

Appendices

Unequal access: cross-sectional associations of deprivation, racial composition, and independent and joint cannabis and alcohol outlet densities among Michigan census block groups

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Appendix Results:

Appendix Table 1. Characteristics of the analytic sample of Michigan census block groups, 2023 (n=7,988)

Characteristic	Median (IQR)
Population	1,142 (718)
Cannabis Outlet Density (per 1,000 people)	0.00 (0.00)
Rate of Cannabis Outlets within a One-mile Buffer, among Block Groups with at Least One Cannabis Outlet	2.09 (3.07)
Alcohol Outlet Density (per 1,000 people)	1.07 (2.50)
Rate of Alcohol Outlets within One-mile Buffer among Block Groups with at Least One Alcohol Outlet	15.36 (22.69)
Area Deprivation Index	5.50 (5.00)
Rate of Non-White Block Group Population (per 10 people)	1.42 (2.92)
Urban, n (%)	5,829 (72.97%)
Length of Roadway (Kilometers)	13.40 (27.33)

Appendix Table 2. Spatially unadjusted and independent associations of area deprivation index, percent of non-White block group population, and cannabis and alcohol outlet density among Michigan census block groups (n=7,988)

	Cannabis Outlet Density	Alcohol Outlet Density
	Incident Rate Ratio (95%CI)	Incident Rate Ratio (95%CI)
Area Deprivation Index	1.26 (1.18, 1.35)	1.07 (1.05, 1.09)
Spatially Lagged Area Deprivation Index	1.12 (1.04, 1.21)	1.01 (0.98, 1.03)
Rate of Non-White Block Group Population (per 10 people)	1.04 (0.97, 1.12)	0.95 (0.92, 0.97)
Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	0.82 (0.75, 0.89)	0.97 (0.94, 0.99)
Akaike Information Criterion (AIC)	4,846.61	31,065.34
Moran's I	0.13	0.14

Cannabis outlet density includes medical and adult-use cannabis outlets.

Negative binomial regressions include a census block group population offset and a covariate for urbanicity.

Bold font indicates a statistically significant incident rate ratio at $\alpha=0.05$

Abbreviations: CI=confidence interval

Appendix Table 3. Independent associations of area deprivation index, percent of non-White block group population, and cannabis outlet density, by type of outlet, among Michigan census block groups (n = 7,988)

	Medical Cannabis Outlet Density	Adult-Use Cannabis Outlet Density	Both Medical and Adult-Use Outlet Density
	Incident Rate Ratio (95%CI)	Incident Rate Ratio (95%CI)	Incident Rate Ratio (95%CI)
Area Deprivation Index	1.29 (0.99, 1.69)	1.22 (1.13, 1.32)	1.26 (1.14, 1.40)
Spatially Lagged Area Deprivation Index	1.05 (0.77, 1.44)	1.13 (1.00, 1.26)	1.08 (0.95, 1.23)
Rate of Non-White Block Group Population (per 10 people)	1.15 (0.90, 1.46)	1.05 (0.96, 1.15)	1.02 (0.91, 1.14)
Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	1.07 (0.81, 1.43)	0.88 (0.77, 0.99)	0.91 (0.79, 1.05)
Akaike Information Criterion (AIC)	463.28	3,374.03	2,001.48
Moran's I	0.03	0.06	0.06

Negative binomial regressions include a census block group population offset, a 2-dimension thin-plate smoothing spline, and a covariate for urbanicity.

