

Association between Availability and Proximity of Recreational Cannabis Retailers and Adolescent Cannabis Use

Kai-Wen Cheng

kcheng@govst.edu

Governors State University

Junyao Yang

Governors State University

Research Article

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Abstract

Objectives

This study examined cannabis use among 8th-, 10th-, and 12th-grade students in Illinois following adult recreational cannabis legalization and assessed whether recreational cannabis dispensary (RCD) availability and proximity were associated with adolescent cannabis outcomes.

Study Design

Repeated cross-sectional study.

Methodology

Data came from the 2020 and 2022 Illinois Youth Survey, a biennial survey of Illinois public school students. RCD data, including licensing dates and locations, were obtained from the Illinois Cannabis Regulation Oversight Officer website. Measures of RCD access included ZIP code-level availability, population exposure, density, and estimated travel distance and time to the nearest RCD. Logistic regression models examined associations of RCD availability and proximity with perceived cannabis access, current and heavy cannabis use, adjusting for individual and contextual factors.

Results

Compared with adolescents residing more than 30 minutes from the nearest RCD, those residing 15–30 minutes away were more likely to report perceived easy access. Similarly, those residing within 15 minutes or 3–10 miles of the nearest RCD were more likely to report past-30-day cannabis use than those residing more than 30 minutes or more than 10 miles away, respectively. RCD availability and proximity were not associated with heavy cannabis use.

Conclusion

Selected measures of retailer proximity were associated with perceived cannabis access and current use, but not heavy use, among Illinois adolescents. Overall, the findings provided some evidence of a potential spillover association between geographic accessibility and adolescent cannabis access and use following legalization, although the observed associations do not establish causality.

1. INTRODUCTION

Cannabis use remains common among adolescents in the United States. In 2024, past 30-day use was 4.3% among 8th graders, 9.5% among 10th graders, and 16.2% among 12th graders, with post-pandemic trends remaining relatively stable.^[1] Adolescent cannabis use is a persistent public health concern due to its links with impaired cognition, mental health problems, risky behaviors, and long-term adverse health and social outcomes.^[2–4]

As of 2025, recreational cannabis use is legal for adults in 24 states and the District of Columbia, including Illinois, which legalized adult-use cannabis in 2020. Adults aged 21 and older may purchase and possess limited amounts from licensed retailers. Despite state-level legalization, cannabis remains a Schedule I substance under federal law. Debate over recreational cannabis legalization (RCL) is partly driven by concerns about potential increases in adolescent use and related harms.^[5] While prior studies consistently show increases in adult use following RCL, evidence for adolescents is mixed.^[6–9]

Legal cannabis market expansion may affect adolescents through greater availability, lower perceived harm, and increased social acceptability.^[10, 11] Although minors cannot legally purchase cannabis, RCL may still influence use through multiple pathways: normalization and increased acceptability,^[11–13] expanded marketing exposure and use intentions,^[14, 15] and diversion from adults who legally purchase cannabis.^[16, 17] Conversely, regulated markets may reduce youth access by

replacing illicit markets with licensed dispensaries that enforce age verification and regulate sales.^[18, 19] These mechanisms may operate simultaneously in opposing directions.

Evidence on cannabis retail environments and adolescent use remains limited and inconsistent. Studies from states such as California, Colorado, and Washington report positive, null, and context-dependent associations between retailer availability, density, proximity, and youth use.^[11, 20–23] Evidence from Illinois remains particularly limited despite rapid post-legalization retail expansion.

This study examines cannabis use among Illinois 8th, 10th, and 12th graders following RCL and assesses whether dispensary availability, density, and proximity are associated with perceived access and use. It also evaluates whether associations may operate through perceived risk, social acceptability, and ease of access. By focusing on a newly legalized and rapidly evolving retail environment, our study provides updated evidence on cannabis retail exposure and adolescent use in Illinois and informs ongoing policy and research discussions on youth outcomes in legalized markets.

2. METHODS

2.1 Data

We used data from the 2020 and 2022 Illinois Youth Surveys (IYS), biennial self-reported, school-based surveys of 8th, 10th, and 12th graders funded by the Illinois Department of Human Services. The sampling frame included Illinois public schools serving these grades, excluding schools with fewer than 16 eligible students, non-standard grade configurations, and specialized schools (e.g., vocational, special education, and Department of Corrections schools). This study used the voluntary IYS dataset, which includes participating schools and students. The survey collected information on demographics, socioeconomic status, health behaviors, substance use, academic performance, and home and school environments. Median household income by ZIP code was obtained from the 2010–2014 American Community Survey.

Licensed adult-use cannabis dispensary data, including store locations and licensing dates, were obtained from the Illinois Cannabis Regulation Oversight Officer (CROO). License dates were used as proxies for opening dates, with dispensaries considered operational from the month of licensure onward.

Respondents' locations were approximated using residential ZIP code centroids from a national latitude–longitude database. Geodesic distances from each ZIP code centroid to all dispensaries were calculated to identify the five nearest dispensary candidates. The Google Maps Distance Matrix API was then used to estimate driving distance and travel time to each candidate, and the nearest dispensary from each ZIP code was identified. The nearest dispensary was defined as the one with the minimum driving distance or travel time. Only dispensaries licensed before each survey year were included to ensure temporal alignment between exposure and survey responses.

2.2 Sample

The sample size for the IYS 2020 and 2022 survey data is 254,687. We excluded those who reported being in 6th (0.52%; N = 1,332), 7th (0.59%; N = 1,497), 9th (10.4%; N = 26,488) and 11th grades (9.01%; N = 22,942) due to the survey is designed for 8th, 10th, and 12th grades only, or those who did not answer their current status of cannabis use (1.7%; N = 4,371), or those who did not provide their residential ZIP code information (4.6%; N = 11,871) or ZIP code is unidentified (0.4%; N = 1,024). After applying the exclusion criteria described above, which were not mutually exclusive and therefore do not sum to the total number of excluded respondents, the final analytic sample included 185,162 respondents from 8th grade (40%; N = 74,901), 10th grade (35%; N = 63,876), and 12th grade (25%; N = 46,385) in Illinois statewide.

2.3 Measures

Dependent (outcome) variables:

Perceived Cannabis Accessibility

Perceived cannabis accessibility was measured by asking, “If you wanted to get some marijuana, how easy would it be for you to get some?” Responses of “Sort of easy” or “Very easy” were classified as perceived easy access; all other responses were classified as no perceived easy access.

Cannabis Use and Heavy Cannabis Use

Past 30-day cannabis use was assessed with the question, “On how many occasions have you used marijuana during the past 30 days?” Any use (≥ 1 –2 occasions) was coded as past 30-day use, and ≥ 20 occasions was coded as heavy use.

Primary Predictors: Cannabis Availability and Proximity

Recreational Cannabis Dispensary (RCD) Availability

RCD crude count referred to the number of RCDs within a ZIP code, RCD population exposure to the number of RCDs per capita within a ZIP code, and RCD density to the number of RCDs per square mile within a ZIP code.

RCD Proximity

Two proximity measures were computed: travel distance, the driving distance to the nearest RCD by vehicles, and the travel time to the nearest RCD by vehicles. Travel distance was classified by < 3 miles, 3–10 miles, and > 10 miles. Travel time was classified by < 15 minutes, 15–30 minutes, and > 30 minutes.

Social Acceptability of Adolescent Cannabis Use

Social acceptability of adolescent cannabis use was measured with the question, “How wrong would most adults (over 21) in your community think it is for kids to use marijuana?” Responses of “Not wrong at all” were coded as high social acceptability; all other responses were coded as low social acceptability.

Risk Perception of Cannabis Use

Risk perception of cannabis use was measured with the question: “How much do you think people risk harming themselves (physically or in other ways) if they use marijuana once or twice a week?” Respondents who reported “Great risk” were categorized as reporting high risk perception of cannabis use, while all other responses were categorized as low risk perception of cannabis use.

Individual Covariates: Socio-demographic Characteristics of Individuals, Households, and Schools

Socio-demographic and psychosocial characteristics used to predict substance use included gender (male, female, other), grade (8th, 10th, 12th), and race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian and Other). Self-reported feelings of depression were coded as 1 if participants answered “Yes” to the question, “During the past 12 months, did you ever feel so sad or hopeless almost every day?” and 0 otherwise. Having family substance use rules was coded as 1 if participants agreed that their family had clear rules about alcohol or drug use, and 0 otherwise. c use was coded as 1 if participants believed using e-cigarettes, cigarettes, alcohol, or cannabis would make them look cool, and 0 otherwise. Good academic grades were coded as 1 for mostly A’s/B’s and 0 for mostly C’s or lower. Past 30-day alcohol use was coded as 1 if participants reported any use, and 0 otherwise. Urban versus rural residence was defined by county, with residents of Winnebago, McHenry, Lake, DeKalb, Kane, Kendall, DuPage, Cook, Will, Kankakee, Peoria, Tazewell, McLean, Champaign, Vermilion, Sangamon, Madison, and St. Clair classified as urban, and all others as rural. Median household income by residential location was categorized as <\$30,000, \$30,000–58,000, \$58,000–94,000, \$94,000–150,000, and $\geq$ \$150,000.

