

## Background

From 2010 to 2020, the population of Mexico went from 112.3 to 126 million inhabitants and grew at an annual rate of 1.1%.

Uneven development and poverty have been two constant problems in the country. In 2018 42% of the population lived in poverty.

Also, due to drug war and organized crime, during the last 15 years homicide rates have tripled from 9.7 (per 100,000 population) in 2005 to 29 in 2019.

It has been studied the demographic implications that the sharp increase in violence has in internal migration (CONAPO & UNFPA, 2019) and life expectancy in the country (Aburto et al., 2016). However, no works were identified that address the implications of poverty and violence together in the internal demographic growth of recent years in Mexico.

## Aim

Estimate the effects of poverty and violence on population growth of municipalities in Mexico from 2010 to 2020.

## Data and methods

Indicators for 2,469 municipalities:

- Annual rate growth based on Population Censuses from 2010 and 2020
- Poverty indices obtained from CONEVAL (National Council for the Evaluation of Social Development Policy)
- Average homicide rate from 2011 to 2019 calculated from vital statistics.

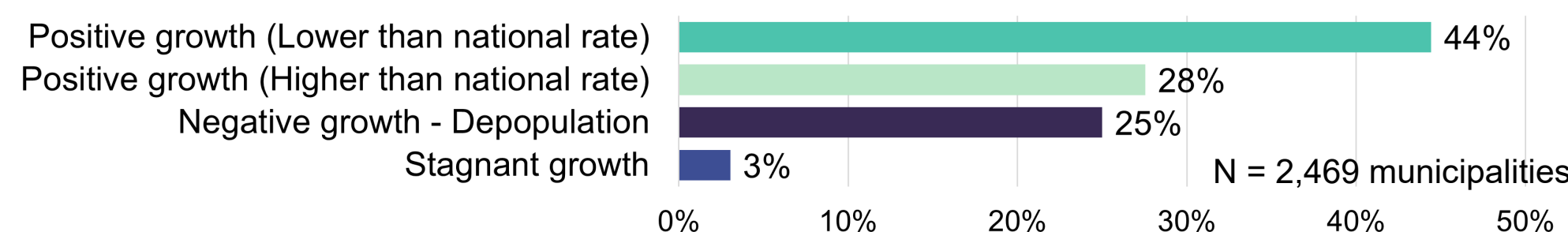
A multiple linear regression model was formulated where the share of the population living in poverty and the homicide rate (per 100 000 population) were the independent variables and the population growth, expressed in the annual average growth rate, the response variable. Absolute and standardized regression coefficients were considered to find out the strength of each variable. The model was applied individually in each state.

