Identifying cannabis-attributed health outcomes in Colorado

Assessment of hospital and emergency department data

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Contents

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Abstract

This report, required by House Bill 21-1317 and produced by the Colorado Department of Public Health and Environment, attempts to use hospital and emergency department discharge data, as directed in statute, to examine conditions or diagnoses reflecting marijuana use with and without co-use of alcohol and other drugs. The department, however, believes the findings have limited utility because of significant limitations. Standardized diagnoses and/or conditions proven and accepted by the medical community to be caused by marijuana do not exist; therefore, novel definitions and methodology were developed by the department to analyze the data. The department defined a "cannabis-only discharge" as one with a high probability of being at least partially attributable to cannabis use. Findings presented in this report need to be interpreted with caution, and as the true prevalence of marijuana-related hospital and emergency department discharges cannot be measured through this methodology. The key findings of 2023 include: 1) The overall percentage of hospital and emergency department discharges likely-attributed to cannabis remains low. 2) Cannabis-likely attributed codes were highest in emergency department discharges and among individuals aged 13-17 years. 3) Ninety-eight percent of children younger than 6 years old discharged from the emergency department with only a cannabis code and no other substance codes present, were thought to be likely-attributed to cannabis. In 2024, the National Center for Health Statistics' ICD-10-CM Coordination and Maintenance Committee approved the proposal and new code for Cannabis Hyperemesis Syndrome. This will enable tracking of a medical syndrome directly resulting from cannabis use.

Introduction

Pursuant to C.R.S. 25-3-127, the Colorado General Assembly requires the Colorado Department of Public Health and Environment to "produce a report on hospital and emergency room discharge data of patients, including demographic information, presenting with conditions or a diagnosis that reflect marijuana use" annually by Jan. 2. Information requested on these patients includes age, race, ethnicity, gender, and geographic location. The department must also include information identifying if marijuana use was in conjunction with the use of alcohol or other drugs. Informed by these data findings or the lack thereof, this report concludes with recommendations to educate, inform, and protect Coloradans.

Methodology and limitations

As required by statute, CDPHE examined data from the Colorado Hospital Association for hospital and emergency department discharges containing cannabis-related codes. CDPHE developed a logic model for grouping counts of discharges by presence or non-presence of cannabis and other substance codes (see Appendix A). CDPHE used a novel definition of cannabis-likely attributed to identify discharges thought to be at least partially due to cannabis (see Appendix B). CDPHE developed this definition E in response to the legislation and it is not based on standardized definitions, peer-reviewed research, or best practices.

CDPHE has concerns regarding how informative the Colorado Hospital Association dataset is for the purposes of this report. The International Classification of Diseases system has not established codes that specifically identify health events caused by cannabis. As a result, the information provided by these data is insufficient to directly identify and evaluate conditions and diagnoses as we cannot infer causation between cannabis use and medical outcomes.

Methodology used for this report includes novel definitions developed by CDPHE of what constitutes a cannabis-attributed case. These definitions were informed by four studies[1-4] and input from subject matter experts, including CDPHE's Retail Marijuana Public Health Advisory Committee. However, without validating the methodology used in this report, CDPHE cannot provide a solid conclusion to the request in statute.These are a few considerable limitations in how the information contained in this report may be interpreted. A complete list of limitations is available in Appendix C.

Findings

Interpret the findings of this report with caution due to the limitations listed in Appendix C. Information on methods involving data and statistical analyses is available in Appendix D.

Emergency department

Of all emergency department discharges in 2023 (n=2,112,439):

- 0.8% (n=15,915) had any cannabis code present (Figure 1).
- 0.6% (n=12,453) had a cannabis-only code, compared to 5.2% (n=110,217) that had alcohol and/or drug code(s), and 0.2% (n=3,462) that had cannabis plus alcohol and/or drug codes.
- Cannabis likely-attributed discharges accounted for 0.12% of all ED discharges, with a rate of 120.4 per 100,000 discharges (Figure 3).