2.4 Statistical Analysis

Descriptive analyses were conducted to examine adolescents’ demographic, social, behavioral, and cannabis use characteristics, as well as travel distance and time to the nearest dispensary, in 2020, 2022, and the pooled sample. Logistic regression models were used to assess associations between these factors and perceived cannabis accessibility, past 30-day use, and heavy use, including risk perception, social acceptability, and dispensary availability and proximity. Standard errors were clustered at the ZIP code level to account for within-area correlation. RCD availability measures (count, exposure, and density) were log-transformed to reduce skewness and improve distributional normality.

3. RESULTS

3.1 Summary Statistics

Table 1 presents descriptive statistics for Illinois 8th, 10th, and 12th graders in 2020, 2022, and the pooled sample. Overall, 10.36% reported past 30-day cannabis use, declining from 12.18% in 2020 to 9.0% in 2022. Heavy use was reported by 2.31%, decreasing from 2.77% to 1.99% over the same period. The sample was 48% male, 49% female, and 3% missing/other gender, with 40% in 8th grade, 35% in 10th, and 25% in 12th. Racial/ethnic composition was 62% White, 10% African American, 20% Hispanic, and 8% Asian/other. Socioeconomic indicators were stable across years, with most adolescents living in ZIP codes with median household income between \$58,000–\$94,000 (46%), followed by \$30,000–\$58,000 (38%), \$94,000–\$150,000 (13%), <\$30,000 (2%), and ≥\$150,000 (1%).

About 36% reported depressive feelings, 70% earned mostly A/B grades, 24% perceived substance use as “cool,” 21% reported past 30-day alcohol use, and 82% reported family substance use rules. Perceived easy access to cannabis was 31% overall, declining from 36% in 2020 to 28% in 2022. Perceived high risk remained stable (37–38%), while perceived social acceptability declined from 4.3% to 3.5%.

Retail access increased over time. The share of residents living within 15 minutes of a dispensary rose from 36.2% in 2020 to 54.9% in 2022, while the share living more than 30 minutes away declined. Similarly, the proportion of living within 3 miles increased from 13.5% to 24.5%, while those beyond 10 miles decreased from 48.0% to 32.2%.

Figure 1 shows a clear shift in dispensary proximity from 2019 to 2022. Over time, a larger proportion of Illinois adolescents in the sample resided closer to licensed dispensaries, with a steady decline in the share living more than 10 miles away and a corresponding increase in those living within 3–10 miles. By 2022, the distribution shifted toward mid-range proximity (3–10 miles), reflecting rapid retail expansion and geographic saturation across Illinois. Figure 2 shows similar trends in travel time. The proportion of adolescents living within a 15-minute drive increased steadily, while those living more than 30 minutes away declined substantially. The 15–30 minute category remained relatively stable, indicating that changes were driven mainly by shifts from low-access to higher-access areas. By 2022, most adolescents lived within a 15–30 minute drive or less, reflecting substantially improved statewide geographic accessibility.

3.2 Regression Analysis

Three sets of logistic regression models examined perceived easy access to cannabis, past 30-day use, and past 30-day heavy use, each estimated with six specifications incorporating different RCD availability and proximity measures (Tables 2–4).

Perceived Easy Access to Cannabis

As shown in Table 2, adolescents in 2022 had lower odds of reporting easy access than those in 2020 (aOR: 0.67; 95% CI [0.64, 0.70]). Females were less likely than males to report easy access (aOR: 0.85; 95% CI [0.82, 0.88]). Lower odds were also observed for adolescents perceiving high risk (aOR: 0.35; 95% CI [0.33, 0.36]), with stronger academic performance (aOR: 0.88; 95% CI [0.85, 0.91]), family substance use rules (aOR: 0.75; 95% CI [0.73, 0.91]), and higher-income ZIP codes (\$58k–\$94k: aOR: 0.82; 95% CI [0.73, 0.95]; \$94k–\$150k: aOR: 0.82; 95% CI [0.74, 0.91]).

Higher odds of perceived ease of access were observed among White (aOR: 1.21; 95% CI [1.15, 1.27]), African American (aOR: 1.31; 95% CI [1.22, 1.40]), and Latino adolescents (aOR: 1.20; 95% CI [1.14, 1.27]) compared with Asian/other groups. Depressive feelings (aOR: 1.76; 95% CI [1.71, 1.80]), perceived social acceptability (aOR: 2.40; 95% CI [2.23, 2.58]), viewing substance use as “cool” (aOR: 2.42; 95% CI [2.36, 2.48]), alcohol use (aOR: 2.76; 95% CI [2.68, 2.84]), and higher grade level (10th: aOR: 2.73; 95% CI [2.61, 2.86]; 12th: aOR: 4.50; 95% CI [4.24, 4.78]) were also positively associated with perceived ease of access.

Compared with adolescents living more than 30 minutes from an RCD, those living 15–30 minutes away had higher odds of reporting easy access (aOR: 1.09; 95% CI [1.03, 1.15]), whereas the estimate for those living within 15 minutes was not statistically significant (aOR: 1.09; 95% CI [0.99, 1.20]). Neither the less-than-3-mile category nor the 3–10-mile category was significantly associated with perceived easy access. RCD availability measures were not significantly associated with perceived easy access.

Past 30-Day Cannabis Use

Table 3 shows lower odds of use in 2022 versus 2020 (aOR: 0.78; 95% CI [0.70, 0.87]). Lower odds of use was associated with females (aOR: 0.88; 95% CI [0.84, 0.93]), high risk perception (aOR: 0.19; 95% CI [0.18, 0.20]), stronger academic performance (aOR: 0.52; 95% CI [0.50, 0.54]), family rules (aOR: 0.74; 95% CI [0.70, 0.77]), and higher-income ZIP codes.

Higher odds of use were observed for African American adolescents (aOR: 1.71; 95% CI [1.47, 1.98]), depressive feelings (aOR: 1.95; 95% CI [1.85, 2.06]), perceived social acceptability (aOR: 2.61; 95% CI [2.34, 2.91]), “coolness” perception (aOR: 1.60; 95% CI [1.52, 1.69]), alcohol use (aOR: 7.61; 95% CI [7.07, 8.20]), and higher grade level (10th: aOR: 2.10; 95% CI [1.98, 2.23]; 12th: aOR: 3.14; 95% CI [2.86, 3.45]). Urban residence was also positively associated in some models (aOR: 1.10; 95% CI [1.00, 1.21]).

Compared with adolescents living more than 10 miles from an RCD, those living 3–10 miles away had higher odds of use (aOR: 1.12; 95% CI [1.03, 1.23]), whereas the estimate for those living within 3 miles was not statistically significant (aOR: 1.10; 95% CI [0.97, 1.25]). Compared with those living more than 30 minutes away, adolescents living within 15 minutes had higher odds of use (aOR: 1.13; 95% CI [1.03, 1.24]), whereas the estimate for those living 15–30 minutes away was not statistically significant (aOR: 1.10; 95% CI [0.98, 1.22]). Thus, the associations were limited to selected proximity categories and did not demonstrate a consistent dose-response pattern. RCD availability measures were not significantly associated with past-30-day cannabis use.

Past 30-Day Heavy Cannabis Use

Table 4 shows lower odds of heavy use in 2022 versus 2020 (aOR: 0.85; 95% CI [0.74, 0.98]). Lower odds were observed for females (aOR: 0.58; 95% CI [0.51, 0.67]), Latino adolescents (aOR: 0.77; 95% CI [0.66, 0.91]), high risk perception (aOR: 0.19; 95% CI [0.17, 0.22]), stronger academic performance (aOR: 0.40; 95% CI [0.38, 0.43]), family rules (aOR: 0.73; 95% CI [0.67, 0.79]), and higher-income ZIP codes.

Higher odds of heavy use were observed for White (aOR: 1.18; 95% CI [1.06, 1.32]) and African American adolescents (aOR: 1.37; 95% CI [1.16, 1.63]), depressive feelings (aOR: 1.93; 95% CI [1.82, 2.04]), perceived social acceptability (aOR: 3.31; 95% CI [3.03, 3.63]), “coolness” perception (aOR: 1.44; 95% CI [1.36, 1.53]), alcohol use (aOR: 6.42; 95% CI [5.94, 6.95]), and higher grade level (10th: aOR: 2.32; 95% CI [2.02, 2.65]; 12th: aOR: 3.95; 95% CI [3.44, 4.53]). RCD proximity was not significantly associated with heavy cannabis use. RCD population exposure was also not significantly associated with heavy use. However, greater RCD density was associated with lower odds of heavy use in Models 5 and 6 (aOR: 0.933; 95% CI [0.886, 0.983] and aOR: 0.936; 95% CI [0.883, 0.991], respectively), although the corresponding estimate in Model 1 was not statistically significant. This inverse association should therefore be interpreted cautiously because it was not consistent across all model specifications.

