Identifying Relationships between Demographic, Geographic, and Socioeconomic Status with COVID-19 Disparities: Storytelling with Data

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PURPOSE

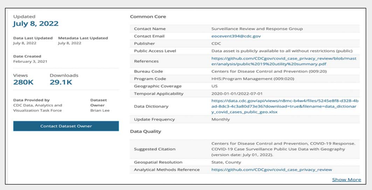
- Utilize the public data to reveal the relationships between demographic, geographic, and socioeconomic status with COVID-19 disparities.

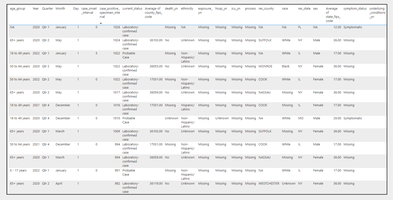
OBJECTIVE

- Identify hidden relationships between demographic, geographic, and socioeconomic factors and COVID-19 infections and deaths in the US.
- Aid healthcare practitioners in gaining a deeper comprehension of the ailment, enabling them to make well-informed choices regarding the distribution of public health resources and effort.

METHOD

- **Data Collection**: COVID-19 cases and deaths in the US published by the Centers for Disease Control and Prevention (CDC) between March 2020 and March 2022 were collected.
  - **Variables**: case_month, res_state, state_fips_code, res_county, county_fips_code, age_group, sex, race, ethnicity, case_positive_specimen_interval, case_onset_interval, process, exposure_yn, current_status, symptom_status, hosp_yn, icu_yn, death_yn, underlying_conditions_yn.





- **Data Analysis:**
  - Both descriptive and statistical analyses were conducted to compare the disparity differences among the groups. For comparison, incidence and incidence rate per 100,000 population were calculated.
    - **Descriptive Analysis**: Power BI and R Programming Language were used
    - **Statistical Analysis**: Kruskal-Wallis test was used to compare the statistical differences of COVID-19 cases and deaths among the groups. A threshold of 95% confidence interval was used in the Kruskal-Wallis statistical test.

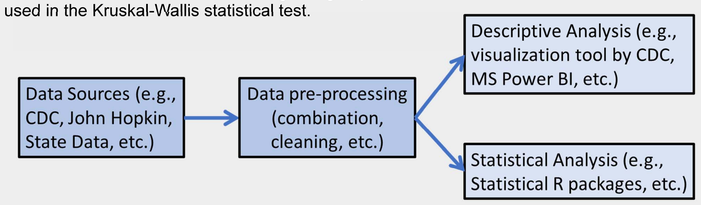


Figure 1. System architecture of data collection and analysis

RESULT

- CA with 9,500,411 cases had the highest number of cases, followed by NY (5,322,736) and FL (4,565,071).
- Los Angeles (CA, 2,947,426), Maricopa (AZ, 1,297,193), and COOK (IL, 1,232,698) were the counties with the highest cases.

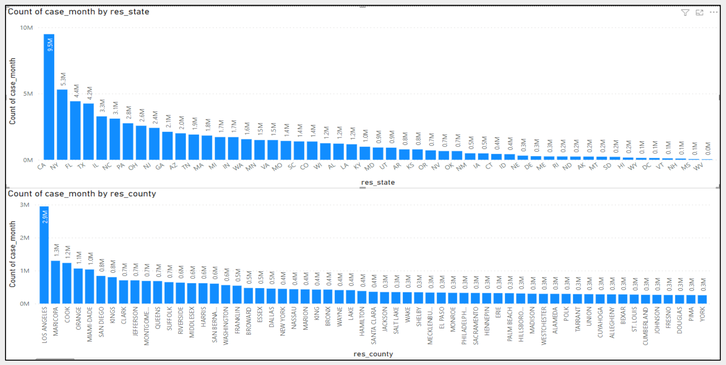


Figure 2. Cases by states and counties. CA (9,500,411), NY (5,322,736), and FL (4,565,071) were the states with the highest cases whereas Los Angeles (CA, 2,947,426), Maricopa (AZ, 1,297,193), and COOK (IL, 1,232,698) were the counties with the highest cases.

- Highest number of cases in younger age groups with half of the cases occurring in age groups 18-49.

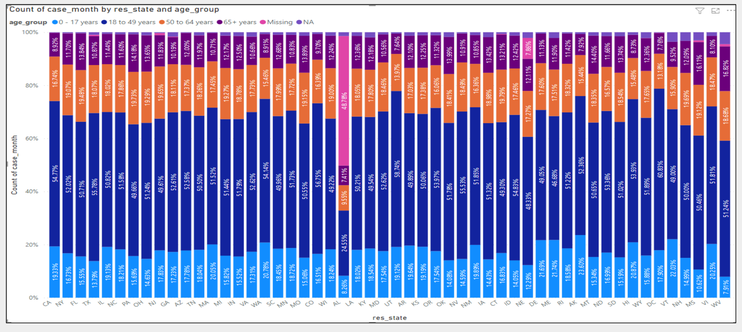
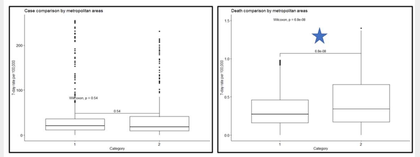


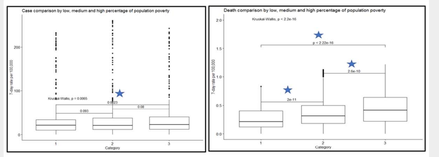
Figure 3. Case distribution by age in different states.

RESULT (CONT.)

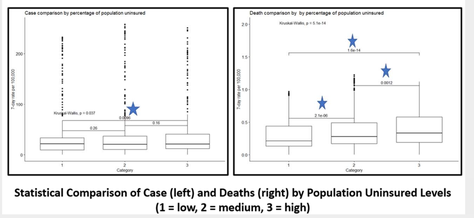
- Higher cases and deaths in rural areas, areas with higher levels of poverty, and uninsured.



Statistical Analysis of Cases (left) and Deaths (right) Metro vs. Rural Areas (1 = Metro, 2 = Rural).



Statistical Comparison of Cases (left) and Deaths (right) by Poverty Levels (1 = low, 2 = medium, 3 = high)



Statistical Comparison of Case (left) and Deaths (right) by Population Uninsured Levels (1 = low, 2 = medium, 3 = high)

Figure 4. Statistical comparison of cases and deaths by location, poverty levels, and uninsured levels.

CONCLUSION

- Highest cases were in States and Counties with the highest populated density.
- Higher death rates were found in rural areas compared to metro areas.
- Higher case rates were found in communities with higher poverty and a higher rate of uninsured.
- Findings would aid healthcare professionals understand the disease better and make informed decisions regarding the allocation of resources and efforts.

ACKNOWLEDGMENTS

- Rami Almukhtar would like to thank the support of the 2022 CNUCOP Summer Research Fellowship.
- Dr. Tran and Dr. Le would like to thank the support of the CNUCOP Faculty Development Fund.

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[2] Carethers, J. M. (2021). Insights into disparities observed with COVID-19. Journal of internal medicine, 289(4), 463-473.