of India. It includes information on the number of confirmed cases, recoveries, deaths, testing rates, and other epidemiological indicators recorded at the state level. The analysis covers a period spanning from the onset of the pandemic to the present, allowing for an examination of trends and patterns over time. Additionally, demographic factors such as age, gender, and comorbidities may be considered to understand the differential impact of COVID-19 across different population groups.

- iii. Analysis Results

The analysis reveals significant variation in the distribution of COVID-19 cases across different states and union territories of India. Some states may experience higher case counts due to factors such as population density, mobility patterns, healthcare infrastructure, and adherence to public health measures. Trends over time may show fluctuations in case numbers, with periods of surges followed by periods of relative stability. Understanding these patterns is crucial for anticipating future outbreaks and implementing timely interventions to contain the spread of the virus.

- iv. Visualization



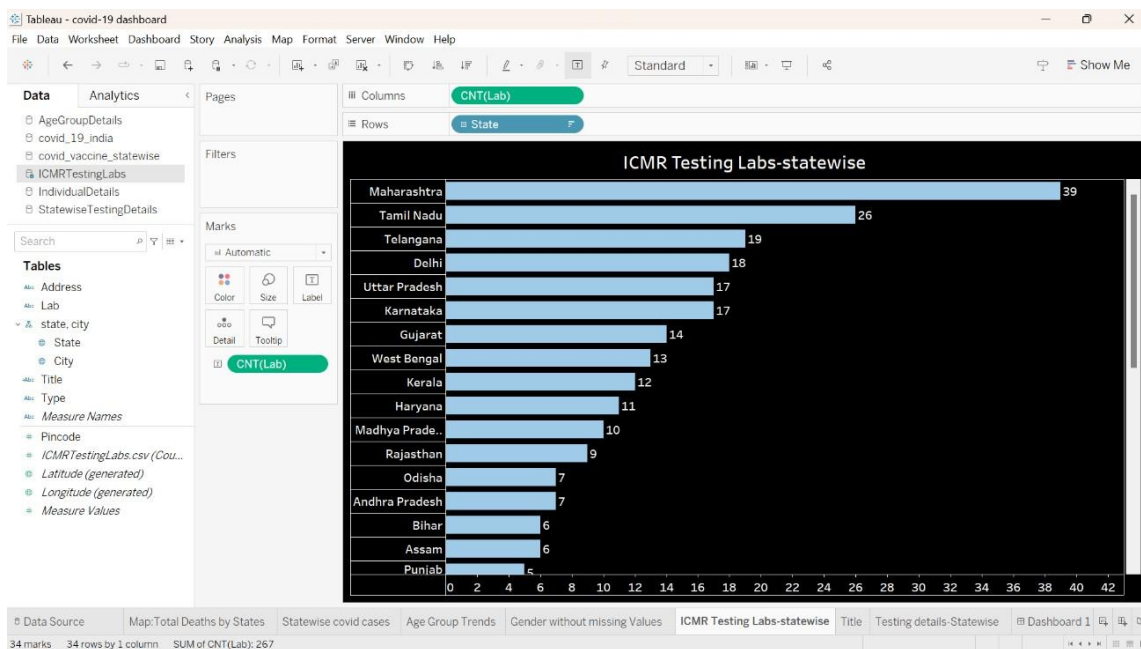
6.4. ICMR Testing Labs-Statewise

- i. Introduction: The Indian Council of Medical Research (ICMR) plays a pivotal role in coordinating and facilitating COVID-19 testing efforts across India. As part of its mandate, the ICMR has established a network of testing laboratories nationwide to expand testing capacity, enhance diagnostic capabilities, and facilitate timely detection and containment of COVID-19 cases. The ICMR Testing Labs-Statewise dataset provides valuable insights into the distribution and capacity of COVID-19 testing laboratories across different states and union territories in India.
- ii. General Description : The ICMR Testing Labs-Statewise dataset comprises information on the location, type, and accreditation status of COVID-19 testing laboratories authorized by the ICMR. These laboratories include both public and private sector facilities, such as government medical colleges, research institutions, hospitals, and private diagnostic centers. The dataset provides details on the number of testing laboratories operational in each state and union territory, including their classification as RT-PCR, TrueNat, CBNAAT, or other types of testing facilities.

