Cannabis Retail Access and Binge Drinking in Pre-Commercialization Baltimore

A Shared Geography of Racialized Economic Segregation

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Introduction

Background

Cannabis and alcohol may function as substitutes or complements[1]; dispensary proximity may serve as a spatial proxy for neighborhood-level cannabis market exposure[2].

Policy Context

Maryland legalized adult-use cannabis in July 2023; spatial equity of retail siting is a pressing environmental justice concern[3].

Research Gap

The structural basis of dispensary-binge drinking co-clustering remains unclear at the census tract level in pre-commercialization settings.

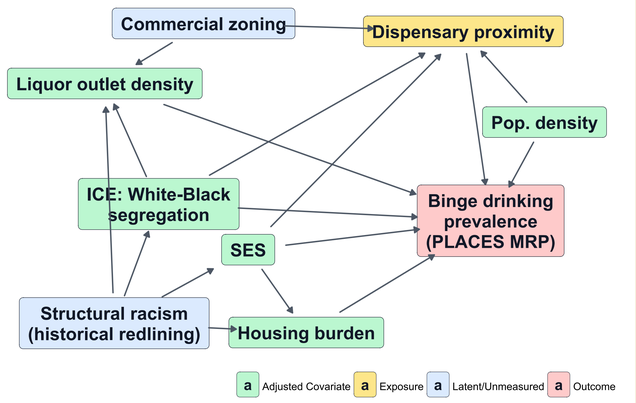
Objective

To describe the pre-commercialization co-clustering of medical dispensaries and binge drinking in Baltimore City and establish a baseline for spatial equity monitoring following adult-use commercialization.

Methods

Study Design	Cross-sectional ecological analysis; n = 194 of 200 Baltimore City census tracts (6 excluded due to missing PLACES estimates or covariate data)
Exposure	Gaussian distance-decay proximity to nearest medical dispensary Primary bandwidth: 1.0 km (sensitivity: 0.5, 2.0 km)
Outcome	Binge drinking prevalence (CDC PLACES 2025; modeled from BRFSS 2022–23 via multilevel regression and poststratification (MRP))
Covariates (sequential, M0-M5)	Index of Concentration at the Extremes (ICE) [4], SES, demographics, housing burden, liquor outlet density
Analysis	Sequential OLS regression with robust standard errors; spatial autocorrelation analysis (Moran's I); spatial model sensitivity analyses (SEM, SLM)
Data Sources	CDC PLACES 2025, ACS 2019-2023, Maryland Cannabis Administration (dispensary), Open Baltimore (liquor licenses)

Figure 1. Directed Acyclic Graph (DAG) depicting hypothesized relationships among dispensary proximity, binge drinking prevalence, and structural covariates.



Results

Unadjusted Co-Clustering of Dispensaries and Binge Drinking

- Dispensary proximity and binge drinking prevalence share a similar spatial distribution across Baltimore City census tracts (Figures 2-3).
- Their unadjusted association is positive across all three bandwidth specifications (Figure 4).

Figure 2-3. Spatial co-clustering of cannabis dispensary proximity and binge drinking prevalence. White points = licensed medical dispensaries.

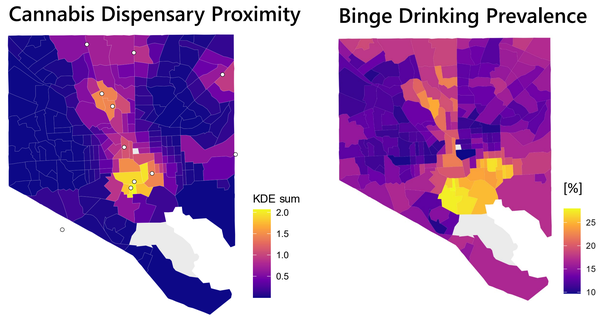
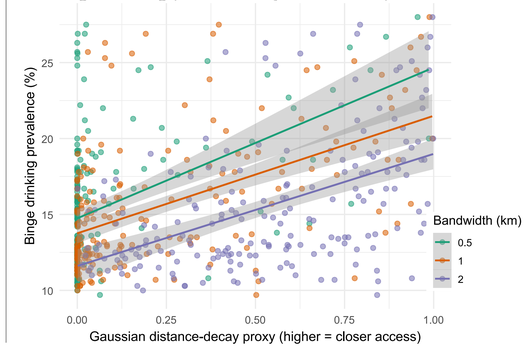


Figure 4. Unadjusted association between dispensary proximity and binge drinking prevalence by bandwidth specification.



Sequential Adjustment Attenuates the Association

- ICE (White-Black economic segregation) = (affluent white − poor Black residents) / total population (Figure 5).
- **Dispensary proximity coefficient attenuated 94.9% from M0 to M5; largest single step at ICE entry (−66%), robust across all bandwidth specifications.**
- Spatial model specifications (SEM/SLM: β ≈ 0.41) and no residual spatial autocorrelation (Moran's I = 0.012, p = 0.34) confirm robustness.