## Results

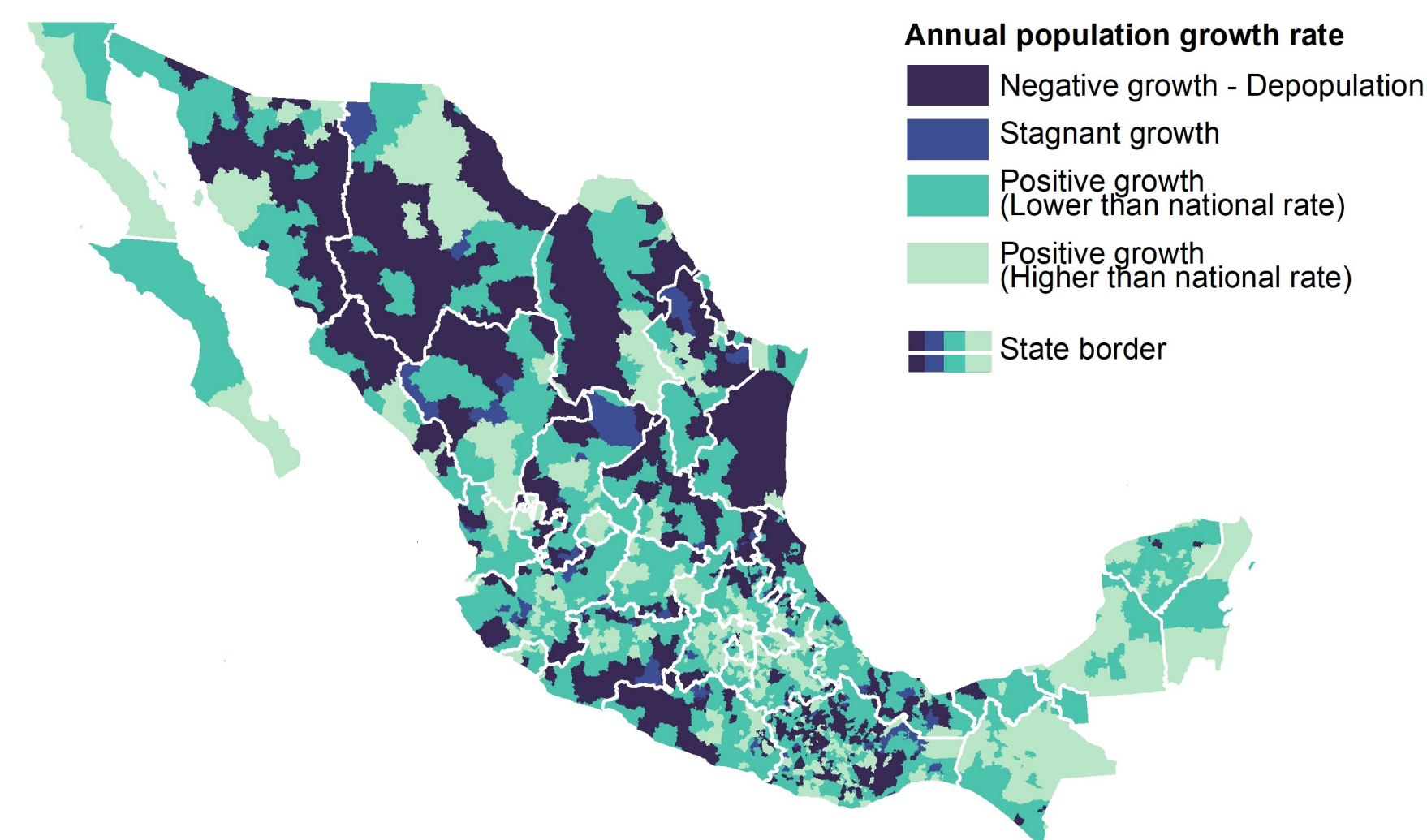
From 2010 to 2020, 72% of the 2,469 municipalities experienced a positive population growth, but most of them (44%) below national average (1.1%). A quarter of the municipalities had a negative population growth rate and 3% apparently had no changes in their size population (**Fig. 1**). Municipalities with negative growth are mainly located in the north and south (**Fig. 2**).

There is a negative relationship between poverty and/or homicide rates in eighteen states, that is, the higher the poverty or violence, the lower the growth (**Fig. 3 and 4**).

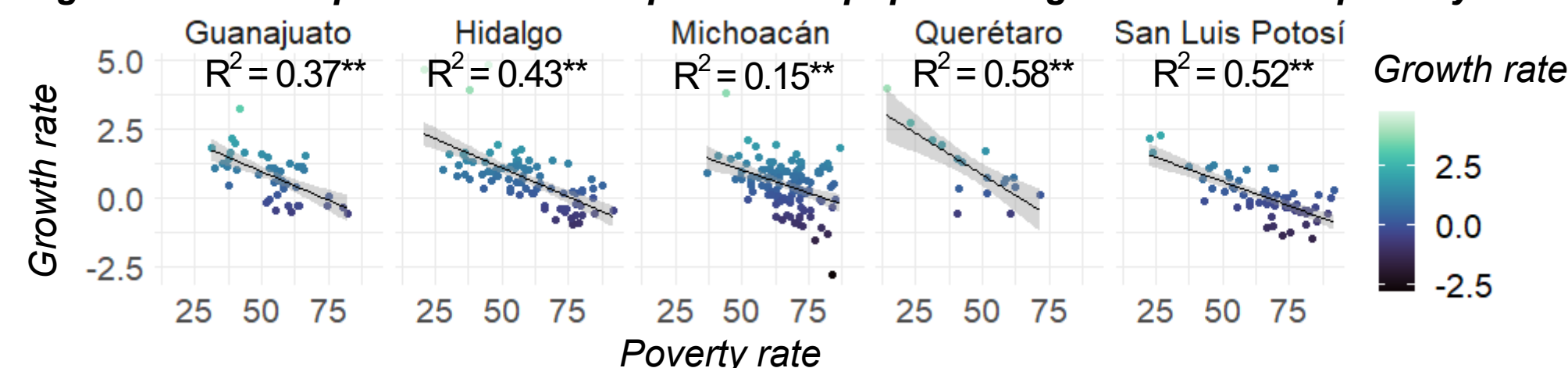
**Fig. 1 Distribution of municipalities by annual population growth rate**



