Why Has COVID-19 Affected Some Cities More than Others?

- Some correlates of the impact of COVID-19 at the city level are similar in very different contexts. In both the Brazil and the United States, for example, population density is associated with higher COVID-19 deaths per capita.

- Other correlates behave differently depending on the context. In Brazil, cities with higher median income had fewer people staying at home and more COVID-19 deaths; the opposite was true in the United States.

- Cities with higher levels of socio-economic vulnerability in Brazil experienced more deaths per capita, despite their higher tendency to stay at home in the first months of the pandemic.

CONTEXT

Within countries, not all areas have been affected with the same intensity by the COVID-19 pandemic. While much of the variation is explained by policy interventions, such as mobility restrictions or vaccination campaigns, a large part of the differences is explained by pre-pandemic city characteristics. Research in the United States found that variables such as higher density and lower income correlate with more COVID-19 deaths. This study examines whether these and other patterns also hold for Brazil, where results could be different due to factors like higher levels of residential crowding and labor informality.

Key concept

MEDIAN INCOME
The midpoint of monthly family income: 50 percent of individuals live in families that earn less than this figure, and the other 50 percent live in families that earn more.

PROJECT

This study uses a detailed dataset containing daily information on cumulative COVID-19 deaths per capita and a measure of tendency of people to stay at home based on phone data across 2,509 Brazilian cities. The 2010 census provides data for most of the remaining variables. The paper computes daily estimates of the correlations of COVID-19 deaths and mobility with population, commuting time, share of population aged 60 or older, nursing home residents per 10,000 people, distance to the closest international airport, informality rate, share of college-educated in employment, share of self-declared Black and mixed race in the population, average persons per room, and share of households located in *favelas* (slums).

RESULTS

The study finds that variables that are associated with higher COVID-19 deaths, and the magnitude of this association, can change significantly depending on when these correlations are measured. This is because some city characteristics are associated with unusually high early impacts of the pandemic, while others have an association with COVID-19 deaths that is sustained over time. This is true in both Brazil and the United States.

Population density is strongly associated with higher deaths per capita in Brazilian cities, as shown in the top-left panel of Figure 1. This relationship is sustained for most of the first year of the pandemic, and it is very consistent with similar estimates obtained for the United States. The top-right panel shows a negative association between higher density and the share of individuals staying at home. This result is likely linked to the fact that density is conducive to a higher number of human interactions, and interactions in turn drive infections.

Meanwhile, controlling for other factors, individuals from cities with higher median income in Brazil were *less* likely to stay at home and experienced *more* COVID-19 deaths per capita during most of the first year of the pandemic (Figure 1, bottom panels). This result is the opposite of those found for the United States in comparable studies. These results are not driven by policies, as higher-income cities were *not* more likely to implement COVID-19 containment policies. They may reflect the fact that richer cities demand more goods and services, in a context where a relatively large share of these goods and services are provided in person, creating incentives for more human interactions and infections.

In addition, the study finds that cities with other socio-economic vulnerabilities—such as a larger share of population living in favelas (slums) and a higher residential crowding—also experienced more COVID-19 deaths per capita, even though people in those cities were more likely to stay at home.

CUMULATIVE COVID-19 DEATHS PER CAPITA

Total COVID-19 deaths reported in a municipality from the beginning of the pandemic until a particular date, divided by the city's population.

POLICY IMPLICATIONS

Almost two years into the pandemic, and despite great progress in the development and deployment of vaccines, as well as of therapeutic methods to treat COVID-19, the threat of the pandemic continues to loom large in Latin America and the Caribbean, as in the rest of the world. New variants continue to emerge, and the effectiveness of existing tools to control their spread and contain their harmful impact on lives and livelihoods remains uncertain.

This study shows that cities with certain characteristics—such as high population density, large presence of slums, or higher residential crowding levels—are disproportionately vulnerable to the pandemic. This suggest that geographically emphasizing preventive and containment efforts in such areas may help boost the effectiveness of these efforts.

Moreover, the study highlights that the higher toll of COVID-19 in some cities—in particular those with large populations experiencing socioeconomic vulnerabilities, like those residing in slums—is not explained by larger mobility. This implies that containment policies that seek to incentivize people to stay at home, such as curfews and lockdowns, may be relatively less effective in those places, and emphasizing vaccination and access to treatment may be especially critical there.