iii. Analysis results

The analysis of the ICMR Testing Labs-Statewise dataset reveals significant variations in testing infrastructure and capacity across different states and union territories in India. States with higher population densities and urban centers tend to have a greater number of testing laboratories, reflecting efforts to expand testing access and coverage in areas with higher disease burden and transmission rates. Moreover, the dataset highlights disparities in testing infrastructure between states, with some regions facing challenges in access to testing facilities, particularly in remote and rural areas.

iv. Visualization



6.5. Gender Values

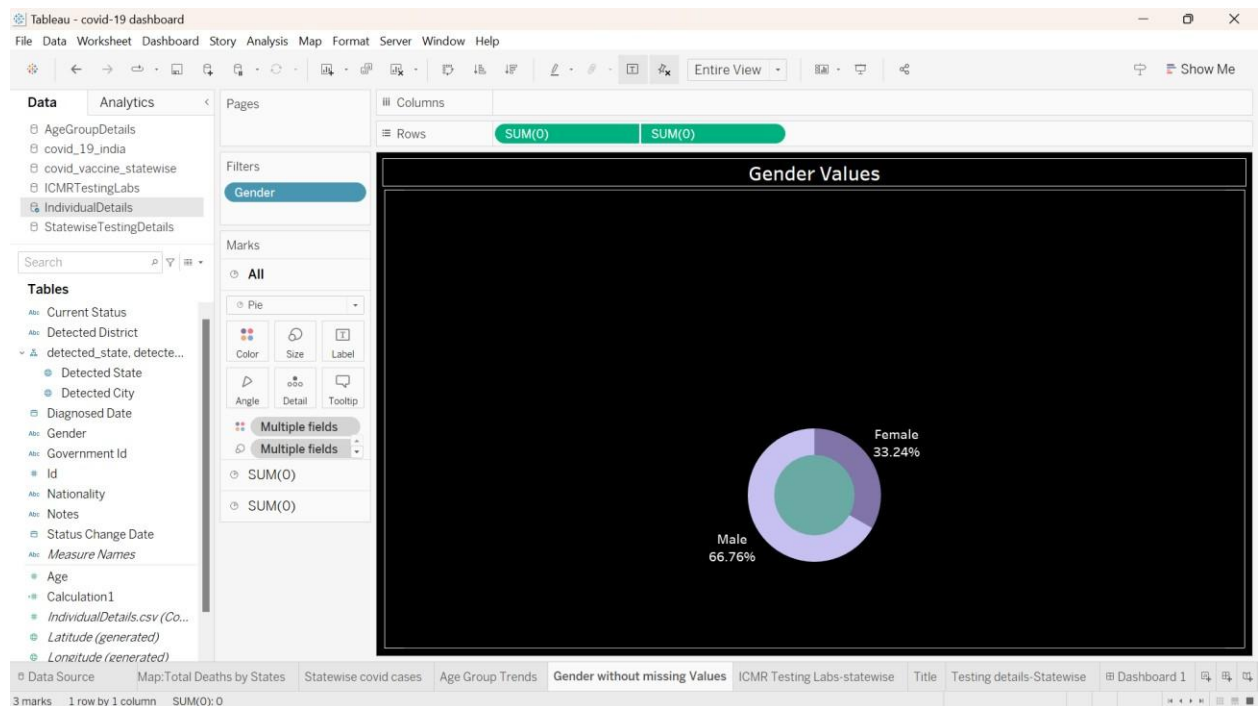
- Introduction:** Understanding the gender distribution of COVID-19 cases is crucial for assessing disparities in infection rates and outcomes. By analyzing gender values in COVID-19 datasets, we can gain insights into how the virus affects different demographic groups and tailor public health interventions accordingly.
- General Description:** The gender values in COVID-19 datasets typically include categories such as male, female, and sometimes other or unknown. These values represent the gender identity or sex assigned at birth of individuals diagnosed with COVID-19. Analyzing these

values allows us to assess the proportion of cases occurring in males versus females and explore any patterns or differences in disease severity or susceptibility between genders.

iii. Analysis results

The analysis of gender values in COVID-19 datasets reveals important insights into the distribution and impact of the virus. For example, initial findings may indicate that a higher proportion of confirmed cases occur in males compared to females, suggesting potential differences in exposure or susceptibility. Further analysis may reveal differences in disease severity, with males experiencing higher rates of hospitalization or mortality compared to females. Additionally, examining gender values alongside other demographic and clinical factors can help identify vulnerable populations and inform targeted public health strategies, such as outreach programs or vaccination campaigns. Overall, analyzing gender values in COVID-19 datasets provides valuable information for understanding the epidemiology of the virus and guiding evidence-based interventions to mitigate its spread and impact.

