

# Has the Covid-19 vaccine had the same effectivity in regions with different violence levels?

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*The impact of vaccination was greater in the less vulnerable regions and in areas with lower homicide rates, which contributes to health inequalities and points to the possible interference of violence in access to health care in the most vulnerable areas.*

## BACKGROUND

This study analyzes the spatial relationship between Covid-19 mortality, the Human Development Index (HDI), Health Promotion activities, urban violence, and vaccine resonance in the 5th largest city in Brazil (Fortaleza-Brazil).

The dynamics of Covid-19 caused damage to the health of the population and imposed major challenges for the health sector. Confronting the Covid-19 pandemic has been a challenge for countries that have profound social inequalities, highlighting its possible repercussions on indicators of violence and crime, historically greater in scenarios of social vulnerability. Brazil was among the most seriously affected country by Covid-19, and Fortaleza, the capital city of Ceará, among most relevant municipality in these statistics, as well as in violence rates (the world 7<sup>th</sup> most violent city in recent years). The advent of vaccination started to reduce Covid-19 indicators. Although vaccine was available (for free) to all Brazilian citizens by the end year of 2021, it is believed that there were difficulties in the equitable uptake of immunobiologicals by the population, especially in more vulnerable areas (e.g., more violent neighborhood).

## METHODS

Primary data were derived from questionnaires applied to Community Health Agents (CHA) and secondary data, such as vaccination, homicide rates and human development index (HDI) by neighborhoods, extracted from official municipal indicators. For analysis, the spatial statistics and IDW (Inverse Distance Weighted) method was used to generate thematic maps.

## RESULTS

The decrease in health promotion services (CHA actions in the territory) did not occur homogeneously, being predominant in more vulnerable places.