4. DISCUSSION

Our study found that selected RCD proximity measures were positively associated with perceived cannabis access and past 30-day cannabis use among adolescents, but not with heavy cannabis use; broader measures of RCD availability were not significantly associated with these outcomes. By incorporating actual driving distance and travel time, this study improves upon prior proximity measures and better captures real-world retail accessibility. The observed proximity associations are consistent with a possible spillover mechanism, but they do not demonstrate that expansion of adult-use cannabis retail availability caused greater perceived access or current cannabis use among Illinois adolescents. RCD proximity was not associated with heavy cannabis use which may be more strongly shaped by peer networks, social environments, and individual vulnerabilities than by geographic proximity alone.^[24–26]

Swartz et al. (2025) reported that although adolescent cannabis use declined overall following legalization in Illinois, cannabis acquisition patterns shifted over time.^[27] Reliance on social sources, particularly adults, increased, whereas use of illicit market sources declined. Direct purchases from dispensaries remained low and stable at approximately 7%.^[27] Together, our findings suggest that associations between RCD proximity and adolescent cannabis use may operate indirectly through adult social sources and cannabis diversion rather than direct retail purchasing.

Our findings contribute to a limited and mixed literature on cannabis retail environments and adolescent cannabis use. Prior studies from California, Oregon, and Washington report inconsistent associations between retailer density, proximity, and youth cannabis use.^[20–23, 28] Evidence from Illinois remains limited. One pre-legalization Illinois study using 2018 data found lower cannabis use among 10th- and 12th-grade students living in ZIP codes with medical dispensaries.^[29] Other studies suggest that cannabis retailer presence, density, proximity, and advertising exposure may normalize cannabis use, increase perceived acceptability, reduce perceived harm, and increase perceived access among adolescents.^[30–33]

Accordingly, RCD proximity could be associated with adolescent use through changes in perceived risk, social norms, and access pathways. Because our models have adjusted for perceived risk and social acceptability, the observed associations may reflect mechanisms beyond normalization alone. RCD proximity may facilitate adolescents' cannabis access and use indirectly through social sources, such as older peers who may obtain cannabis from RCDs and share it with adolescents, rather than through adolescents' direct purchases. Although the present analyses did not directly test this mechanism, indirect social access may represent a plausible, but unconfirmed, pathway linking RCD proximity to adolescent cannabis access and use. The findings are partially consistent with prior research on tobacco and alcohol retail environments, suggesting that greater retail proximity may increase youth substance use and intentions to use.^[34–36] The variation in estimates across proximity gradients in our study warrants cautious interpretation.

Our study has several limitations. First, cannabis use and perceived access were self-reported and may be subject to social desirability and recall bias. Second, measures of RCD availability and proximity were based on residential ZIP codes and may not fully capture adolescents' exposure in schools or social settings. Third, the study focused only on licensed recreational dispensaries and did not account for other cannabis sources, including home cultivation, illicit markets, online sources, or unlicensed retailers. Fourth, as the IYS data are repeated cross-sectional and respondents were not followed over time, our analyses cannot make causal inferences about the relationship between RCD environment and adolescents' cannabis access and use. Further, other contextual characteristics, such as cannabis taxes, prices, and regulations, may account for part of the observed associations but were not captured or accounted for in the analyses. Finally, RCD availability and proximity measures were based on a 2025 cross-sectional registry and may not fully capture dispensary openings and closures during the study period, which could lead to exposure misclassification.

5. CONCLUSION

Our study found that selected measures of retailer proximity were associated with perceived cannabis access and current use, but not heavy use, among Illinois adolescents. These findings provide some evidence of a potential spillover

association between geographic accessibility and adolescent cannabis access and use following legalization, although causal inferences cannot be made.

DECLARATIONS

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None.

Conflicts of interest/Competing interests

Authors report no conflicts of interest.

Ethics, Consent to Participate, and Consent to Publish: Ethics approval:

This study involved the analysis of secondary data and was reviewed by the Institutional Review Board of Governors State University (IRB Protocol No. IRB-FY2026-77). All study procedures were conducted in accordance with the approved IRB protocol and applicable ethical guidelines. Consent to participate: Not applicable. Consent for publication: Not applicable

Data Availability Statement

The data used in this study were provided by the Center for Prevention Research and Development (CPRD), a unit within the School of Social Work at the University of Illinois Urbana-Champaign. The dataset is not publicly available because it was provided under a Data Use Agreement that restricts redistribution by the authors. Access requests should be directed to CPRD and are subject to approval and applicable data use requirements.

Author Contribution

KWC: Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Writing. JY: Formal analysis; Investigation; Methodology; Writing. All authors reviewed the manuscript.

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TABLES

Table 1. Socio-demographics of the sample, Illinoisan 8th, 10th, and 12th graders, 2020 and 2022 Illinois Youth Survey

Variable	All Years (%)	Year 2020 (%)	Year 2022 (%)
Past 30 Days Cannabis Use	10.36	12.18	9.05
Past 30 Days Heavy Cannabis Use	2.31	2.77	1.99
Gender			
Male	47.57	47.59	47.56
Female	49.27	50.58	48.33
Other	3.16	1.83	4.12
Grade			
8th grade	40.45	41.58	39.64
10th grade	34.50	33.67	35.09
12th grade	25.05	24.75	25.27
Race/ethnicity			
White	61.97	62.92	61.28
African American	9.54	9.24	9.76
Latino	19.88	19.33	20.28
Asian and others	8.61	8.51	8.68
Self-reported depression in past 12 months			
Yes	36.41	35.23	37.27
Academic performance			
Grades mostly As and Bs	70.17	70.21	70.14
Perceived being seen as cool if use cigarettes, vaping, alcohol, or cannabis			
Yes	24.18	27.19	22.00
Past 30 days alcohol use			
Yes	20.75	24.39	18.12
Family has clear rules about alcohol and drug use			
Yes	81.61	81.22	81.89
Median household income of the residential location			
Less than 30k	1.71	1.76	1.67
30k-58k	38.06	39.39	37.10
58k-94k	45.99	46.59	45.55
94k-150k	13.35	10.88	15.13
150k and above	0.90	1.38	0.55

Accessibility, Proximity, Exposure Measures			
Self reported easy cannabis accessibility	31.18	35.88	27.79
Risk perception of cannabis use	37.22	36.77	37.54
Social acceptability of adolescent cannabis use	3.84	4.26	3.54
Number of dispensary stores within the zipcode	8.32	3.47	11.82
Number of dispensary stores per 10,000 square miles within the zipcode	108.49	45.69	153.87
Number of dispensary stores per 1 million residents within the zipcode	5.50	2.99	7.31
Traveling miles to the nearest dispensary store	13.00	15.90	10.90
Traveling minutes to the nearest dispensary store	19.86	23.33	17.36
Traveling miles to the nearest dispensary store <= 3 miles	19.88	13.50	24.49
Traveling miles to the nearest dispensary store 3 - 10 miles	41.26	38.53	43.22
Traveling miles to the nearest dispensary store > 10 miles	38.86	47.97	32.28
Traveling minutes to the nearest dispensary store <= 15 minutes	47.13	36.29	54.97
Traveling minutes to the nearest dispensary store 15-30 minutes	34.00	38.01	31.10
Traveling minutes to the nearest dispensary store > 30 minutes	18.87	25.70	13.94
Total Observations	185,162	77,678	107,484