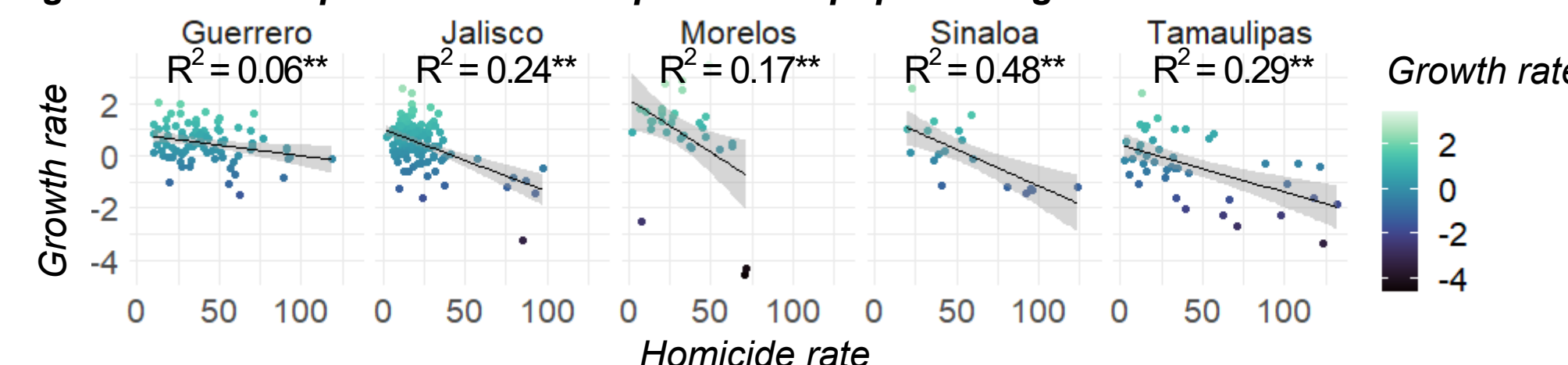
**Fig 2. Municipal annual population growth rate, Mexico 2010-2020**