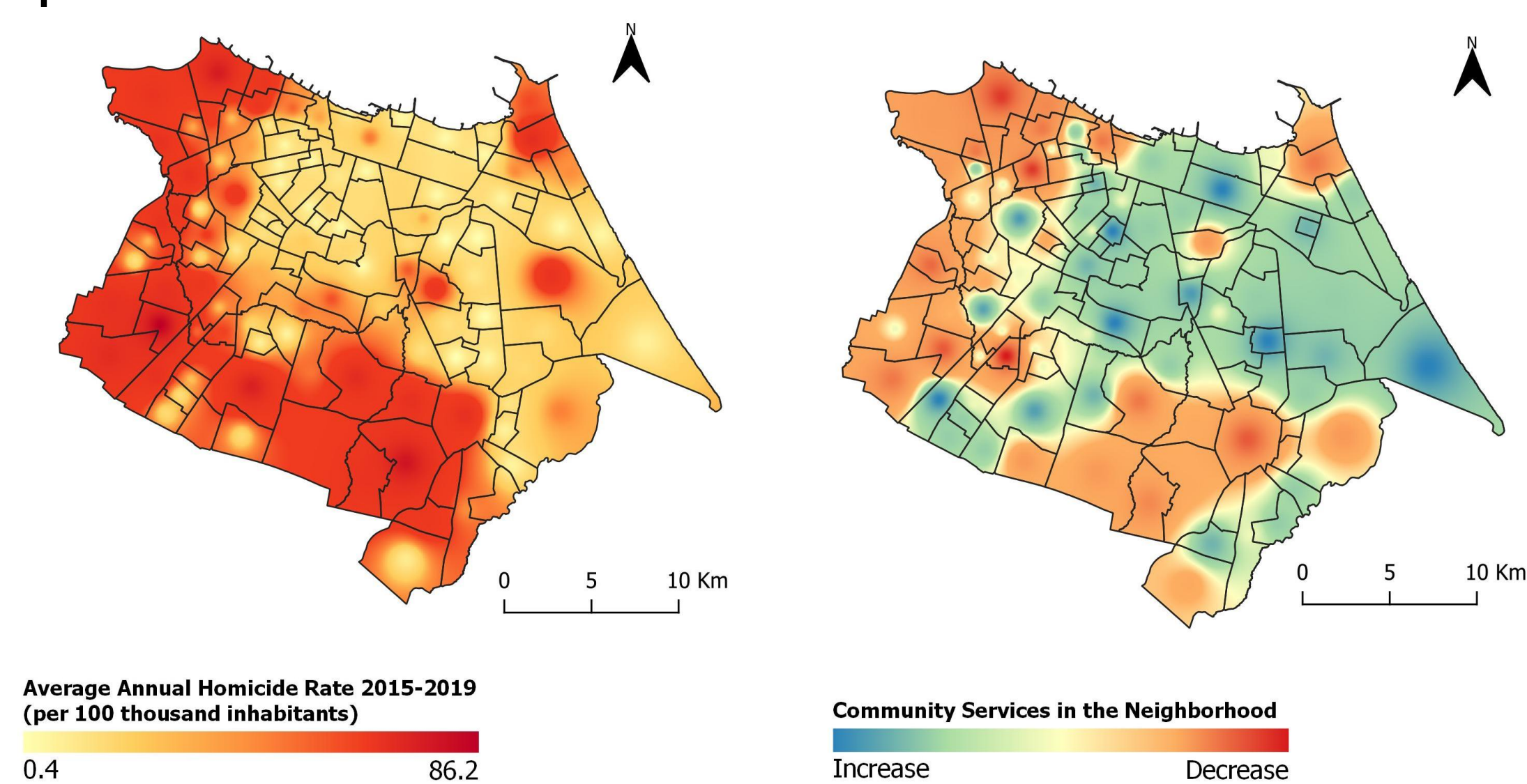


Figure – Relationship between urban violence and health promotion services

The bivariate global Moran index was -0.067 ( $p=0.054$ ) and -0.074 ( $p=0.032$ ) for the relationship between the resonance of the Covid-19 vaccine with HDI and urban violence. The results showed spatial heterogeneity in the distribution of the mortality rate due to Covid-19 in the analyzed period (2020 [previous to Covid-19 vaccine] vs 2022 [when all the population had access to vaccine]).

## RESULTS CONTINUED

The resonance of vaccination was greater in less vulnerable regions and with lower homicide rates, which denotes the influence of social issues in the development of the population's health during the pandemic, contributing to health inequalities, and suggesting the possible interference of violence in access to health care in the most vulnerable areas.

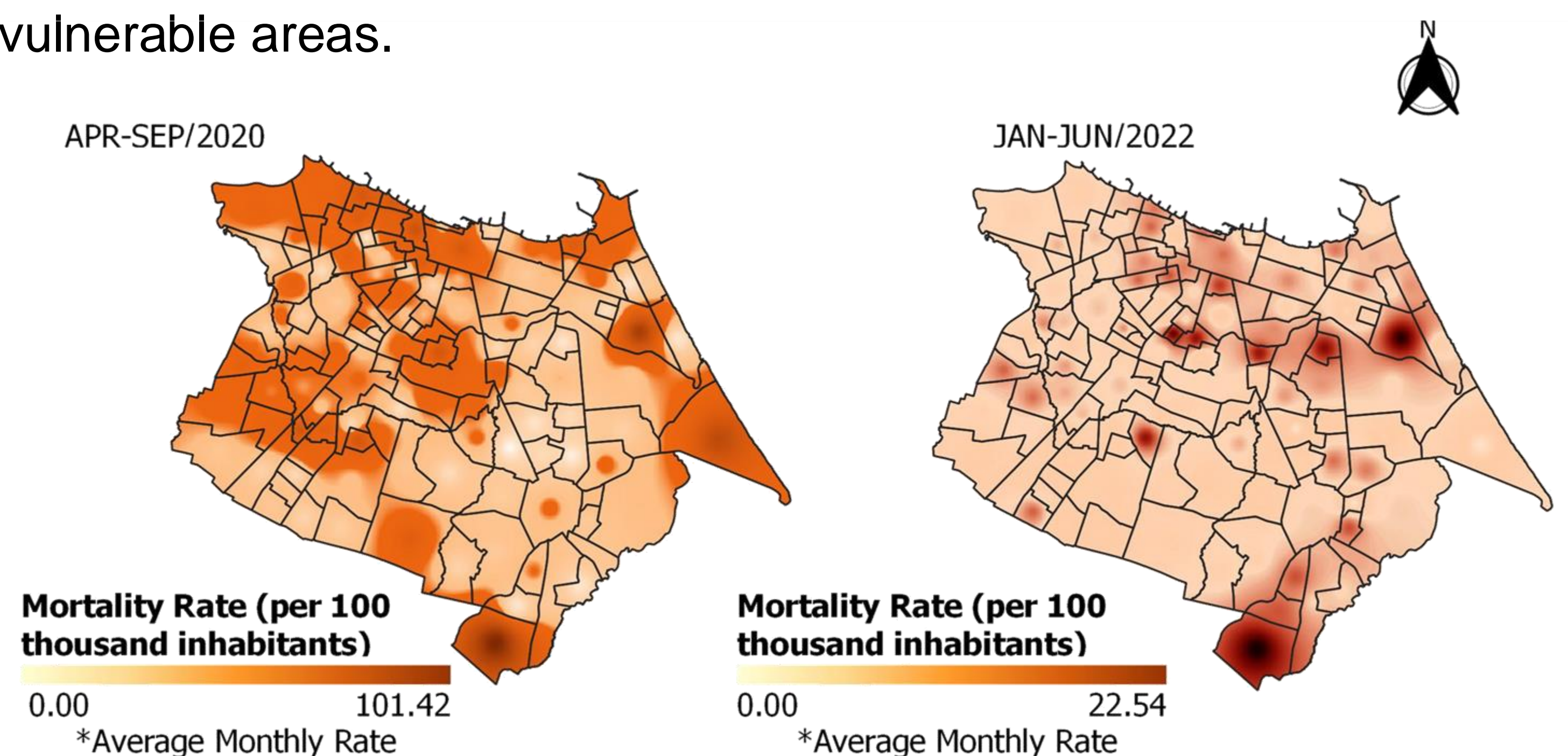


Figure - Spatial dynamics of Covid-19 mortality in the period before vaccination (April to September 2020) and after offering the Covid-19 vaccine to all population and geographic groups in the city of Fortaleza (January to June 2022). Source: authors' elaboration