Table 2. Self-Reported Easy Accessibility to Cannabis

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year (Ref: 2020)						
2022	0.675 [0.648, 0.702]	0.666 [0.638, 0.695]	0.670 [0.643, 0.699]	0.670 [0.645, 0.695]	0.667 [0.638, 0.696]	0.669 [0.642, 0.697]
Gender (Ref: Male)						
Female	0.856 [0.827, 0.886]	0.856 [0.827, 0.886]	0.856 [0.828, 0.886]	0.856 [0.827, 0.886]	0.856 [0.827, 0.886]	0.856 [0.827, 0.886]
Other	1.034 [0.926, 1.156]	1.034 [0.926, 1.156]	1.035 [0.927, 1.156]	1.035 [0.926, 1.157]	1.034 [0.926, 1.155]	1.034 [0.925, 1.156]
Race (Ref: Asian and Others)						
White	1.214 [1.155, 1.275]	1.214 [1.153, 1.277]	1.218 [1.159, 1.280]	1.219 [1.159, 1.281]	1.213 [1.154, 1.275]	1.214 [1.154, 1.277]
Black	1.313 [1.227, 1.406]	1.313 [1.226, 1.406]	1.312 [1.226, 1.405]	1.313 [1.226, 1.407]	1.311 [1.224, 1.404]	1.312 [1.223, 1.408]
Latino	1.208 [1.148, 1.272]	1.210 [1.150, 1.273]	1.207 [1.146, 1.271]	1.205 [1.144, 1.269]	1.213 [1.155, 1.274]	1.210 [1.153, 1.270]
Feelings of Depression (Ref: No)						
Yes	1.762 [1.717, 1.808]	1.761 [1.716, 1.807]	1.763 [1.718, 1.808]	1.762 [1.718, 1.808]	1.761 [1.717, 1.806]	1.761 [1.717, 1.806]
Social Acceptability of Adolescent Cannabis Use (Ref: No)						
Yes	2.404 [2.236, 2.585]	2.403 [2.235, 2.584]	2.406 [2.239, 2.585]	2.405 [2.238, 2.584]	2.401 [2.237, 2.578]	2.402 [2.238, 2.578]
Risk Perception (Ref: Low)						
High	0.349 [0.337, 0.362]	0.349 [0.337, 0.362]	0.349 [0.337, 0.362]	0.349 [0.337, 0.362]	0.349 [0.337, 0.362]	0.349 [0.337, 0.362]
Academic Performance (Ref: C and below)						
Mostly As and Bs	0.884 [0.857, 0.913]	0.884 [0.857, 0.913]	0.883 [0.855, 0.912]	0.884 [0.856, 0.912]	0.884 [0.857, 0.913]	0.885 [0.857, 0.914]
Peer Image (Ref: No)						
Yes	2.424 [2.369, 2.481]	2.424 [2.368, 2.481]	2.425 [2.370, 2.481]	2.424 [2.369, 2.481]	2.424 [2.369, 2.480]	2.424 [2.369, 2.480]
Alcohol Use (Ref: No)						
Yes	2.767 [2.689,	2.768 [2.691,	2.764 [2.686,	2.766 [2.689,	2.768 [2.690,	2.770 [2.693,

	2.846]	2.846]	2.845]	2.846]	2.848]	2.849]
Family Rule (Ref: No)						
Yes	0.756 [0.736, 0.776]	0.756 [0.736, 0.776]	0.756 [0.736, 0.777]	0.756 [0.735, 0.776]	0.756 [0.736, 0.776]	0.755 [0.735, 0.776]
Grade Level (Ref: 8th Grade)						
10th Grade	2.734 [2.612, 2.861]	2.733 [2.612, 2.859]	2.736 [2.617, 2.860]	2.736 [2.617, 2.860]	2.739 [2.619, 2.864]	2.739 [2.620, 2.863]
12th Grade	4.507 [4.248, 4.783]	4.507 [4.250, 4.779]	4.514 [4.264, 4.778]	4.513 [4.261, 4.779]	4.523 [4.271, 4.789]	4.521 [4.266, 4.790]
Household Income (Ref: <30k)						
30k-58k	0.920 [0.787, 1.076]	0.925 [0.784, 1.090]	0.929 [0.797, 1.082]	0.929 [0.801, 1.078]	0.931 [0.791, 1.097]	0.931 [0.796, 1.088]
58k-94k	0.821 [0.732, 0.919]	0.826 [0.731, 0.935]	0.827 [0.738, 0.927]	0.826 [0.740, 0.922]	0.837 [0.734, 0.953]	0.833 [0.736, 0.942]
94k-150k	0.826 [0.748, 0.913]	0.832 [0.747, 0.926]	0.829 [0.752, 0.914]	0.825 [0.747, 0.913]	0.839 [0.751, 0.937]	0.832 [0.742, 0.933]
>150k	0.834 [0.623, 1.116]	0.840 [0.623, 1.131]	0.836 [0.631, 1.108]	0.833 [0.617, 1.125]	0.848 [0.641, 1.122]	0.844 [0.625, 1.139]
Rural/Urban (Ref: Rural)						
Urban	1.065 [0.972, 1.167]	1.056 [0.993, 1.123]	1.046 [0.948, 1.153]	1.034 [0.954, 1.120]	1.070 [0.974, 1.175]	1.058 [0.967, 1.158]
Cannabis Availability						
RCD/square mile	1.002 [0.985, 1.018]				0.985 [0.965, 1.005]	0.987 [0.968, 1.007]
RCD/capita		1.017 [0.991, 1.044]			1.022 [0.978, 1.067]	1.012 [0.965, 1.061]
Cannabis Proximity (in minutes)						
<15 minutes				1.090 [0.989, 1.202]		1.107 [0.975, 1.256]
15-30 minutes				1.089 [1.032, 1.148]		1.097 [1.023, 1.175]
>30 minutes						
Cannabis Proximity (in distance)						
<3 miles			1.055 [0.909, 1.224]		1.070 [0.892, 1.285]	

3-10 miles	1.046 [0.979, 1.119]	1.059 [0.971, 1.155]
>10 miles		

Odds ratios reported with 95% confidence intervals in brackets.

Table 3. Past 30 Days Use of Cannabis

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year (Ref: 2020)						
2022	0.787 [0.709, 0.873]	0.795 [0.728, 0.868]	0.789 [0.713, 0.873]	0.790 [0.718, 0.869]	0.797 [0.730, 0.871]	0.800 [0.734, 0.871]
Gender (Ref: Male)						
Female	0.888 [0.842, 0.936]	0.888 [0.842, 0.936]	0.888 [0.842, 0.936]	0.888 [0.842, 0.936]	0.888 [0.842, 0.936]	0.888 [0.842, 0.936]
Other	1.093 [0.981, 1.217]	1.091 [0.979, 1.216]	1.094 [0.982, 1.219]	1.092 [0.979, 1.218]	1.095 [0.984, 1.219]	1.094 [0.982, 1.218]
Race (Ref: Asian and Others)						
White	1.057 [0.966, 1.157]	1.049 [0.957, 1.150]	1.059 [0.967, 1.161]	1.056 [0.965, 1.156]	1.063 [0.971, 1.163]	1.062 [0.971, 1.162]
Black	1.712 [1.476, 1.985]	1.712 [1.474, 1.989]	1.710 [1.472, 1.986]	1.712 [1.472, 1.992]	1.710 [1.473, 1.986]	1.713 [1.474, 1.991]
Latino	0.928 [0.855, 1.008]	0.936 [0.864, 1.014]	0.930 [0.854, 1.014]	0.932 [0.858, 1.011]	0.925 [0.847, 1.012]	0.924 [0.848, 1.005]
Feelings of Depression (Ref: No)						
Yes	1.954 [1.850, 2.063]	1.951 [1.845, 2.062]	1.953 [1.849, 2.063]	1.953 [1.848, 2.063]	1.956 [1.855, 2.062]	1.956 [1.856, 2.062]
Social Acceptability of Adolescent Cannabis Use (Ref: No)						
Yes	2.619 [2.350, 2.918]	2.613 [2.341, 2.916]	2.618 [2.349, 2.918]	2.614 [2.344, 2.916]	2.623 [2.361, 2.915]	2.622 [2.361, 2.912]
Risk Perception (Ref: Low)						
High	0.195 [0.184, 0.207]	0.195 [0.185, 0.207]	0.195 [0.185, 0.207]	0.195 [0.185, 0.207]	0.195 [0.184, 0.207]	0.195 [0.184, 0.207]
Academic Performance (Ref: C and below)						
Mostly As and Bs	0.527 [0.507, 0.548]	0.529 [0.508, 0.551]	0.527 [0.508, 0.547]	0.528 [0.508, 0.549]	0.526 [0.508, 0.545]	0.527 [0.508, 0.546]
Peer Image (Ref: No)						
Yes	1.609 [1.529, 1.693]	1.607 [1.528, 1.691]	1.608 [1.529, 1.692]	1.608 [1.528, 1.691]	1.610 [1.530, 1.693]	1.609 [1.529, 1.694]
Alcohol Use (Ref: No)						
Yes	7.620 [7.079,	7.633 [7.088,	7.620 [7.080,	7.629 [7.087,	7.611 [7.075,	7.616 [7.080,