iv. Visualization



6.6. Testing details Statewise

- i. **Introduction:** Testing for COVID-19 is a critical component of pandemic response efforts, providing crucial data for understanding disease transmission, guiding public health interventions, and assessing the effectiveness of containment strategies. Statewise testing details offer valuable insights into the distribution of testing resources, testing rates, positivity rates, and testing strategies across different states and union territories in India. This analysis aims to delve into the statewise testing landscape, examining key metrics and trends to inform evidence-based decision-making and resource allocation.
- ii. **General Description:** Statewise testing details encompass a range of metrics related to COVID-19 testing activities conducted within each state or union territory. These metrics typically include the total number of tests conducted, testing rates per capita, test positivity rates, types of tests employed (such as RT-PCR, antigen tests), and testing infrastructure availability. Additionally, testing data may be further disaggregated by demographic factors such as age, gender, and geographic location to identify testing disparities and prioritize resources accordingly. Understanding the testing landscape at the state level is essential for assessing testing capacity, coverage, and access, as well as monitoring trends over time to detect changes in disease transmission dynamics.
- iii. **Analysis results:** The analysis of statewise testing details reveals significant variations in testing metrics across different states and union territories in India. Some states may demonstrate robust testing infrastructure and high testing rates, indicating proactive testing strategies and comprehensive surveillance efforts. Conversely, other states may exhibit lower testing rates and limited access to testing, potentially hindering early detection and containment of COVID-19 transmission. Disparities in testing rates may also be observed among different demographic groups or geographic regions within states, highlighting areas requiring targeted interventions to improve testing access and coverage. Moreover, trends in test positivity rates provide insights into the adequacy of testing efforts in detecting and controlling the spread of COVID-19 within each state.

7. List of Analysis with Results

The analysis of COVID-19 cases in India provides a comprehensive understanding of the pandemic's trajectory, revealing temporal trends, peak periods, and fluctuations in case counts, recoveries, and deaths. By examining the distribution of cases across states and regions, the analysis identifies hotspots and emerging clusters, enabling targeted intervention and resource allocation efforts. Insights derived from this analysis inform decision-making processes and aid in the development of effective response strategies to mitigate the spread of the virus and minimize its impact on public health and society.

A regional analysis of COVID-19 in India offers valuable insights into the geographic disparities and variations in disease burden across different states and union territories. By assessing regional differences in case counts, testing rates, positivity rates, and healthcare infrastructure, stakeholders can identify areas with higher transmission rates and prioritize interventions accordingly. This analysis facilitates the allocation of resources to regions most in need and enables targeted public health measures to contain the spread of the virus and protect vulnerable populations.

The examination of testing details statewise provides critical information on testing capacity, coverage, and positivity rates within each state and union territory. By analyzing testing data, stakeholders can assess the adequacy of testing infrastructure and identify disparities in testing access and strategies. Insights derived from this analysis enable policymakers and public health officials to implement measures to improve testing equity, expand testing capacity, and enhance surveillance efforts, ultimately strengthening the country's ability to detect, track, and respond to COVID-19.