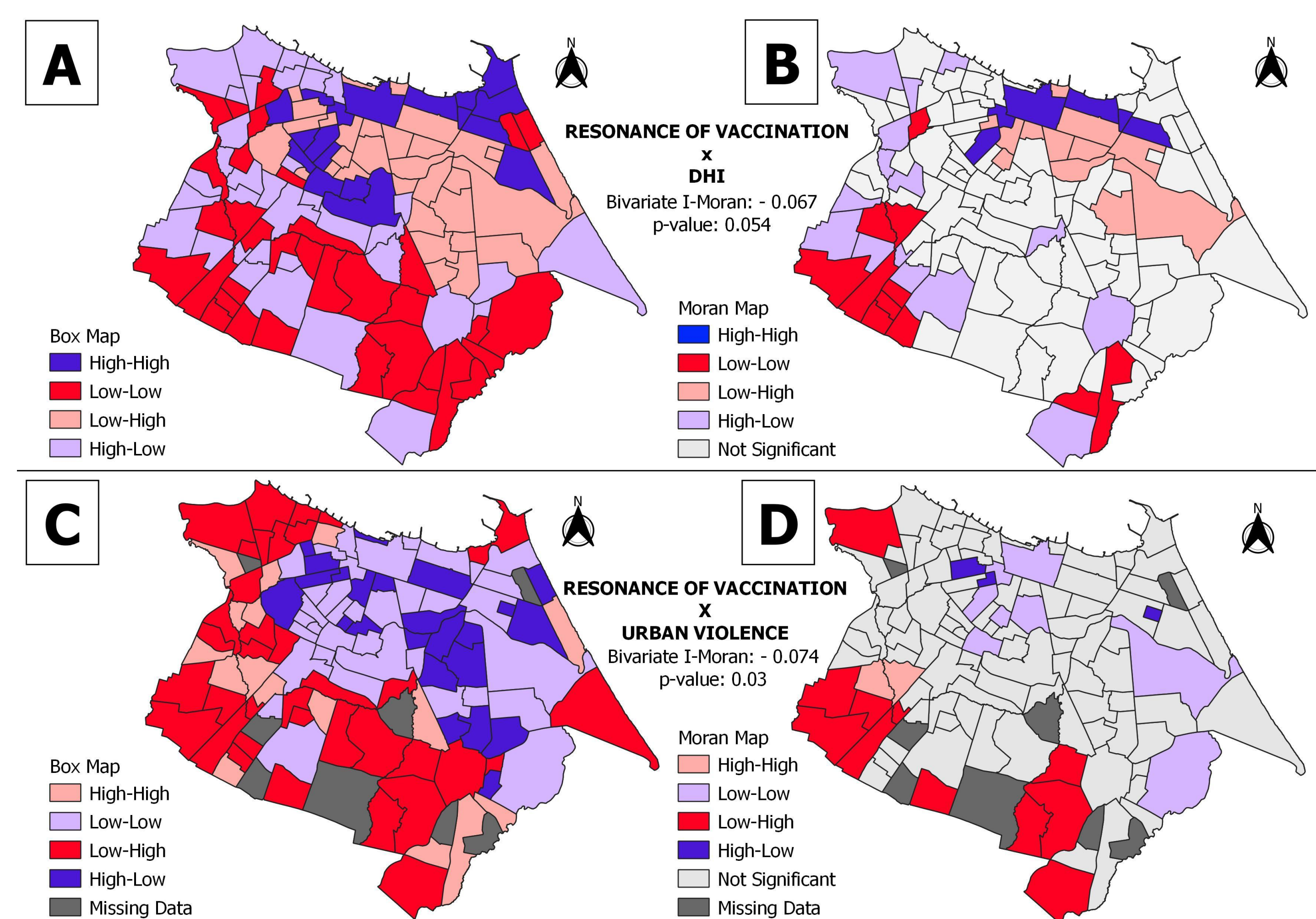


Figure - Relationship between vaccine response and urban violence

## CONCLUSIONS

The fact that the vaccination response was lower in regions with higher homicide rates suggests that violence may interfere with the access of health professionals to the most vulnerable areas and, consequently, with the delivery of health services, leaving them less supported, including with regard to vaccination against Covid-19.

## ADDITIONAL KEY INFORMATION

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