Figure 5. Index of Concentration at the Extremes (ICE) score distribution across Baltimore City.

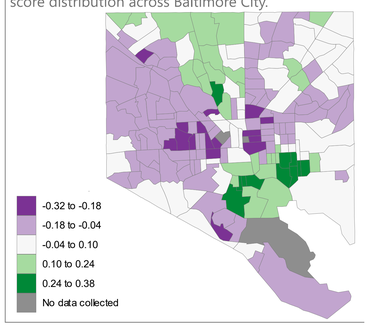
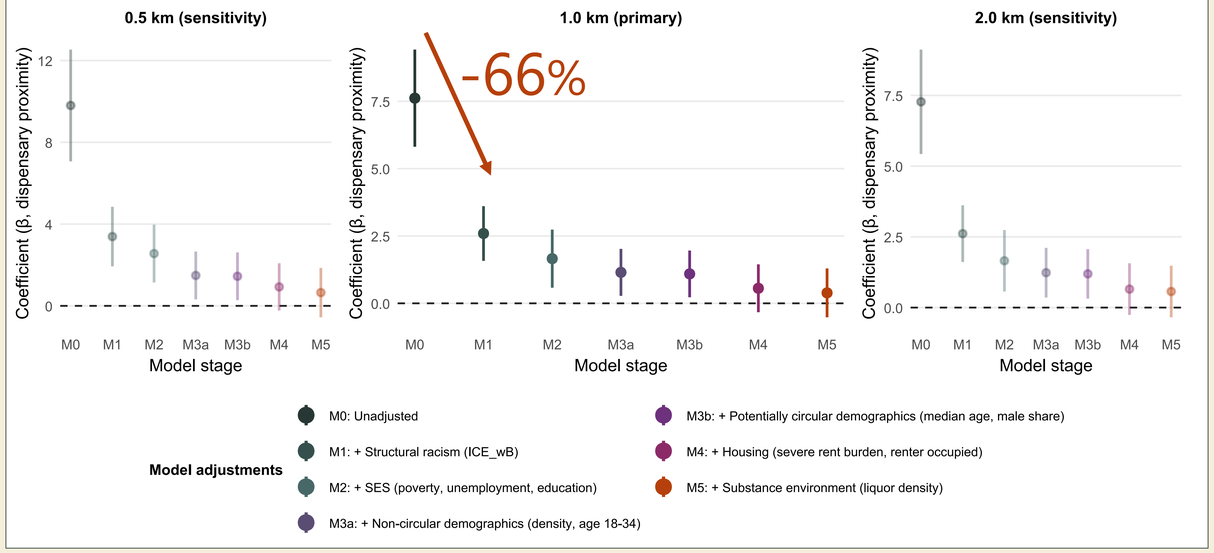


Figure 6. Sequential OLS model coefficients (M0–M5) for dispensary proximity across bandwidth specifications (0.5, 1.0, 2.0 km); error bars = 95% CI.
(M3a vs M3b assesses potential circularity from MRP poststratification covariates)



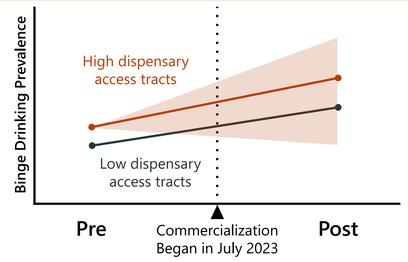
Discussion

- Upstream structural factors dominate over proximal environmental exposures, consistent with Fundamental Cause Theory[5].
- The attenuation pattern is consistent with shared neighborhood disadvantage patterned by Baltimore's history of racial redlining, with ICE serving as a contemporary proxy for its enduring segregation[4,6].
- MRP covariate reintroduction (M3a → M3b) produced <1.2% coefficient change, indicating outcome measurement is unlikely to account for observed attenuation.
- Residual confounding by unmeasured factors (e.g., commercial zoning) and the use of proximity as a proxy for cannabis exposure are inherent limitations of this ecological design.
- Findings align with environmental justice literature on racialized retail siting of alcohol and cannabis outlets[3,7].

Conclusion / Future Directions

- The spatial co-clustering of cannabis dispensaries and binge drinking in pre-commercialization Baltimore reflects shared structural disadvantage rather than an independent dispensary effect, **underscoring the need for equity-centered approaches to cannabis retail siting**.
- Future quasi-experimental analyses (such as Difference-in-Differences design: Figure 7) leveraging Maryland's adult-use rollout can assess whether commercialization exacerbates spatial inequities and inform environmental justice-centered zoning policy.

Figure 7.
Graphical concept of a Difference-in-Differences analysis.
This study establishes the pre-commercialization baseline; whether the gap in binge drinking prevalence widens or narrows post-commercialization remains to be assessed.



References

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