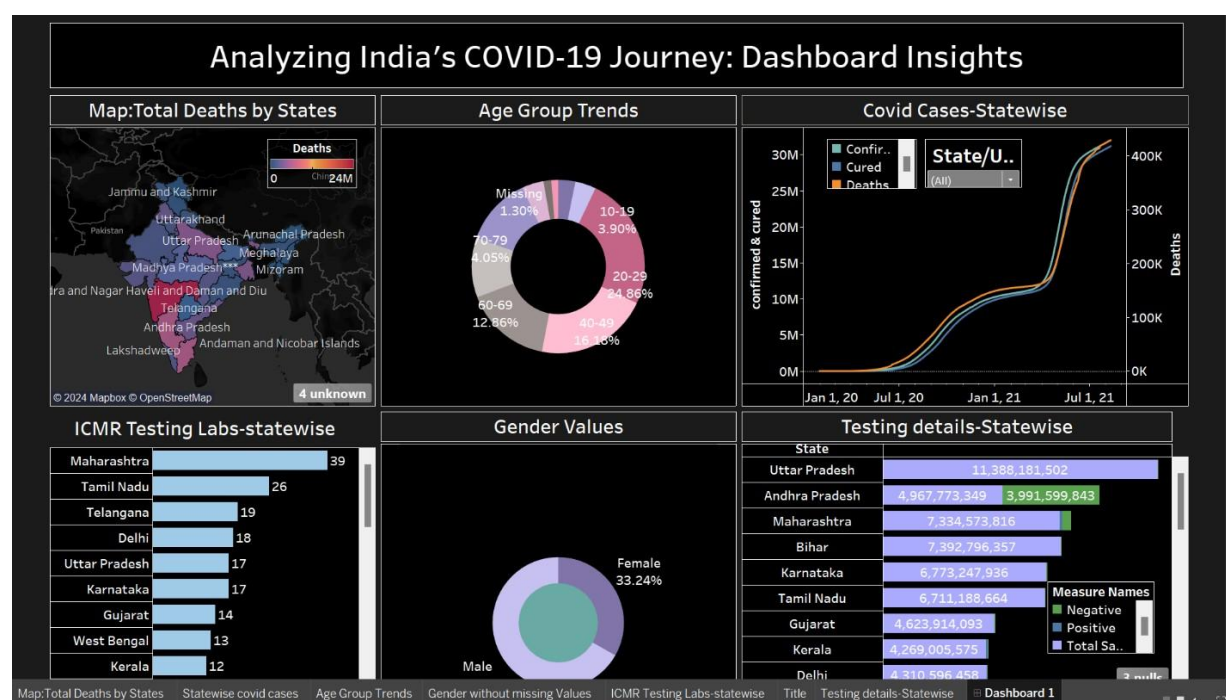
An analysis of the impact of COVID-19 on the healthcare system reveals the strain on healthcare facilities and resources, including hospitalizations, ICU admissions, and bed occupancy rates. By examining healthcare indicators, stakeholders can assess the capacity of the healthcare system to cope with surges in COVID-19 cases and allocate resources effectively to meet the demands of patient care. This analysis informs decision-making processes related to healthcare resource allocation, capacity planning, and surge management, ensuring the provision of adequate care to patients and minimizing the burden on the healthcare system.