	8.202]	8.220]	8.201]	8.213]	8.188]	8.192]
Family Rule (Ref: No)						
Yes	0.741 [0.708, 0.775]	0.740 [0.708, 0.774]	0.741 [0.708, 0.775]	0.740 [0.707, 0.774]	0.741 [0.708, 0.775]	0.740 [0.707, 0.774]
Grade Level (Ref: 8th Grade)						
10th Grade	2.108 [1.984, 2.239]	2.110 [1.984, 2.243]	2.115 [1.992, 2.246]	2.113 [1.987, 2.246]	2.116 [1.993, 2.245]	2.113 [1.989, 2.244]
12th Grade	3.148 [2.865, 3.458]	3.153 [2.867, 3.466]	3.162 [2.877, 3.475]	3.159 [2.872, 3.474]	3.160 [2.876, 3.473]	3.156 [2.872, 3.469]
Household Income (Ref: <30k)						
30k-58k	0.736 [0.590, 0.919]	0.732 [0.580, 0.924]	0.749 [0.601, 0.934]	0.743 [0.594, 0.931]	0.746 [0.600, 0.929]	0.741 [0.595, 0.923]
58k-94k	0.586 [0.491, 0.700]	0.589 [0.489, 0.709]	0.599 [0.501, 0.716]	0.596 [0.499, 0.712]	0.592 [0.497, 0.705]	0.586 [0.493, 0.697]
94k-150k	0.606 [0.474, 0.774]	0.611 [0.476, 0.784]	0.610 [0.472, 0.787]	0.610 [0.473, 0.788]	0.602 [0.472, 0.768]	0.600 [0.470, 0.764]
>150k	0.673 [0.471, 0.962]	0.680 [0.473, 0.978]	0.675 [0.482, 0.946]	0.684 [0.464, 1.007]	0.666 [0.479, 0.926]	0.670 [0.458, 0.979]
Rural/Urban (Ref: Rural)						
Urban	1.093 [0.947, 1.262]	1.153 [1.046, 1.272]	1.099 [0.973, 1.242]	1.106 [1.006, 1.216]	1.086 [0.929, 1.269]	1.077 [0.931, 1.247]
Cannabis Availability						
RCD/square mile	1.021 [0.995, 1.047]				1.012 [0.978, 1.046]	1.018 [0.982, 1.056]
RCD/capita		1.010 [0.962, 1.060]			0.975 [0.907, 1.048]	0.965 [0.896, 1.040]
Cannabis Proximity (in minutes)						
<15 minutes				1.131 [1.030, 1.242]		1.132 [1.013, 1.265]
15-30 minutes				1.100 [0.986, 1.227]		1.103 [0.978, 1.244]
>30 minutes						
Cannabis Proximity (in distance)						
<3 miles			1.110 [0.980, 1.257]		1.106 [0.973, 1.257]	

3-10 miles	1.128 [1.031, 1.234]	1.125 [1.033, 1.226]
>10 miles		

Odds ratios reported with 95% confidence intervals in brackets.

Table 4. Past 30 Days Heavy Use of Cannabis

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year (Ref: 2020)						
2022	0.856 [0.746, 0.983]	0.823 [0.712, 0.952]	0.835 [0.721, 0.968]	0.833 [0.720, 0.964]	0.828 [0.719, 0.953]	0.829 [0.716, 0.960]
Gender (Ref: Male)						
Female	0.589 [0.512, 0.678]	0.589 [0.512, 0.678]	0.589 [0.512, 0.678]	0.589 [0.512, 0.678]	0.589 [0.511, 0.678]	0.589 [0.511, 0.678]
Other	0.946 [0.811, 1.103]	0.946 [0.811, 1.105]	0.947 [0.813, 1.103]	0.947 [0.812, 1.105]	0.944 [0.810, 1.100]	0.943 [0.808, 1.101]
Race (Ref: Asian and Others)						
White	1.188 [1.065, 1.325]	1.203 [1.076, 1.344]	1.202 [1.074, 1.344]	1.202 [1.076, 1.343]	1.182 [1.055, 1.324]	1.181 [1.056, 1.321]
Black	1.376 [1.161, 1.632]	1.374 [1.161, 1.627]	1.376 [1.162, 1.628]	1.375 [1.162, 1.626]	1.376 [1.157, 1.636]	1.377 [1.157, 1.638]
Latino	0.776 [0.661, 0.910]	0.766 [0.646, 0.910]	0.766 [0.648, 0.906]	0.765 [0.645, 0.907]	0.790 [0.672, 0.930]	0.790 [0.673, 0.928]
Feelings of Depression (Ref: No)						
Yes	1.931 [1.828, 2.041]	1.934 [1.829, 2.045]	1.934 [1.830, 2.044]	1.935 [1.830, 2.045]	1.924 [1.821, 2.034]	1.924 [1.821, 2.034]
Social Acceptability of Adolescent Cannabis Use (Ref: No)						
Yes	3.318 [3.031, 3.633]	3.320 [3.043, 3.622]	3.322 [3.039, 3.631]	3.323 [3.043, 3.629]	3.298 [3.012, 3.611]	3.297 [3.012, 3.609]
Risk Perception (Ref: Low)						
High	0.197 [0.171, 0.226]	0.196 [0.171, 0.225]	0.197 [0.171, 0.225]	0.196 [0.171, 0.226]	0.197 [0.172, 0.226]	0.197 [0.171, 0.226]
Academic Performance (Ref: C and below)						
Mostly As and Bs	0.409 [0.381, 0.439]	0.406 [0.379, 0.436]	0.407 [0.379, 0.437]	0.407 [0.378, 0.437]	0.410 [0.382, 0.441]	0.410 [0.382, 0.441]
Peer Image (Ref: No)						
Yes	1.443 [1.362, 1.530]	1.445 [1.364, 1.531]	1.445 [1.363, 1.532]	1.445 [1.363, 1.532]	1.440 [1.359, 1.526]	1.440 [1.358, 1.527]
Alcohol Use (Ref: No)						
Yes	6.427 [5.941,	6.409 [5.929,	6.410 [5.926,	6.409 [5.925,	6.446 [5.960,	6.448 [5.962,

	6.954]	6.928]	6.934]	6.934]	6.971]	6.973]
Family Rule (Ref: No)						
Yes	0.736 [0.678, 0.799]	0.737 [0.679, 0.800]	0.737 [0.679, 0.800]	0.737 [0.678, 0.800]	0.736 [0.678, 0.798]	0.736 [0.678, 0.798]
Grade Level (Ref: 8th Grade)						
10th Grade	2.320 [2.025, 2.659]	2.315 [2.024, 2.648]	2.317 [2.027, 2.648]	2.316 [2.026, 2.647]	2.322 [2.019, 2.671]	2.320 [2.017, 2.667]
12th Grade	3.957 [3.450, 4.539]	3.948 [3.446, 4.523]	3.948 [3.447, 4.522]	3.949 [3.446, 4.525]	3.966 [3.446, 4.565]	3.964 [3.445, 4.560]
Household Income (Ref: <30k)						
30k-58k	0.629 [0.528, 0.748]	0.640 [0.534, 0.768]	0.636 [0.536, 0.755]	0.636 [0.535, 0.757]	0.646 [0.544, 0.766]	0.643 [0.541, 0.765]
58k-94k	0.517 [0.437, 0.611]	0.520 [0.436, 0.621]	0.515 [0.432, 0.615]	0.516 [0.433, 0.614]	0.545 [0.463, 0.642]	0.543 [0.462, 0.638]
94k-150k	0.459 [0.361, 0.583]	0.456 [0.352, 0.592]	0.451 [0.345, 0.589]	0.452 [0.344, 0.595]	0.482 [0.376, 0.617]	0.482 [0.375, 0.618]
>150k	0.599 [0.335, 1.072]	0.595 [0.328, 1.078]	0.587 [0.320, 1.078]	0.588 [0.310, 1.114]	0.628 [0.365, 1.080]	0.632 [0.351, 1.139]
Rural/Urban (Ref: Rural)						
Urban	1.077 [0.824, 1.408]	0.972 [0.800, 1.182]	0.987 [0.772, 1.263]	0.980 [0.809, 1.187]	1.093 [0.838, 1.426]	1.090 [0.853, 1.393]
Cannabis Availability						
RCD/square mile	0.969 [0.929, 1.011]				0.933 [0.886, 0.983]	0.936 [0.883, 0.991]
RCD/capita		1.017 [0.959, 1.078]			1.083 [0.997, 1.176]	1.076 [0.989, 1.171]
Cannabis Proximity (in minutes)						
<15 minutes				1.010 [0.891, 1.145]		1.075 [0.899, 1.286]
15-30 minutes				1.019 [0.860, 1.208]		1.054 [0.857, 1.296]
>30 minutes						
Cannabis Proximity (in distance)						
<3 miles			0.973 [0.785, 1.206]		1.052 [0.860, 1.286]	

3-10 miles	1.004 [0.854, 1.179]	1.069 [0.907, 1.260]
>10 miles		

Odds ratios reported with 95% confidence intervals in brackets.

