Urbanization Differences among California Counties and their Impact on COVID-19 Vaccine Administration, Accessibility and Availability

Daniel Lopez, Itzarely Osuna, Perry Yip
Herbert Wertheim School of Public Health and Human Longevity Science, UC San Diego

UC San Diego
Herbert Wertheim School of Public Health and Human Longevity Science

Introduction

- Emergence of the COVID-19 pandemic significantly burdened the U.S. healthcare system in terms of access and quality of care and amplified existing health care burdens for certain populations.
- Studies have shown that rural areas' experiences with inadequate health care access was amplified during COVID-19
  - Lack of access to vaccine facilities, low vaccination rates, and higher Covid-associated hospitalizations and mortality. [1]
- The aim of this study is to further investigate whether differences in urbanization, characterized as metropolitan and non-metropolitan (rural) areas, impacts COVID-19 vaccine administration, commuting access to vaccine providers, and vaccine provider availability among California residents

Objective

- To examine the association between COVID-19 vaccine accessibility/availability barriers and vaccination rates among California counties that vary by urbanization level.

Methods

- Conducted secondary data analysis utilizing four primary databases & SPSS
  - CDC Vaccination Tracker (2022) → COVID-19 vaccination completion database [3]
  - VaxMap 2.0 (2022)→ location density of vaccine facilities [2]
  - Rural-Urban Continuum Codes (RUCC) from the U.S Department of Agriculture's Economic Research Service (2013) → county urbanization ranking (1 = most urban; 8 = least urban, or rural) [4]
  - California Secretary of State Political Party Registration (2021) → political affiliation for each county
- Analyzed the data among all 58 California counties to conduct scatterplots and regression analysis using SPSS

Results

Table 1. Descriptive Statistics of Each Dataset
All datasets (except CDC vaccination dataset) contained data for all 58 California counties. Eight California counties were not analyzed in CDC dataset due to insufficient data.

Database	Sample Size (N)	California Counties Analyzed	Age
RUCC	58 (Counties)	58	N/A
CDC Vaccination Tracker	24,975,175 (California population)	50	18+
VaxMap 2.0	6,600 (vaccine facilities)	58	N/A
VaxMap 2.0	~38 million (California population)	58	N/A
Political Majority	22,154,304 (California population)	58	18+

Results

Figure 1. California County Rural-Urban Continuum Code (RUCC) vs. Percent of County Population Living More than 10 Miles from Nearest COVID-19 Vaccine Facility.

We observed a **significant positive association** between the California County Rural-Urban Continuum Code (RUCC) and the percent of the county population living more than 10 miles from the nearest COVID-19 vaccine facility.
($p < 0.001$; 95% CI [5.7, 8.6]).

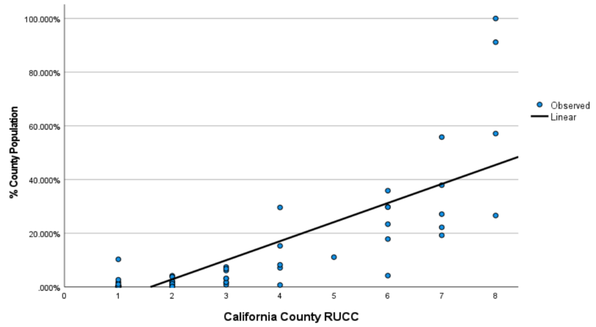


Figure 2. California County Rural-Urban Continuum Code (RUCC) vs. County COVID-19 Vaccine Facility Density (per 10,000).

There was also a **significant positive association** between California RUCC and vaccine facility density (per 10,000) ($p < 0.03$; 95% CI [0.008, 0.193]).

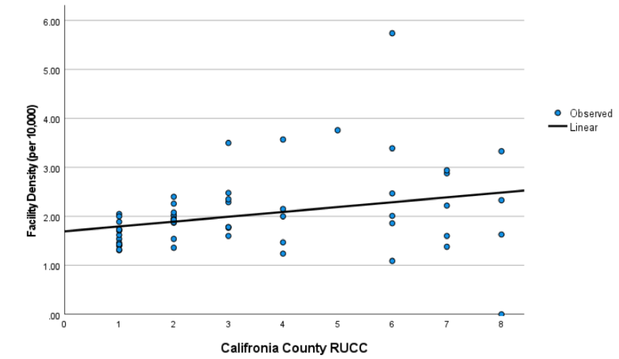


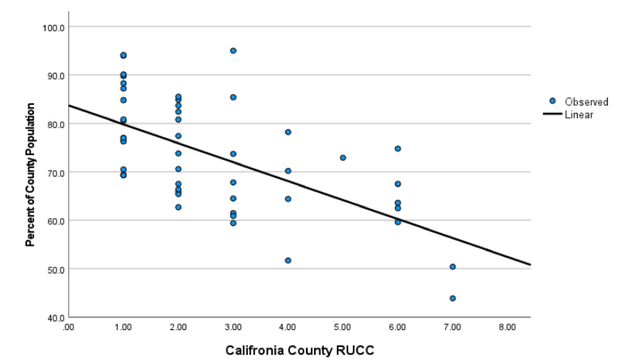
Table 2. Completion of COVID-19 primary vaccination series by county, controlled for political majority.

All California counties reported either Democrat or Republican as their majority. Percent change in California County Political Majority goes from Democratic counties to Republican counties. The * symbol signifies statistical significance ($p < 0.05$). California counties with a Republican-registered majority had a **significantly lower percentage** of the population completing the primary COVID-19 vaccine series than counties with a Democrat majority ($p < 0.001$).

	Percent Change (B coefficient)	P-value	95% Confidence Interval
California County Political Majority	-11.8 %	< 0.001*	[-17.8, -5.8]
California County RUCC	-2.2 %	0.01*	[-3.8, -0.5]

Figure 3. California County Rural-Urban Continuum Code (RUCC) vs. Percent of County Population (18+) Completing Primary COVID-19 Vaccination Series.

We observed a **significant negative association** between California RUCC and the percent of the population who completed the primary series of the COVID-19 vaccine ($p < 0.001$; 95% CI [-5.5, -2.4]). Dataset was analyzed using SPSS.



Conclusions

- We can conclude that California residents do not experience availability barriers to COVID-19 vaccines if they live in less urbanized counties.
- There may be accessibility barriers to COVID-19 vaccines among residents who live in less urbanized counties, for they may need to travel further distances to reach the nearest vaccination clinic.
- Political standing may be associated with COVID-19 vaccine hesitancy and may reflect a lower percentage of fully vaccinated status in Republican counties, though more research on this association must be done.
- Based on these findings, it is unclear whether COVID-19 vaccine accessibility barriers among California residents living in less urbanized counties are the major factor in lower vaccination rates, though accessibility barriers may play a role.

Policy Implications

- The implementation of mobile vaccination clinics could be used as a solution to reach populations living in less urbanized California counties in an attempt to bridge accessibility gaps.

Limitations

- The dataset from ERS-USDA's California RUCC codes was last updated in 2013, and updates every decade (2023), so the dataset may not reflect current California county population sizes. However, RUCC codes have remained fairly constant since the 2003 dataset.
- The CDC vaccination tracker contained missing data for some California counties with an RUCC of 8, which could impact results.
- In regard to the political registration dataset, not all populations from each county are eligible for political registration, and not all of those eligible are registered, which could make it difficult to generalize county political majority populations to the county populations in the CDC vaccination database.

References

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