Bold font indicates a statistically significant incident rate ratio at $\alpha=0.05$

Abbreviations: CI=confidence interval

Appendix Table 4. Independent associations of area deprivation index, percent of non-White block group population, and alcohol outlet density, by type of outlet, among Michigan census block groups (n = 7,988)

	On-Premises Alcohol Outlet Density	Off Premises Alcohol Outlet Density
	Incident Rate Ratio (95%CI)	Incident Rate Ratio (95%CI)
Area Deprivation Index	1.04 (1.01, 1.07)	1.09 (1.06, 1.11)
Spatially Lagged Area Deprivation Index	0.93 (0.90, 0.97)	0.96 (0.93, 0.99)
Rate of Non-White Block Group Population (per 10 people)	0.93 (0.91, 0.96)	0.95 (0.93, 0.97)
Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	0.98 (0.94, 1.02)	1.00 (0.97, 1.03)
Akaike Information Criterion (AIC)	21,872.88	28,400.59
Moran's I	0.11	0.09

Negative binomial regressions include a census block group population offset, a 2-dimension thin-plate smoothing spline, and a covariate for urbanicity

Bold font indicates a statistically significant incident rate ratio at $\alpha=0.05$

Abbreviations: CI=confidence interval

Appendix Table 5. Average census block group area deprivation index and rate of non-White population by cannabis and alcohol co-density category, calculated using cut offs at the 75th percentile (n=7,988)

	Area Deprivation Index	Rate of Non-White Population (per 10 people)
	(Mean, SD)	(Mean, SD)
High-Cannabis/High-Alcohol (n=363)	7.52 (2.84)	3.91 (3.11)
High-Cannabis/Low-Alcohol (n=100)	7.50 (2.32)	3.52 (3.16)
Low-Cannabis/High-Alcohol (n=1,607)	6.09 (2.89)	3.53 (3.09)
Low-Cannabis/Low-Alcohol (n=5,918)	5.10 (2.75)	2.19 (2.51)
Entire State (n=7,988)	5.50 (2.87)	2.58 (2.76)

Abbreviations: SD=standard deviation

Appendix Table 6. Results from multinomial logistic regressions examining relationships between structural social vulnerability measures and cannabis and alcohol co-density categories, calculated using cut offs at the 75th percentile (n=7,988)