Figures

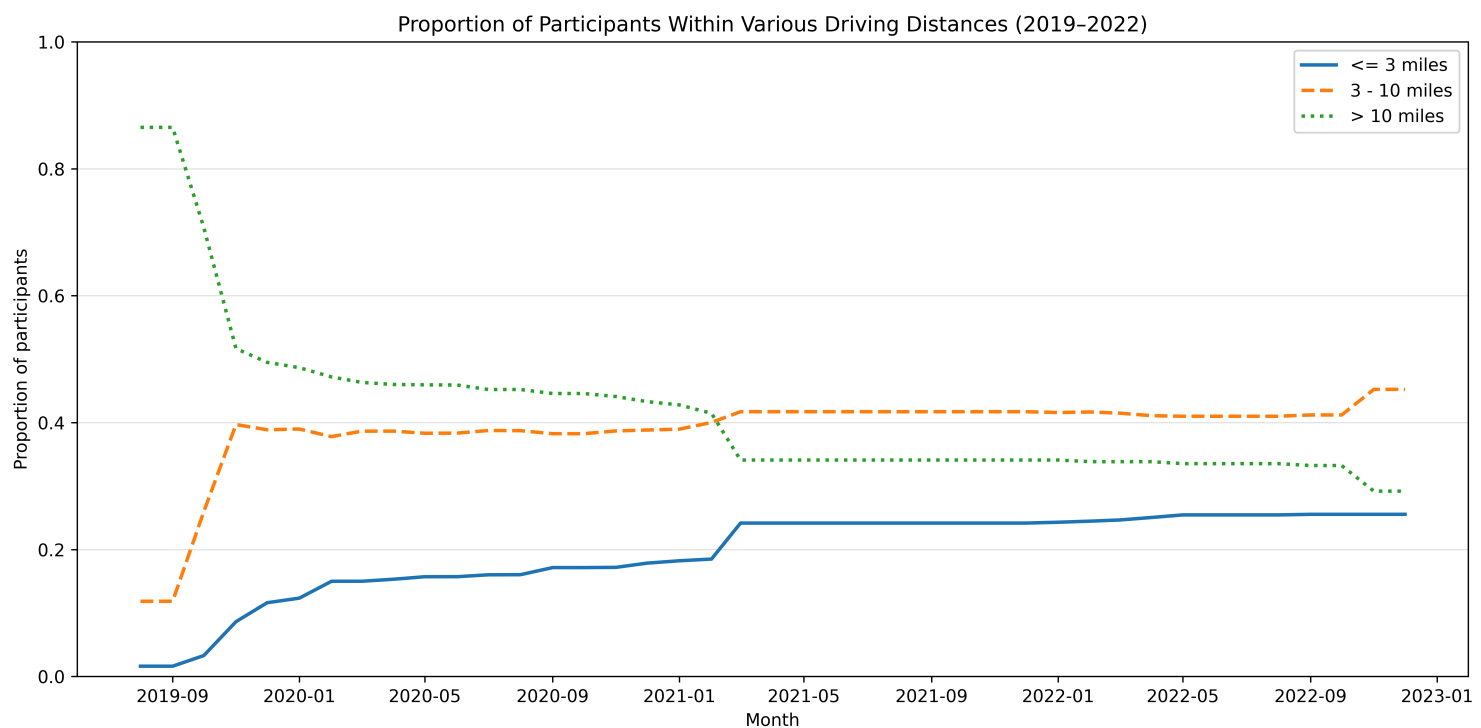


Figure 1

Legend not included with this version.

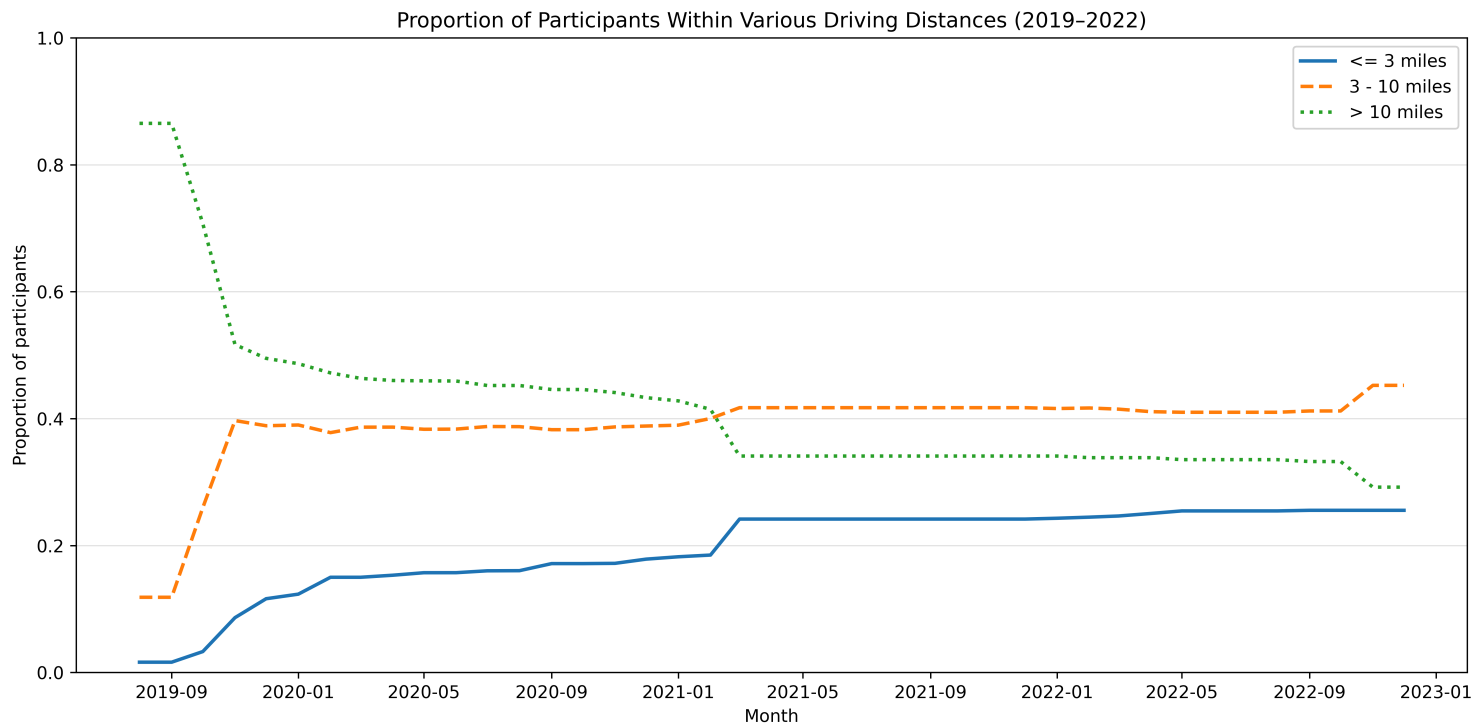


Figure 1

Legend not included with this version.