Of emergency department discharges that contained any cannabis code in 2023 (n=15,915):

- 78.2% (n=12,453) contained cannabis-only code(s) compared to 21.8% (n=3,462) that contained cannabis plus alcohol and/or drug codes (Figure 1).

Of emergency department discharges that contained cannabis-only code(s) in 2023 (n=12,453):

- 20.4% (n=2,544) could be described as cannabis likely-attributed compared to 79.6% (n=9,909) that have the less reliable cannabis-mentioned codes (Figure 1).

The counties with the highest rates of age-adjusted emergency department discharges with cannabis-only code(s) in 2023 were:

- Counties with the highest number of discharges were El Paso (n=1,752), Denver (n=1,327) and Adams (n=1,115) (Table 8).
- Otero (53.5 per 1,000 county residents, n=885), and Bent (26.2 per 1,000 county residents, n=156*) (Figure 5, Table 8). Caution should be used when interpreting rates in small populations due to the degree of uncertainty.

The demographics with the highest rate of cannabis likely-attributed emergency department discharges in 2023 were among:

- Ages 13-17 years old (492.3 per 100,000 discharges; Table 2).
    - Of note, among children younger than 6 years old discharged with a cannabis-only code, 98% of the codes were cannabis likely-attributed (n=147, rate of 76.5 per 100,000 discharges).
- Males (148.5 per 100,000 discharges; Table 3).
- Black race/ethnicity (195.2 per 100,000 discharges; Table 4), significantly higher than all other race and ethnicity groups, except the Unknown and "Other" race group. White, non-Hispanic is significantly lower than Black, Hispanic, Other, and Unknown race/ethnicity groups.

Hospitalizations

Of all hospital discharges in 2023 (n=486,899):

- 2.4% (n=11,536) had any cannabis code present (Figure 2).
- 1.3% (n=6,451) had a cannabis-only code, compared to 12.5% (n=60,641) that had an alcohol and/or drug code(s), and 1.0% (n=5,085) that had cannabis plus alcohol and/or drug codes.

- Cannabis likely-attributed discharges accounted for 0.05% (n=241) of all hospital discharges, with a rate of 49.5 per 100,000 discharges (Figure 4).

Of hospital discharges that contained any cannabis code in 2023(n=11,536):

- 56.0% (n=6,451) contained cannabis-only code(s) compared to 44.1% (n=5,085) that contained cannabis plus alcohol and/or drug codes (Figure 2).

Of hospital discharges that contained cannabis-only code(s) in 2023(n=6,451):

- 3.7% (n=241) could be described as cannabis likely-attributed compared to 96.3% (n=6,210) that have the less reliable cannabis-mentioned codes (Figure 2).

The counties with the highest rates of hospital discharges with cannabis-only code(s) in 2023 were:

- Counties with the highest number of discharges were Denver (n=900), Arapahoe (n=818) (Table 9).
- Las Animas and Bent (both 3.7 per 1,000 county residents, Las Animas n=55 and Bent n=20) and Pueblo 2.8 per 1,000 county residents, n=410) (Figure 6, Table 9). Caution should be used when interpreting rates in small populations due to the degree of uncertainty.

The demographics with the highest rate of cannabis likely-attributed hospital discharges in 2023 were among:

- Ages 13-17 years and 18-20 years (238.0 and 181.9 per 100,000 discharges, respectively; Table 5).
- Males (66.8 per 100,000 discharges; Table 6).

- Black race/ethnicity (98.7 per 100,000 discharges; Table 7), but was not significantly different from Other (80.8 per 100,000 discharges), or Hispanic (64.7 per 100,000 discharges), or Unknown (51.6 per 100,000 discharges) race/ethnicities.

Hospital to emergency department comparisons

In 2023, the percentage of any cannabis code was higher in hospital discharges than emergency department discharges. These trends did not change from 2022.

- 2.4% of all hospital discharges had any cannabis code present compared to 0.7% of emergency department discharges.

