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Place-based Inequities in Cigarette Smoking Across the United States

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There are inequities in the way that smoking prevalence has declined across US communities.¹ In 2021, the PLACES project² – a collaboration between the United States (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 characterized inequities in cigarette smoking both between and within US states and in relation to state smoking prevalence.

Methods

The PLACES Project 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 analyzed 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 (ICC) to summarize smoking prevalence inequities within and between US states using a linear mixed model with smoking prevalence entered as the outcome variables and random effect term for state to summaries the proportion of variance occurring between states. We also calculated 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 version 4.1.1.

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ECL: conceptualisation, software, methodology, formal analysis, visualisation, supervision, project administration, funding acquisition, data curation. All authors: validation, investigation, resources, writing—original draft preparation, writing—review and editing.

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Results

Inequities in smoking prevalence between census tracts were greater within states (71.9% of the total variation) than 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 statewide 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 recognized 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 programs and that a key evaluation component for these programs needs to focus on their second phase which must be to close the gaps in progress across communities and other social groupings.⁹

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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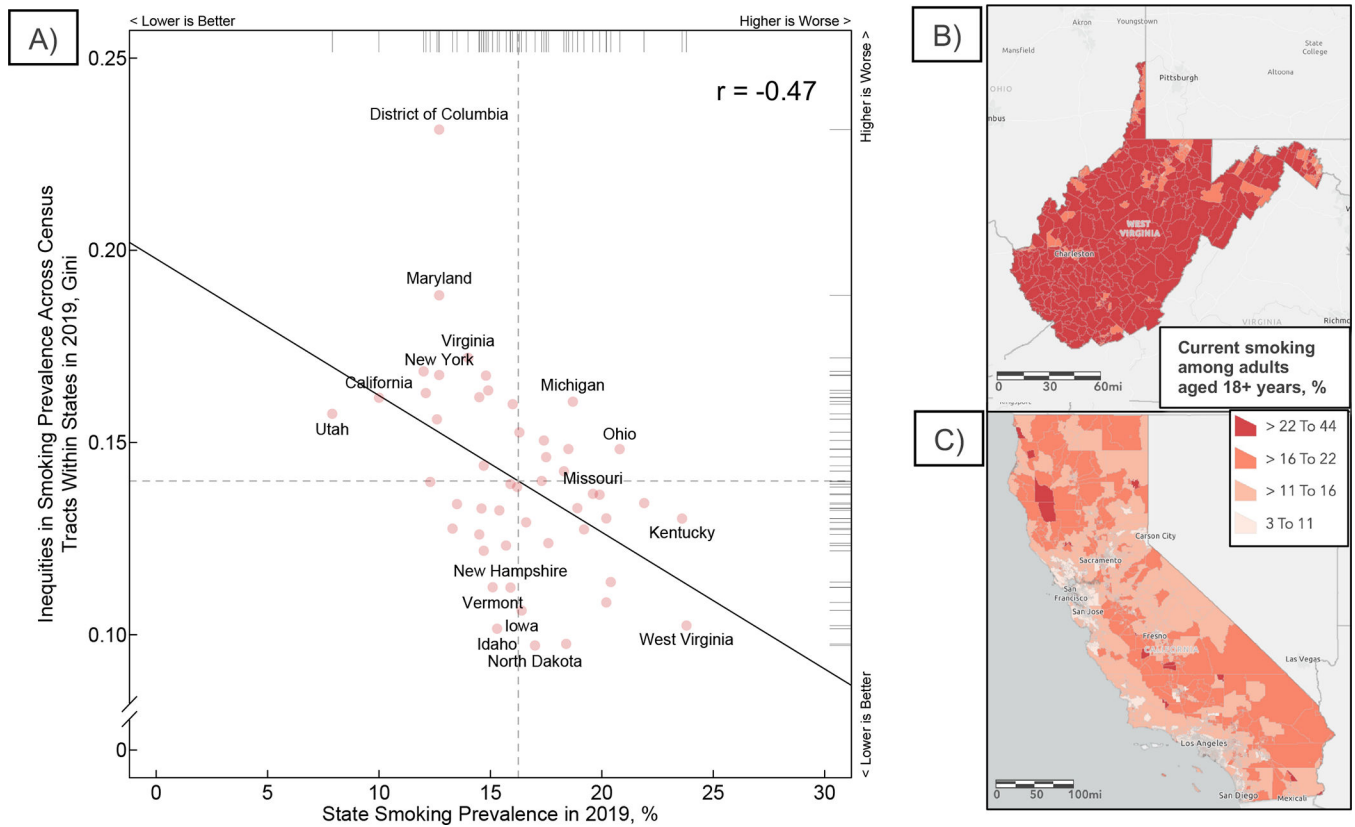


Figure 1. Place-based Inequities in Smoking Prevalence and Their Association with Overall Cigarette Smoking Prevalence

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.