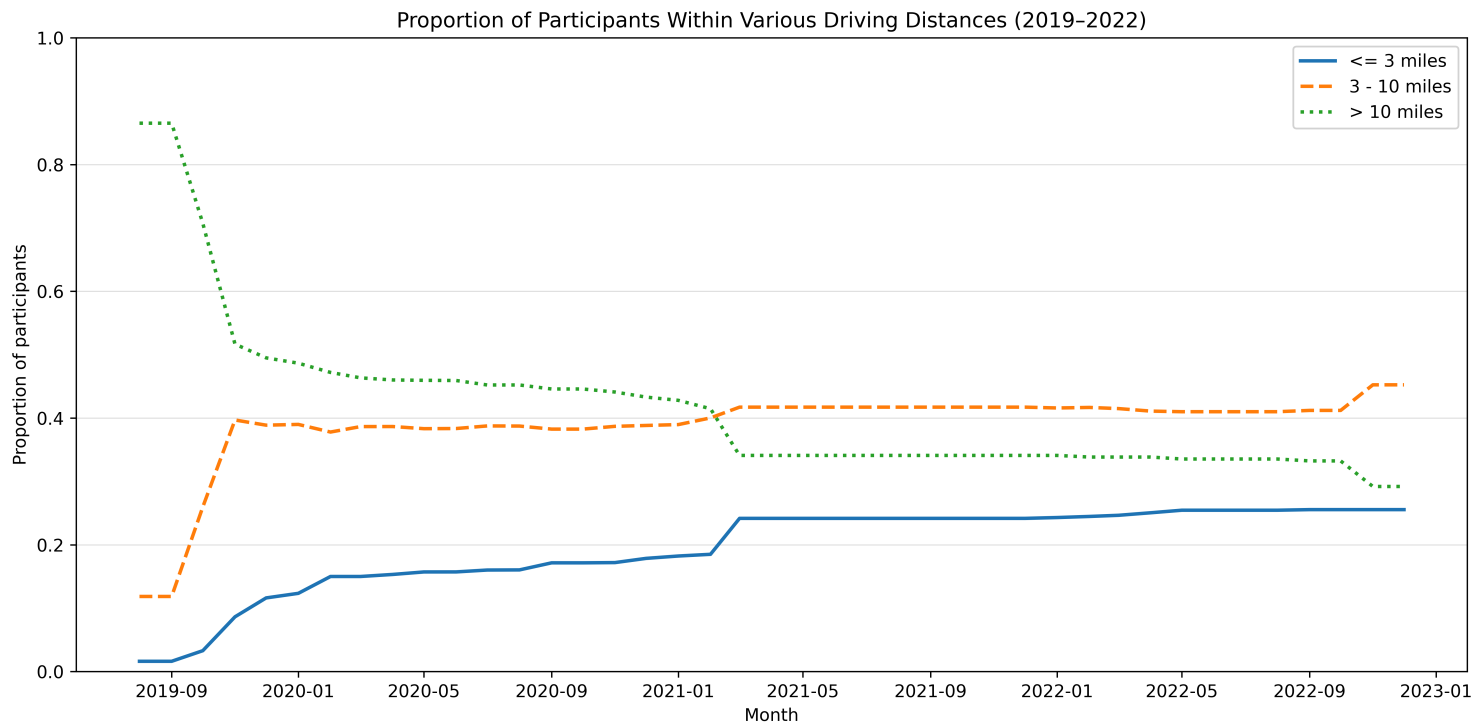


Figure 1

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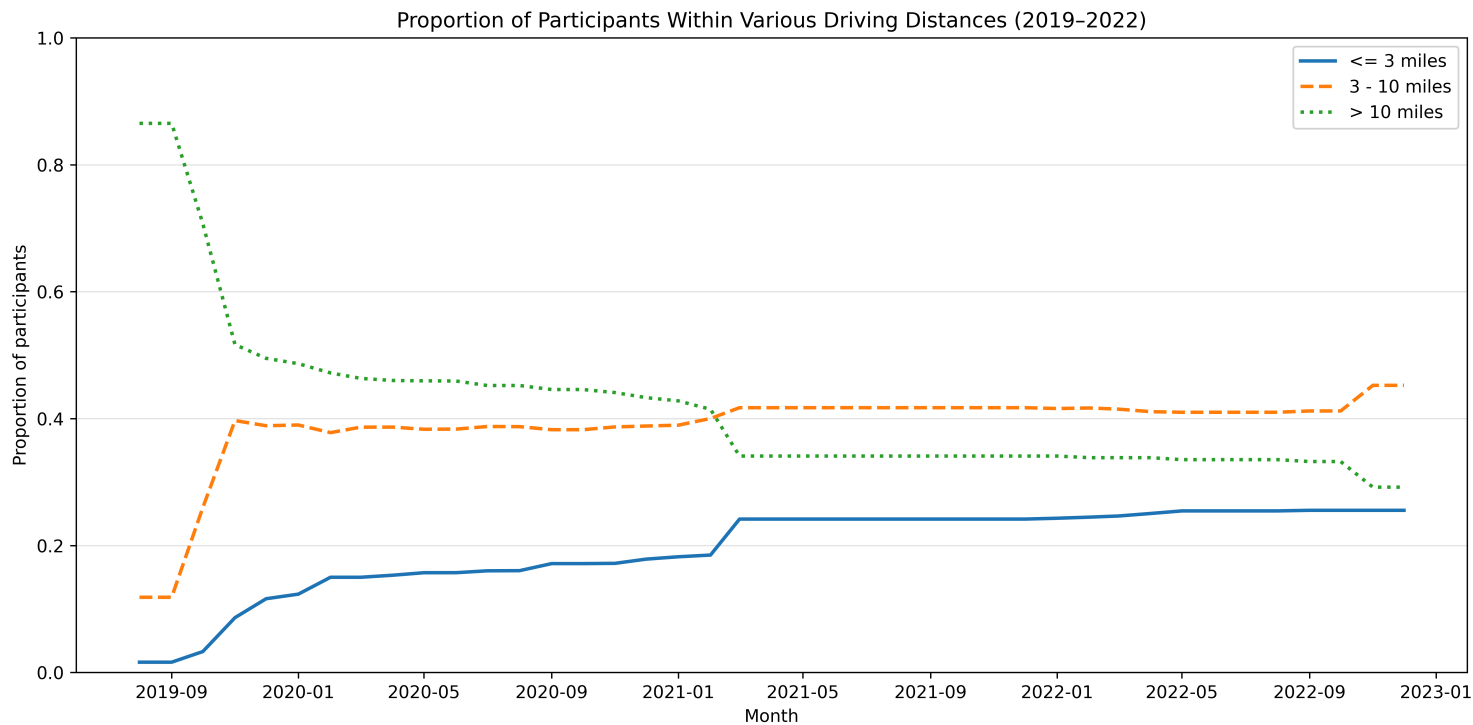


Figure 1

Legend not included with this version.

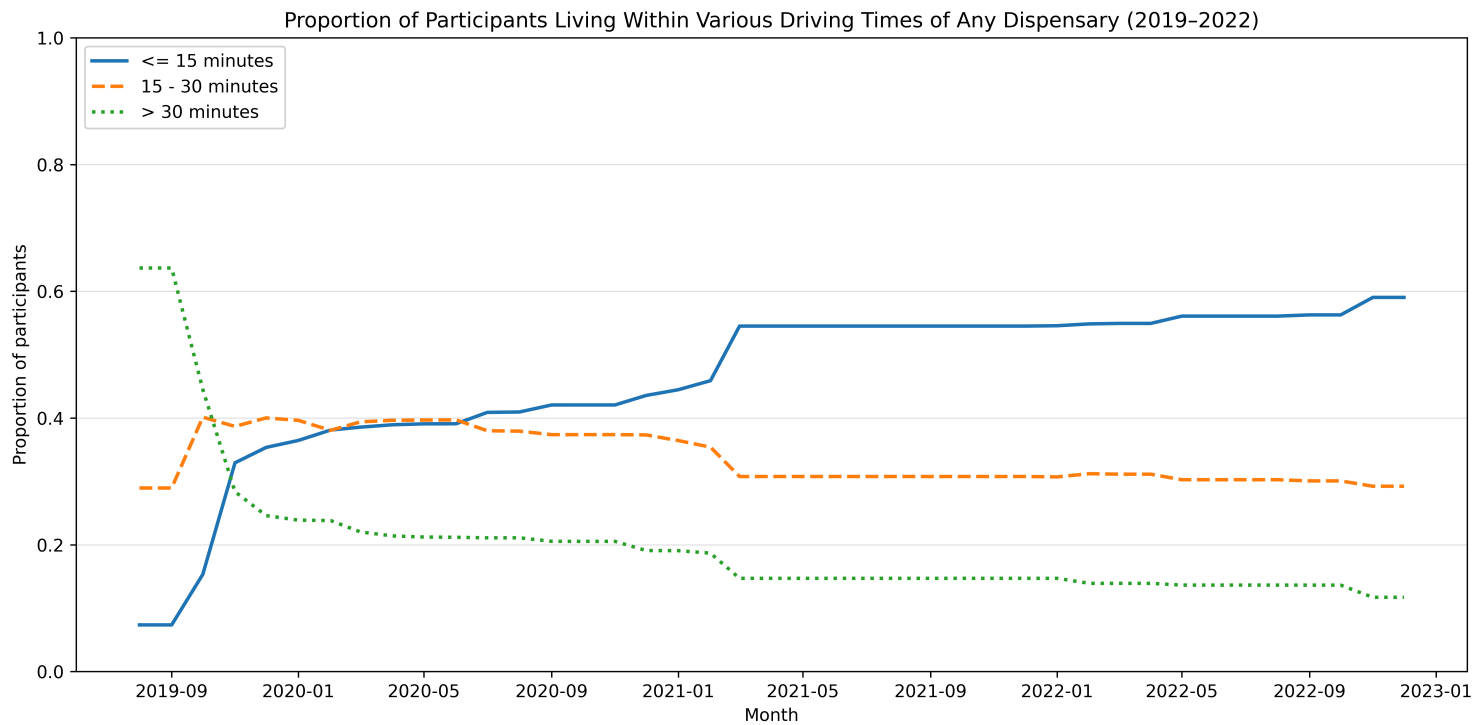


Figure 2

Legend not included with this version.