The analysis of societal impacts assesses the broader repercussions of the pandemic on livelihoods, employment, education, poverty, and mental health. By examining socio-economic indicators,

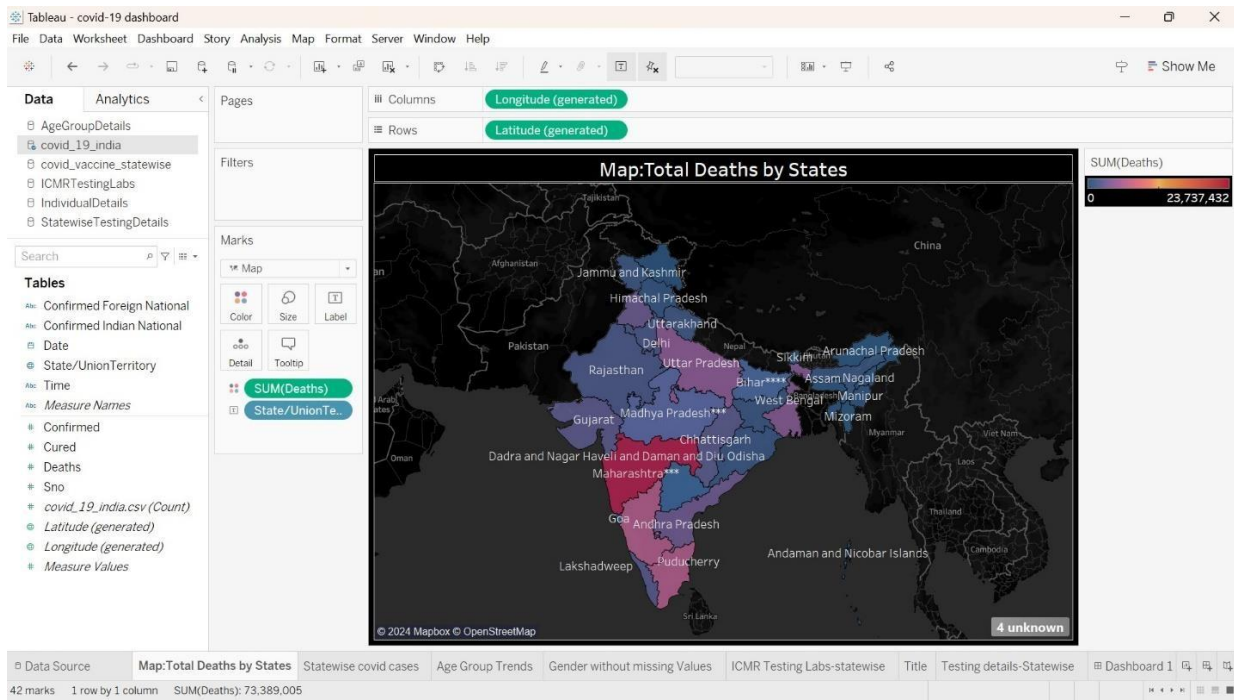
stakeholders can identify vulnerable populations and areas requiring social support and intervention. Insights derived from this analysis enable the development of targeted assistance programs and policies to mitigate the socio-economic impact of COVID-19 and support communities adversely affected by the pandemic.