In 2023, emergency department discharges had a higher percentage of visits with cannabis-only codes, but a lower percentage of discharges with cannabis plus alcohol and/or other drug codes, compared to hospital discharges (Figures 1-2).

- 78.2% of emergency department discharges with any cannabis code were cannabis-only compared to 56.0% of hospital discharges with any cannabis code.

- 1.0% of hospital discharges with any cannabis code were cannabis plus alcohol and/or drug compared to 0.2% of emergency department discharges.

In 2023, emergency department discharges had a higher percentage of cannabis-likely attributed codes compared to hospital discharges.

- 20.4% of emergency department discharges with cannabis-only codes had cannabis likely-attributed codes compared to only 3.7% of hospital discharges.

In 2023, hospital and emergency department discharges shared few similarities in demographic and geographic groups.

- In both hospital and emergency department discharges, cannabis likely-attributed discharges occurred most frequently among males, and the age group 13-17 years.

- In both hospital and emergency department discharges, Bent County had a high rate of age-adjusted cannabis only discharges per county resident population.

Discussion

Limitations aside, cannabis codes provide some insight when used as health indicators. Overall, the analyses showed very small percentages of Colorado's emergency department and hospital discharges had cannabis codes present. The number of discharges decreased with each level of specificity, resulting in suppression of some demographic groups and decreasing statistical method reliability. Nonetheless, the analyses of race/ethnicity groups with cannabis-only codes showed a possible health disparity. This warrants further investigation however, as other independent variables could be at play (e.g. regionality, reporting bias, etc.)

Discharges that were identified as cannabis likely-attributed had higher predictive value compared to those identified as cannabis-mentioned which had lower predictive value. The cannabis likely-attributed definition used in this report was shown in a single study to have a high PPV of >80%, but it only captured 13.5% of emergency department visits ultimately determined to be at least partially attributable to cannabis[1]. Therefore, CDPHE notes that the methodology most likely underestimated the true number of cases attributed to cannabis. This is also why more research is needed to determine the following: 1) why cannabis-mentioned codes do not perform as well, 2) which cannabis codes have highest sensitivity, specificity, and predictive values, and 3) whether predictability varies by other factors, such as demographics, year, or health care setting.

The analysis also found cannabis codes perform better in emergency department visits compared to hospitalizations. This may be a reflection of more acute health outcomes resulting from immediate, or short-term, effects produced by cannabis use. We hypothesize the reason for the lower percentage in hospital discharges is due to the rarity in occurrence of which patients are admitted to the hospital due to cannabis-only exposure.

The demographic group of most concern in the 2023 analysis was children younger than 6 years old. For the third consecutive year, nearly all (98%) pediatric cannabis-only emergency department discharges had cannabis likely-attributed codes. That means that per the methodology, there is a high likelihood these visits were due in part to cannabis exposure. This finding is supported by pediatric cases being more likely to require medical attention due to unintentional cannabis exposure or ingestion. This is a growing problem among this age group, documented in both the literature and data[5-7], and remains a significant public health concern.

Conclusion

Based on the studies reviewed and findings of this report, the Department concludes the Colorado Hospital Association hospital and emergency department discharge data are not suitable to identify diagnoses or conditions caused by cannabis use at this time. Given the limitations of the hospital and emergency department data, plus the lack of standardized and validated methods and case definitions, CDPHE is not able to identify specific cannabis-attributed diagnoses or conditions. The Department is also not confident that the findings presented correctly describe the true impact of cannabis-attributed hospital and emergency department visits in Colorado. Based on this conclusion, the Department makes the following recommendations.