Figure 1. Correlations of Population Density and Median Income with COVID-19 Deaths and the Tendency to Stay at Home across Brazilian Cities
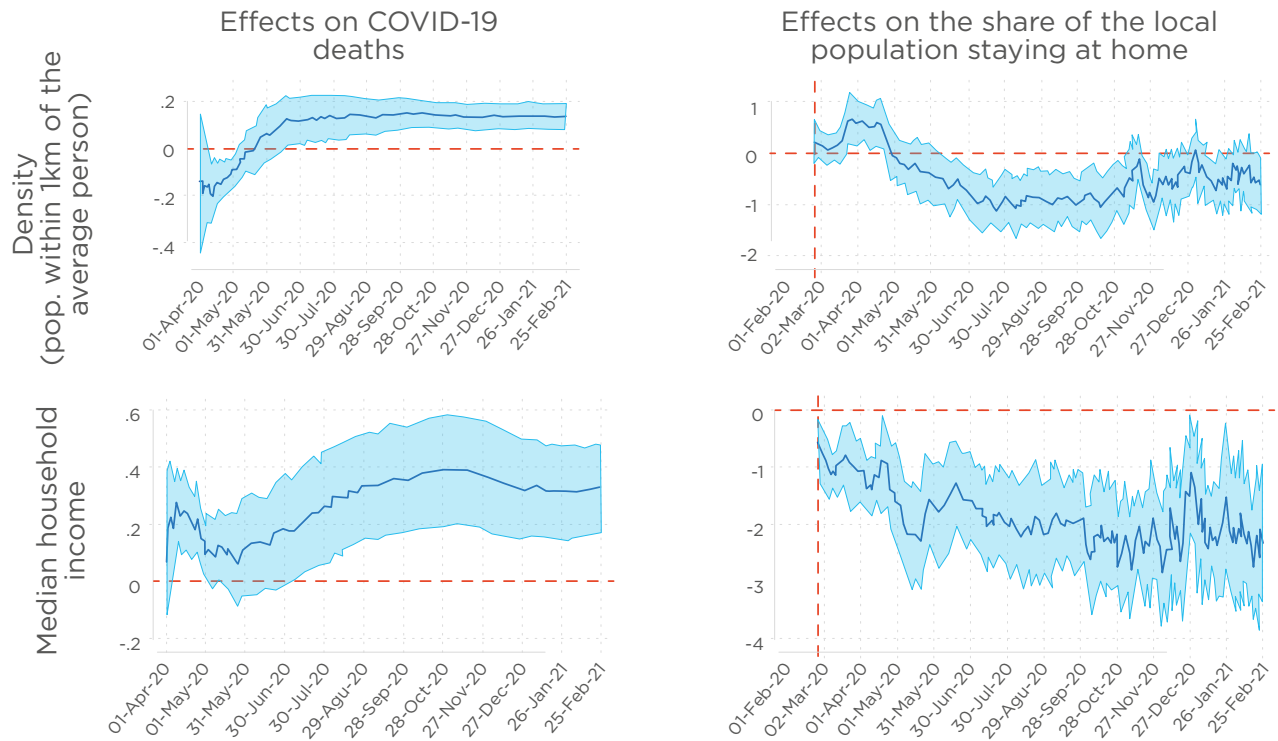
Note: This figure plots daily OLS estimates from multivariate regressions with data from 2,509 Brazilian cities, which control for other 11 covariates. The left column presents estimates of the correlates of COVID-19 deaths per capita, while the right column presents estimates of the correlates of the propensity of the local population to stay at home in these cities (using the seven-day moving average of the Social Isolation Index produced by the firm InLoco). All regressors are standardized. All estimations include a constant and state fixed effects. The shaded area shows 95% confidence intervals constructed from robust standard errors.

Key concept

POPULATION DENSITY
Number of people who reside in a given area. This paper considers the population living within a 1 km-radius circle around the average person of the city.

FULL STUDY

Chauvin, Juan Pablo. 2021. "Why Does COVID-19 Affect Some Cities More than Others?: Evidence from the First Year of the Pandemic in Brazil."

DEPARTMENT OF RESEARCH AND CHIEF ECONOMIST

The Department of Research and Chief Economist generates new ideas to enrich the knowledge base that supports the policy agenda of the Inter-American Development Bank (IDB) and its member countries for achieving sustainable and equitable development in the region. To maximize the impact of its research, the Research Department carries out activities that serve as inputs to other IDB departments, governments, the academic community and public opinion in the region.