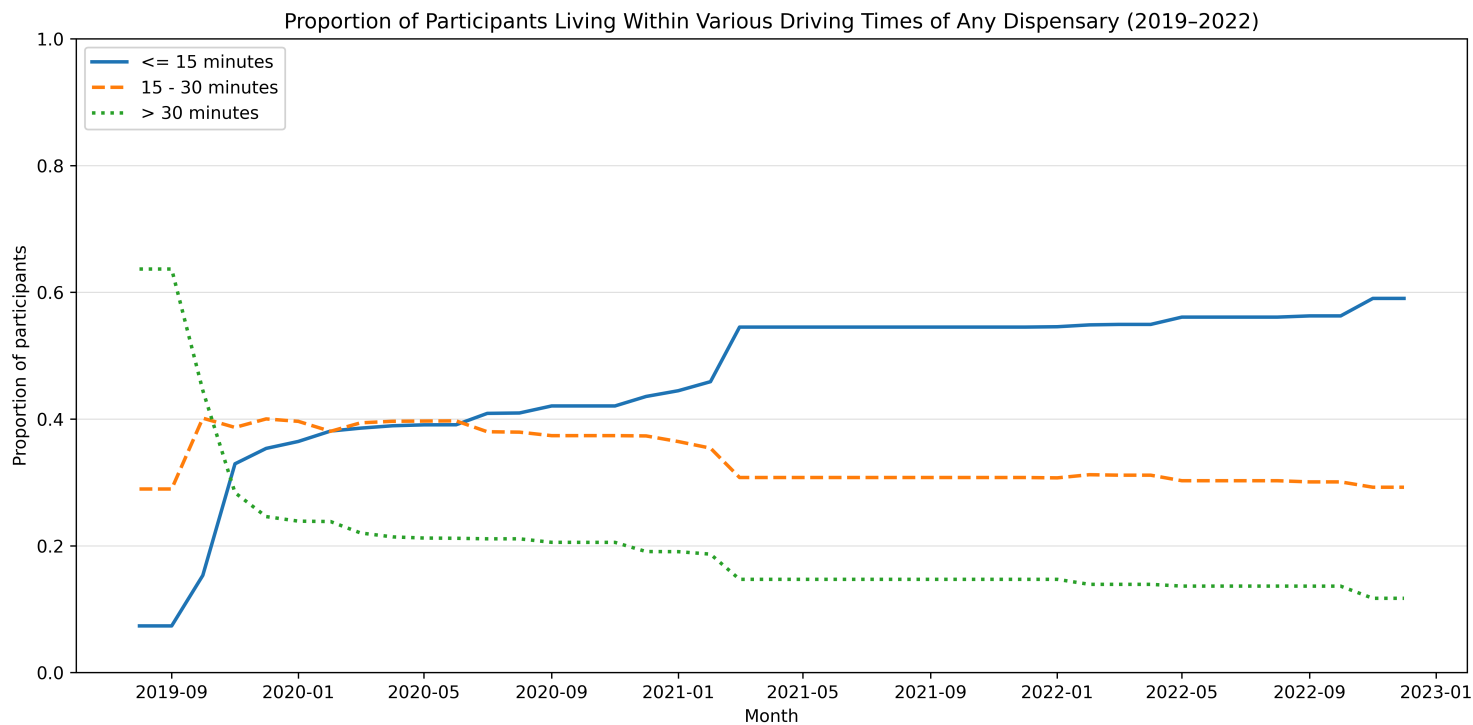


Figure 2

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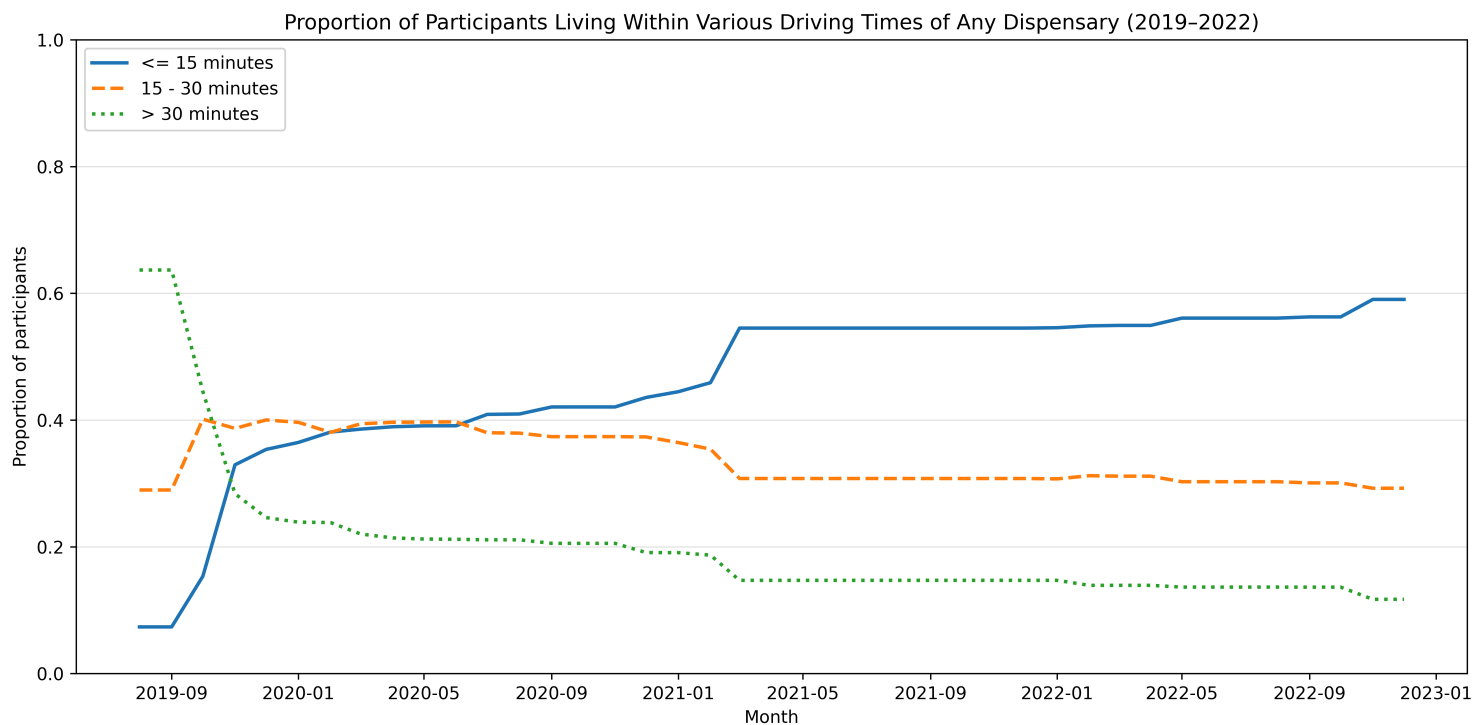


Figure 2

Legend not included with this version.

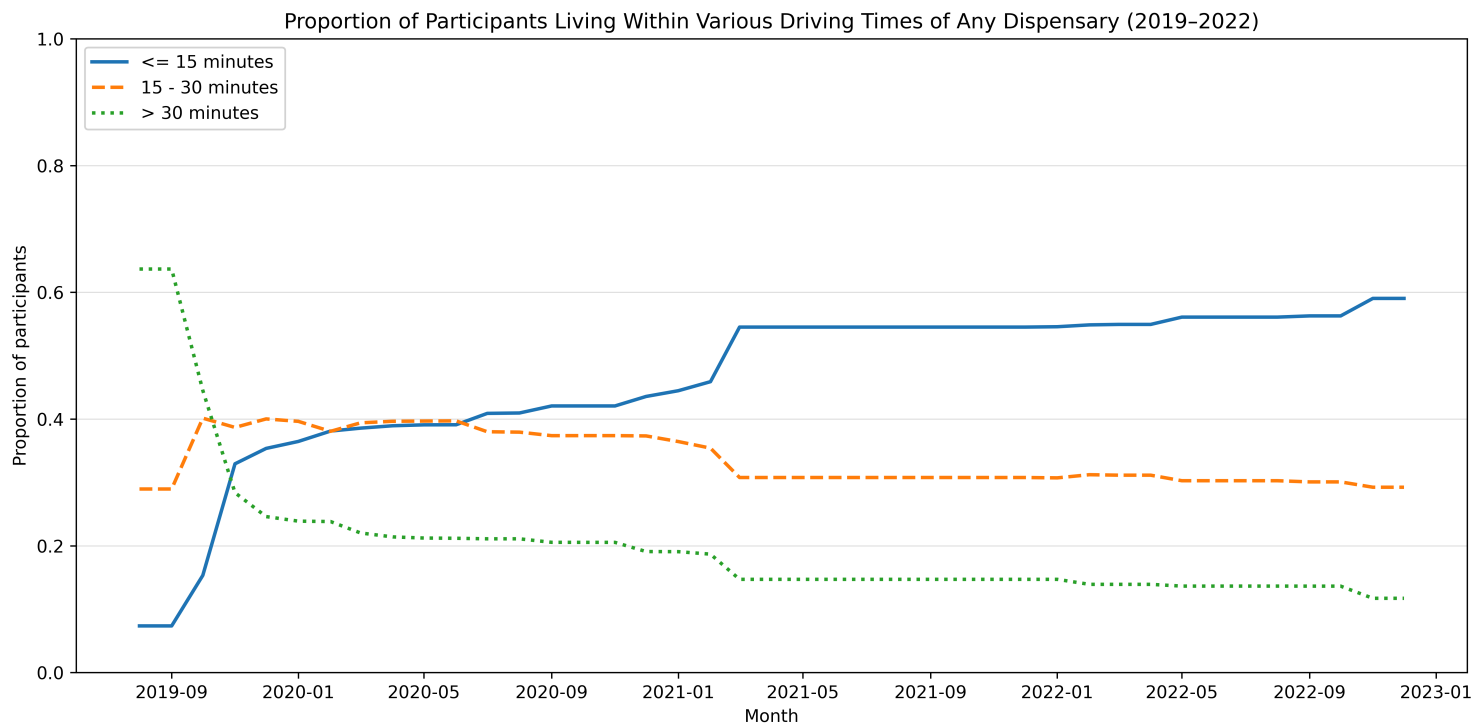


Figure 2

Legend not included with this version.