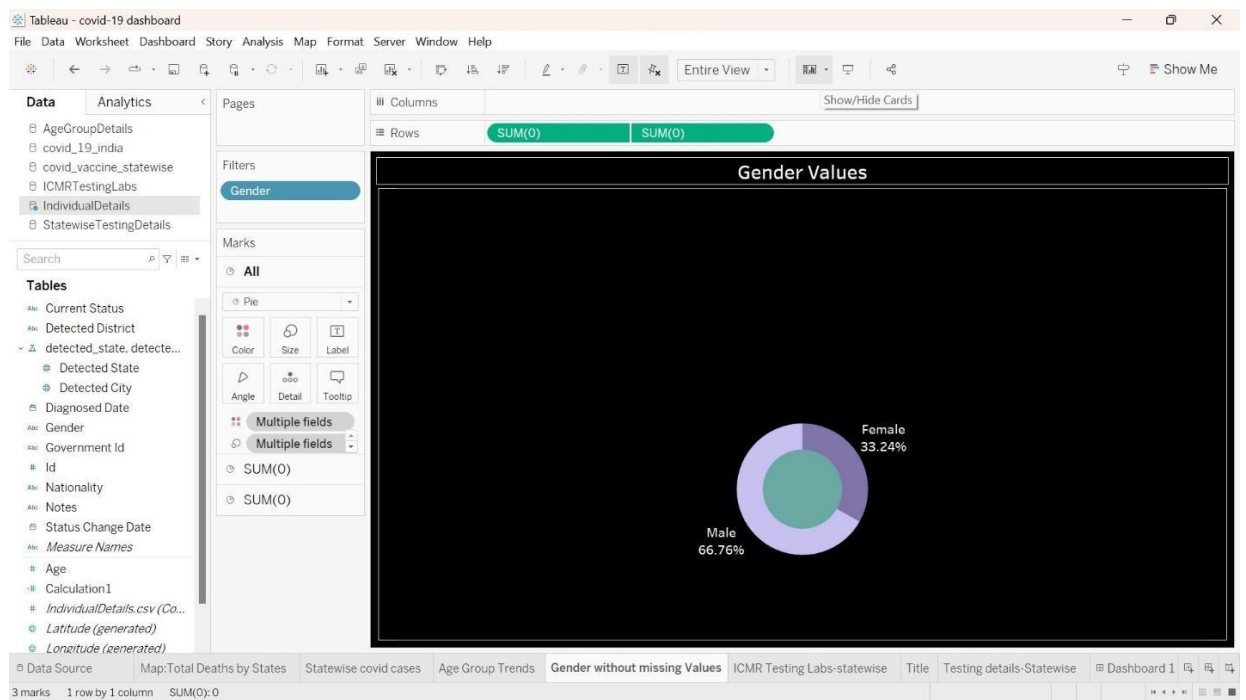
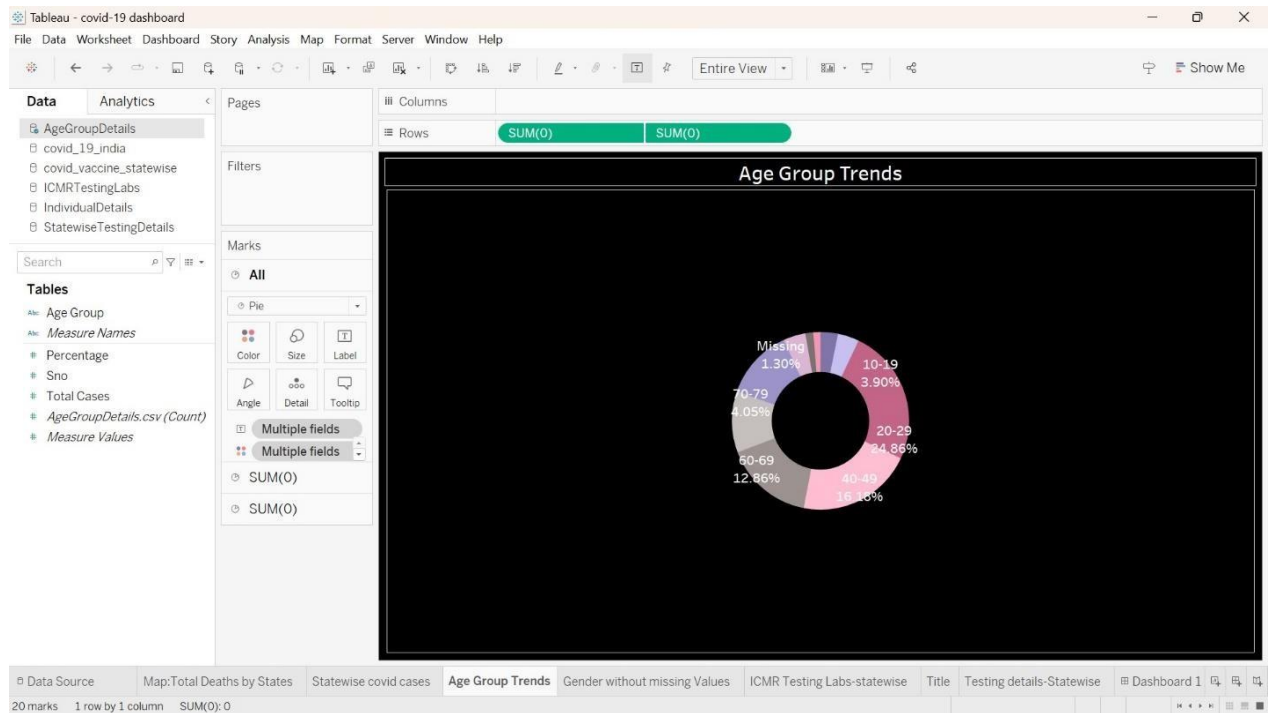
Identification and analysis of vulnerable populations reveal demographic factors associated with increased susceptibility to severe COVID-19 outcomes. By examining disparities in health outcomes and access to healthcare services among vulnerable populations, stakeholders can develop targeted interventions to reduce health inequities and improve health outcomes. This analysis informs the implementation of preventive measures, vaccination strategies, and healthcare services tailored to the needs of vulnerable populations, ensuring equitable access to care and reducing disparities in COVID-19 outcomes.