**Fig 3. Relationship between municipal annual population growth rate and poverty rate**



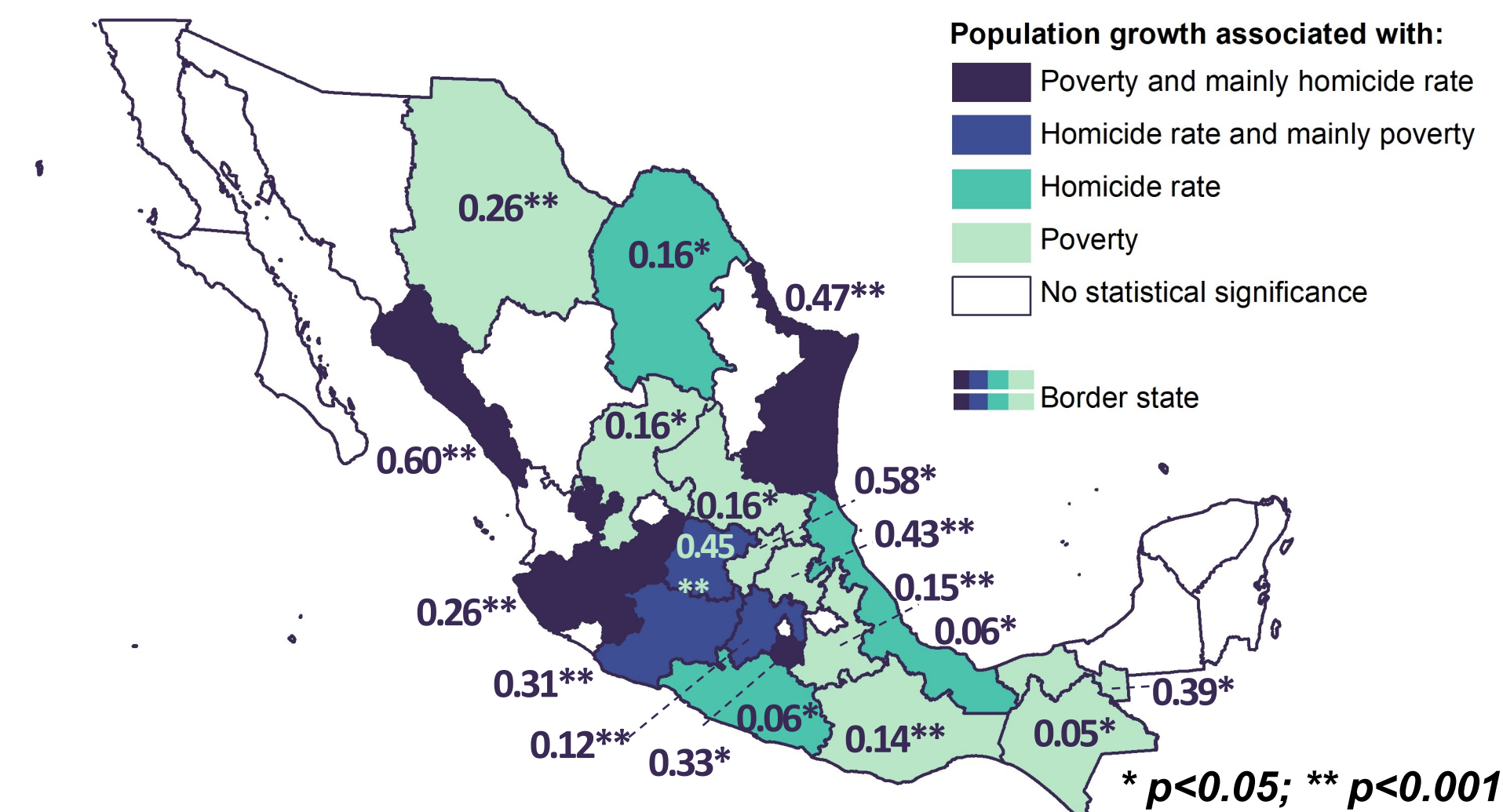
**Fig. 4 Relationship between municipal annual population growth rate and homicide rate**



\*  $p < 0.05$ ; \*\*  $p < 0.001$

Variations in poverty and homicide rates together explained population growth in seven states. Poverty rate alone was associated with population growth in nine states and homicide rate in three states (**Fig. 5**). The cases of Sinaloa and Tamaulipas stand out, where the variations in poverty and mainly homicides, explained 60% and 47% of the variations in population growth.

**Fig. 5. Adjusted R<sup>2</sup> scores from linear regression by state**



## Discussion

Poverty and violence may affect the population growth and depopulation of municipalities, although this is observed only in some states, while in others the growth is explained by other variables not considered in this study.

When considering homicides as indicator, it is shown that the increase in violence in the country not only has implications in terms of security and psychosocial matters, but also has an impact on the national demographic dynamics. It might be suggested that effects of violence in growth, and specially depopulation could be related with migration and even forced displacement.

Finally, in this study absolute population growth was considered, future research could address the effects of poverty and violence in specific components of growth, such as fertility, migration and age structure. Also, it is needed to consider the territory, for which a special lag model or a spatial error model could be employed.

## References

- Aburto, J. M., & Beltrán-Sánchez, H. (2019). Upsurge of Homicides and Its Impact on Life Expectancy and Life Span Inequality in Mexico, 2005–2015. *American Journal of Public Health*, 109(3), 483–489. <https://doi.org/10.2105/AJPH.2018.304878>
- CONAPO, & UNFPA. (2019). *La violencia como causa de desplazamiento interno forzado. Aproximaciones a su análisis en México*. <https://mexico.unfpa.org/es/publications/la-violencia-como-cause-de-desplazamiento-interno-forzado>