

Place-based inequities in cigarette smoking across the USA

There are inequities in the way that smoking prevalence has declined across US communities.¹ In 2021, the Population Level Analysis and Community Estimates (PLACES)²—a collaboration between the US Centers for Disease Control and Prevention (CDC) and the Robert Wood Johnson Foundation—released estimates of smoking prevalence across all US census tracts, allowing these inequities to be quantified. Using methods developed for analyses of census tracts in the 500 largest US cities,³ we characterised inequities in cigarette smoking both between and within US states and in relation to state smoking prevalence.

METHODS

PLACES provides model-based estimates of health indicators from the 2019 Behavioral Risk Factor Surveillance Survey (BRFSS) at census-tract level.² A census tract is generally smaller than a city, larger than a block group and a fairly permanent subdivision of a county. We analysed the census-tract prevalence estimates of adult (18+ years) self-reported current smoking for all census tracts with available estimates (N=70 338). We also obtained state-level estimates of adult self-reported current smoking made by the CDC using the 2019 BRFSS.⁴ New Jersey did not participate in the 2019 BRFSS and was omitted from analysis.

We calculated intraclass correlation coefficients to summarise smoking prevalence inequities within and between US states using a linear mixed model, with smoking prevalence entered as the outcome variable and random effect term for state to summarise the proportion of variance occurring between states. We also calculated the Gini coefficients to quantify the dispersion of smoking prevalence between census tracts within each state (where 0=perfect equity and 1=maximal inequity) and a Pearson's *r* statistic to compare the association between state-level smoking prevalence and inequity—as measured by the Gini coefficients—across census tracts within the state.⁵ All analyses were performed in R V4.1.1.

RESULTS

Inequities in smoking prevalence between census tracts were greater within states (71.9% of the total variation) than

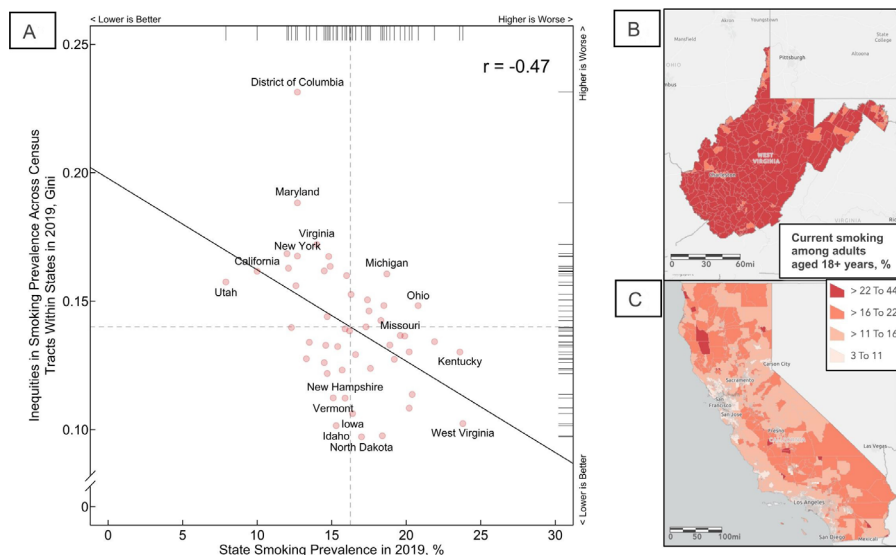


Figure 1 Place-based inequities in smoking prevalence and their association with overall cigarette smoking prevalence. (A) All US states had at least some inequity in smoking prevalence across census tracts (Gini coefficients ≥ 0.10), but inequities were greater among states with lower cigarette consumption (Pearson's $r = -0.47$). (B) West Virginia presents an example of a state where inequity was lower because nearly all census tracts had high smoking prevalence. (C) By contrast, California presents an example of a state that has lowered its overall smoking prevalence but continues to face inequities in smoking prevalence.

between states (28.1% of the total variation) (analyses not shown) and were greater among states with lower smoking prevalence (Pearson's $r = -0.47$) (figure 1A). For instance, in 2019, West Virginia (figure 1B) had the highest smoking prevalence of any US state (23.8%) and this high smoking was shared relatively uniformly across census tracts (Gini=0.10), while California (figure 1C) had one of the lowest smoking prevalence of any US state (10.0%), but greater inequity (Gini=0.16). Some census tracts within low smoking states had a smoking prevalence higher than that of high smoking states. For example, although the overall prevalence in California was low (10.0%), 42 of its census tracts had prevalence estimates above that of West Virginia (23.8%).

DISCUSSION

These results suggest that there may be geographically defined pockets of resistance to successful Tobacco Control Programs that have discouraged state-wide smoking rates. However, a limitation is that these findings are based on model-based estimates of smoking prevalence⁶ and need corroboration by additional surveillance, as well as studies to identify whether such inequities result from markedly different demographics or culture to the majority state community. The California Tobacco Control Program has recognised these inequities and put

a high priority on increasing support for local coalitions in their efforts to implement interventions that may change social norms.⁷ The diffusion of innovations theory⁸ suggests that inequities usually accompany successful programmes and that a key evaluation component for these programmes needs to focus on their second phase, which must be to close the gaps in progress across communities and other social groupings.⁹

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Contributors ECL developed the concept for the study and performed the analytic calculations. All authors contributed to the interpretation of the results and the final version of the manuscript.

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