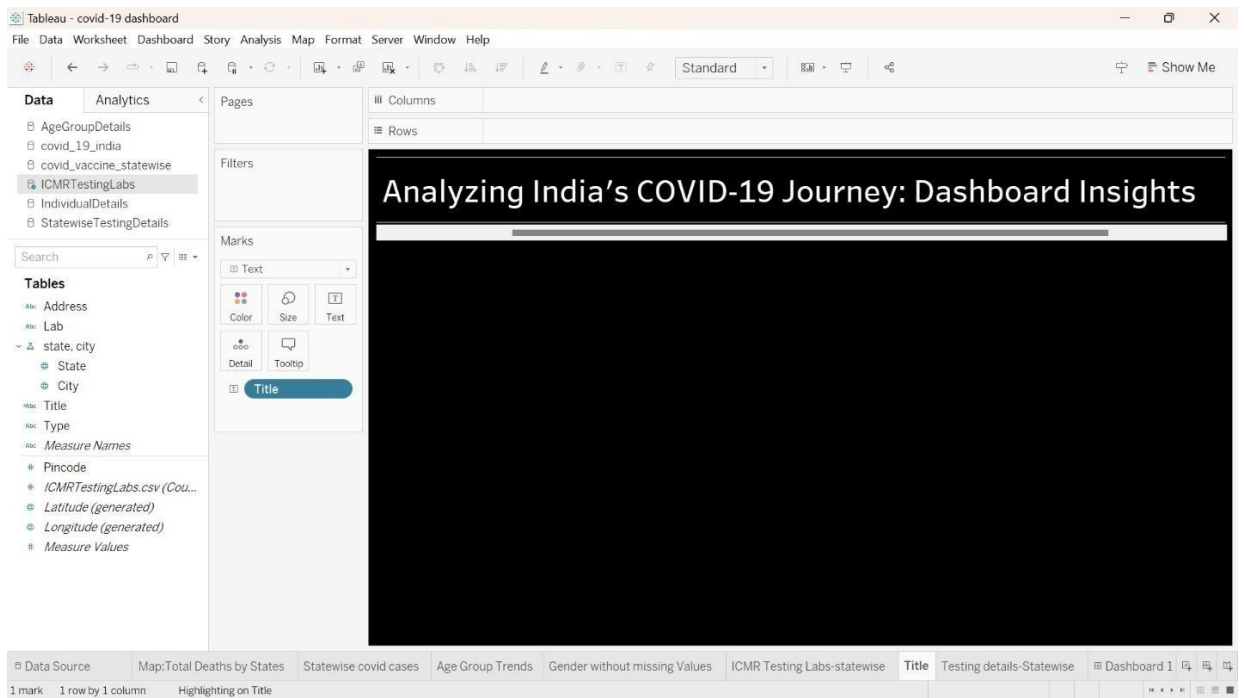
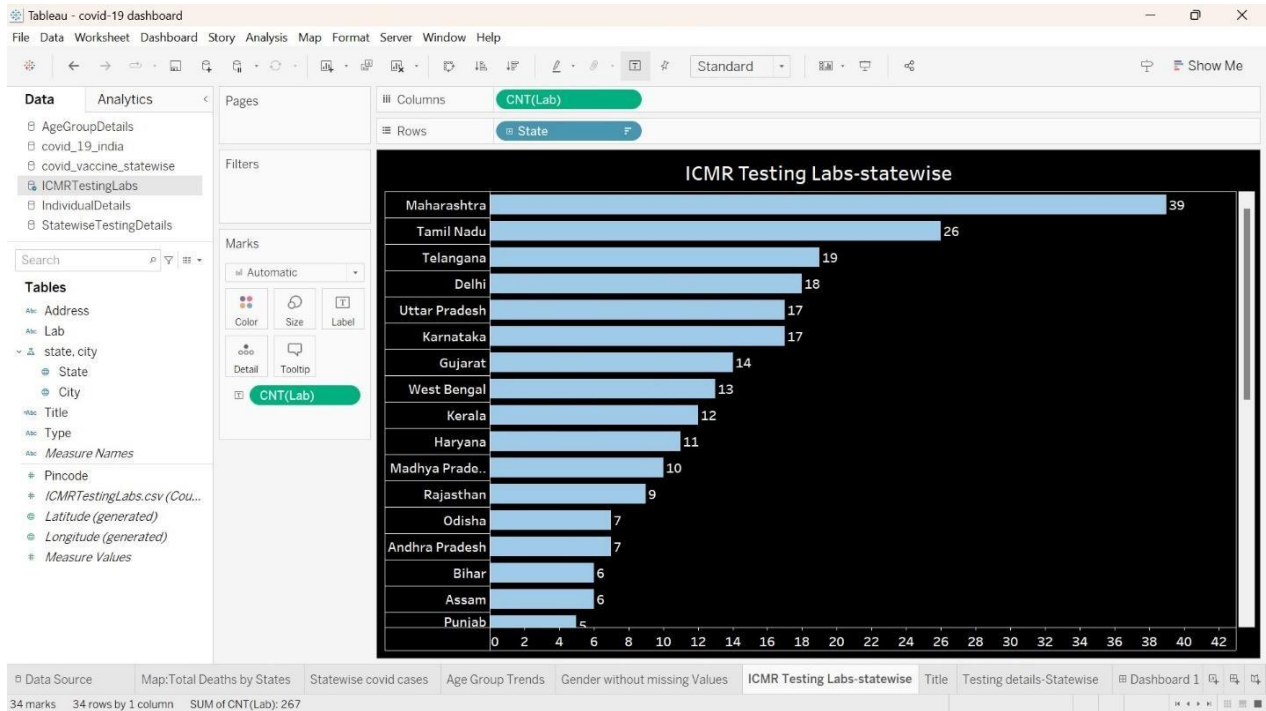
Dashboard Picture:

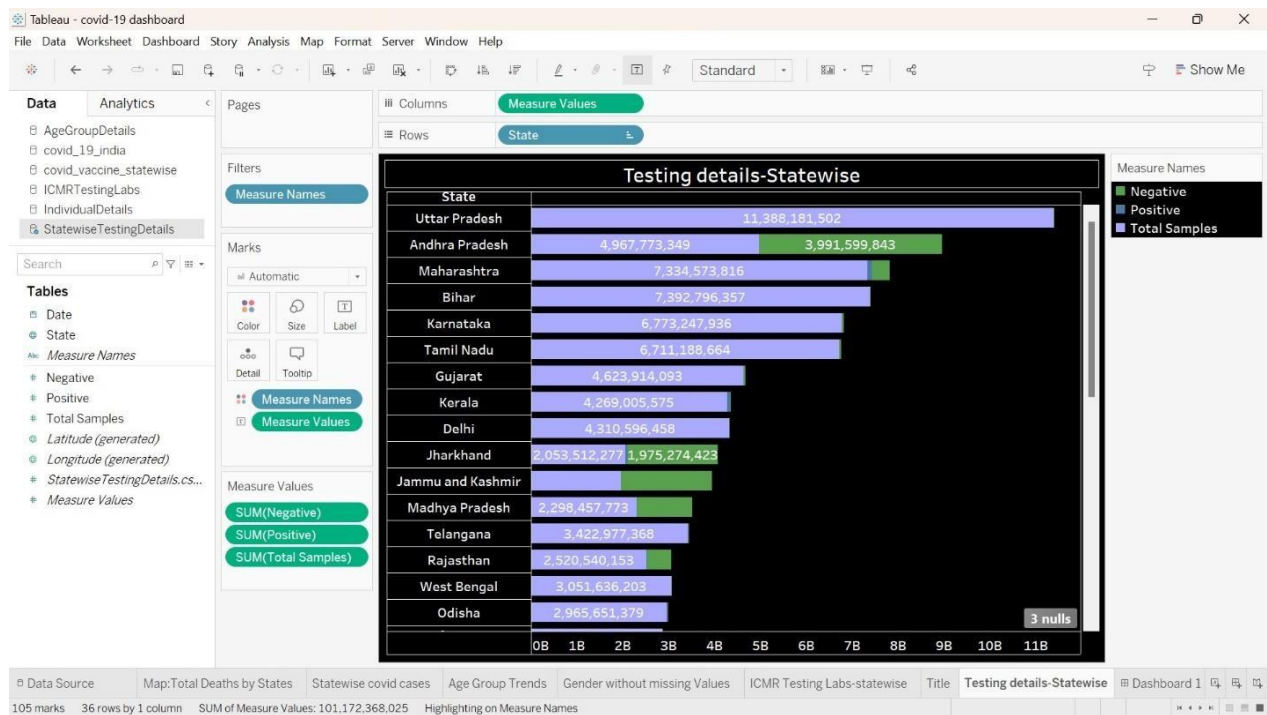


Individual Sheets:









8. Future Scope

The exploration of future scope identifies emerging trends, challenges, and opportunities for further research and analysis in the context of India's COVID-19 response. One key area for future exploration is the continued monitoring and surveillance of COVID-19 variants, including their transmissibility, virulence, and potential impact on vaccine effectiveness. As the virus continues to evolve, ongoing genomic surveillance efforts will be essential for detecting and tracking new variants of concern and informing public health measures to mitigate their spread. Furthermore, there is a need to enhance pandemic preparedness and response capacity, building on lessons learned from the COVID-19 pandemic to strengthen resilience to future public health emergencies. This includes investing in robust surveillance systems, laboratory infrastructure, and healthcare capacity, as well as implementing effective communication strategies to promote public awareness and adherence to preventive measures. Additionally, future research efforts should focus on addressing knowledge gaps in COVID-19 epidemiology, transmission dynamics, and host-pathogen interactions. Research studies investigating the long-term health effects of COVID-19, the role of asymptomatic transmission, and the efficacy of therapeutics and treatments are crucial for improving clinical management and patient outcomes.

Moreover, there is a need to prioritize equitable access to COVID-19 vaccines and ensure vaccine

distribution reaches all segments of the population, including marginalized communities and underserved areas. Strengthening vaccination infrastructure, addressing vaccine hesitancy, and expanding vaccine manufacturing capacity are critical for achieving widespread vaccination coverage and achieving herd immunity. Furthermore, efforts to strengthen global collaboration and solidarity in pandemic response are essential for addressing cross-border transmission and mitigating the risk of future pandemics. Collaborative research initiatives, knowledge-sharing platforms, and resource-sharing mechanisms can facilitate rapid response and coordination during public health emergencies. In conclusion, the future scope of India's COVID-19 response encompasses a range of initiatives aimed at enhancing pandemic preparedness, strengthening healthcare systems, advancing research, and promoting global cooperation. By embracing these opportunities and addressing emerging challenges, India can build a more resilient and sustainable response to COVID-19 and future public health threats.

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www.google.com