**Analysis Plan for the Impact of the 2016 California state tobacco retail licensing fee increase on retail store density and sociodemographic differences**

**Overview**

The goal of this study is to investigate the impact of the 2016 California state tobacco retail licensing fee increase on tobacco use, and differences in the relationship by city-level sociodemographic (SD) characteristics.

**Data sources.** There will be two primary data sources for the outcome and exposure measures. Retail store density data will be obtained from the **California Retail store density data.**

We will control for other city-level policies including licensing and pharmacy bans which will be obtained from the **American Lung Association (ALA) State Tobacco Control Report for 2011-2021.** The policy data and density data will be matched at the city level for all California cities.

Other data sources for control variables will be the American Community Survey (ACS) for the city-level SD covariates. These include estimates for the percentage of population living below the federal poverty level, percent college education, and percent minority population. The impact of the licensing fee increase on retail store density will be analyzed at the city level.

**Measures:**

*Outcome measure -* ***Retail density****:* Here, we can calculate the total number of tobacco retailers in each city using geocodes in the NETS data, then divide this figure by the total population in the city and multiply by 1000 (i.e., retailers per 1000 persons).

*Policy exposure measure* ***– Policy exposure*** was measured as the pre- post- implementation variable to indicate the period before (before 2017=0) and after (2017 and after=1) the licensing fee increase. The policy was introduced in 2016 but the implementation was effective on January 1, 2017.

*City-level sociodemographic covariates*: ***education*** - percentage of those with a college degree or more, ***poverty*** – percent of population living below the federal poverty level, and ***race*** - percentage of Black and Hispanic minority population) education and race.

For the policy interaction measures (described below); ***education*** will be categorized into 1) cities with a higher than 50% college-educated residents and 2) cities with 50% or lower college-educated residents; ***poverty*** will be categorized into 1) communities with a higher than 50% population living below the federal poverty level and 2) communities with 50% or lower population living below the federal poverty level; ***race/ethnicity*** will be categorized as 1) communities with a higher than 50% minority population and 2) communities with a 50% or lower minority population.

*Policy interaction measure:* There will be an interaction measure between the pre- and post-policy variables and the community SD categories (described above) to test for effect modification by SD differences.

*Policy covariates:* ***Local*** (city and unincorporated county) ***retail policies***. For the local retail policy covariates: ***Licensing*** and ***pharmacy*** – the ALA grades for both policies are scored by strength from 0 (no ordinance) to 4 (strongest ordinance).

**Statistical Analyses plan**

This analysis will test for differences in retail density before and after the 2016 CA licensing fee increase.

1. First, we will calculate the mean tobacco retailer density estimates annually, as well as pre-and post-policy.
2. Then, we will be using a quasi-experimental time series design, specifically, an interrupted time-series model, where the pre-intervention (2011-2016) period serves as the control and the post-intervention (2017-2021) period serves as the intervention. For model stability, we will restrict cities in this study to those with population estimates of 5000 or more residents, approximately XXX cities.
3. Three additional models will test the association in separate models with multiplicative interactions between policy and SD covariates (race/ethnicity, poverty, education), examining the potential for effect modification while controlling for all the covariates.
4. For sensitivity tests, we could also estimate separate mixed-effect models, pre- and post-policy, to examine associations while accounting for the city-level clusters and include all cities.

Data management and statistical analyses will be performed in Stata, version 17. Analyses will account for population weighting inherent (replicate weighting) in the ascertainment of study participants.