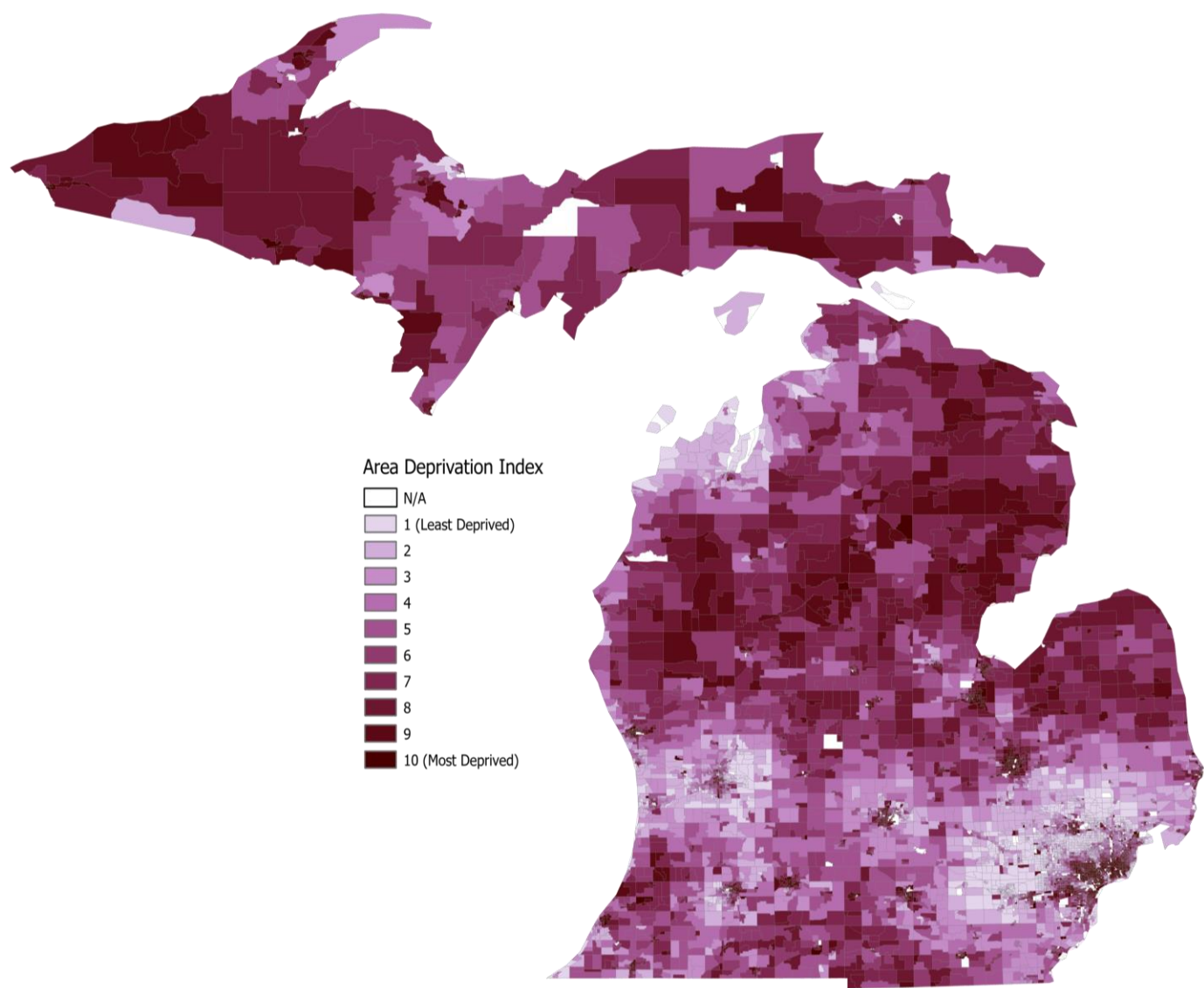
Reference Group	Structural Social Vulnerability Independent Variable	High-Cannabis/ High-Alcohol Relative Risk Ratio (95%CI)	High-Cannabis/ Low-Alcohol Relative Risk Ratio (95%CI)	Low-Cannabis/ High-Alcohol Relative Risk Ratio (95%CI)
Low-Cannabis/ Low-Alcohol	Area Deprivation Index	1.13 (1.03, 1.24)	1.06 (0.97, 1.16)	0.95 (0.83, 1.10)
	Spatially Lagged Area Deprivation Index	1.93 (1.70, 2.20)	1.59 (1.39, 1.81)	0.98 (0.83, 1.17)
	Rate of Non-White Block Group Population (per 10 people)	0.83 (0.77, 0.89)	0.94 (0.87, 1.02)	0.91 (0.82, 1.02)
	Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	1.00 (0.90, 1.11)	1.03 (0.92, 1.14)	1.21 (1.05, 1.40)
Low-Cannabis/ High-Alcohol	Area Deprivation Index	1.14 (1.01, 1.28)	1.08 (0.95, 1.22)	-
	Spatially Lagged Area Deprivation Index	1.71 (1.44, 2.02)	1.45 (1.21, 1.73)	-
	Rate of Non-White Block Group Population (per 10 people)	0.93 (0.83, 1.03)	1.05 (0.94, 1.18)	-
	Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	0.95 (0.82, 1.10)	0.97 (0.83, 1.13)	-
High-Cannabis/ Low-Alcohol	Area Deprivation Index	1.07 (1.02, 1.12)	-	-
	Spatially Lagged Area Deprivation Index	1.21 (1.13, 1.29)	-	-
	Rate of Non-White Block Group Population (per 10 people)	0.87 (0.83, 0.92)	-	-
	Spatially Lagged Rate of Non-White Block Group Population (per 10 people)	0.96 (0.90, 1.03)	-	-

Multinomial logistic regressions include a 2-dimension thin-plate smoothing spline and a covariate for urbanicity.

Bold font indicates a statistically significant relative risk ratio at $\alpha=0.05$

Abbreviations: CI=confidence interval

Appendix Figure 1. Area Deprivation Index (ADI) within Michigan census block groups, 2023 (n=7,988)



Appendix Figure 2. Rate of non-White population within Michigan census block groups, 2023
(n=7,988)