Actions taken

Cannabinoid Hyperemesis Syndrome is an emerging condition that is becoming more common in both emergency departments and hospitals. The literature has well documented the association of cannabis use to Cannabinoid Hyperemesis Syndrome. In 2023, CDPHE partnered with the Centers for Disease Control and Prevention to propose a new ICD-10-CM code specific to this condition in order to monitor its prevalence. In 2024, the National Center for Health Statistics' ICD-10-CM Coordination and Maintenance Committee approved the proposal and the new code for Cannabis Hyperemesis Syndrome (R11.16) will become effective October 2025. This will enable direct tracking of a cannabis caused hospital or emergency department visit.

References

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5. Wang GS, Le Lait MC, Deakyne SJ, Bronstein AC, Bajaj L, Roosevelt G. Unintentional Pediatric Exposures to Marijuana in Colorado, 2009-2015. *JAMA Pediatr*. 2016;170(9):e160971.

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Appendix A

Definitions

CDPHE developed these definitions, specifically for this report. They have not been used, validated or standardized by any other CDPHE program, state agency, or national organization.

ICD-10-CM code: The International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) provides an established set of codes to document diagnoses for billing purposes. A discharge can have as many as 30 diagnosis codes listed on a single discharge billing record.

No cannabis: A discharge that does not have a cannabis ICD-10-CM code.

Any cannabis: A discharge with at least one cannabis ICD-10-CM code.

No substance: A discharge with no cannabis, alcohol, cocaine, opioid, or stimulant ICD-10-CM code.

Alcohol and/or drug: A no cannabis discharge with at least one alcohol, cocaine, opioid, or stimulant ICD-10-CM code.

Cannabis-only: A discharge with at least one cannabis ICD-10-CM code and no alcohol, cocaine, opioid, or stimulant ICD-10-CM code.

Cannabis + alcohol and/or drug: A discharge with at least one cannabis ICD-10-CM code plus at least one alcohol, cocaine, opioid, or stimulant ICD-10-CM code. Further examination of each individual substance can be found on CDPHE's Colorado Hospital Association (CHA) dashboard.

Predictive value: A measurement of performance used to describe the ability to correctly identify a true result (Positive Predictive Value (PPV)) or a true negative result (Negative Predictive Value (NPV)). In this report, we use this term in reference

to the ability of cannabis ICD-10-CM codes to correctly identify a hospital or emergency department discharge likely attributed to cannabis.

Primary diagnosis: The ICD-10-CM code that establishes the main diagnosis for discharge.

Cannabis likely-attributed: A cannabis-only discharge with a high probability of being at least partially attributable to cannabis use. The discharge must contain at least one of the following inclusion criteria that a single, unpublished study has shown to have high predictive values[1].

1. Cannabis poisoning code (T40.7 from Jan. 1, 2021 – Sept. 30, 2021 and T40.71 from Oct. 1, 2021 - Dec. 31, 2023).

2. Cannabis abuse, dependence, or use with an intoxication code (F12.12, F12.22, F12.92).

3. The primary diagnosis ICD-10-CM code contained any cannabis code.

Cannabis-mentioned: A cannabis-only discharge with a low probability of being partially attributable to cannabis use. These discharges do not meet the criteria for the cannabis likely-attributed definition (above) due to unfavorable predictive values as demonstrated in a single, in-depth study[1].

1. The primary diagnosis ICD-10-CM code **does not** contain any cannabis code.

2. The non-primary diagnosis ICD-10-CM code contains any cannabis code **other than** cannabis poisoning code (T40.7 from Jan. 1, 2021 – Sept. 30, 2021 and T40.71 from Oct. 1, 2021 - Dec. 31, 2023) and cannabis abuse, dependence, or use with an intoxication code (F12.12, F12.22, F12.92).

Health indicator: A quantifiable characteristic used in public health to measure, describe and provide general insights on the health of the population.

Appendix B

Limitations

- No epidemiological case definition(s) exist for diagnoses or conditions caused by cannabis in hospital or ED data.
    - There are no standardized definitions nor methods for using ICD-10-CM codes (or sets of codes) that have been validated or scientifically proven to correctly and accurately identify diagnoses or conditions caused by cannabis.
- Our definitions are novel and interpretation of these data are conservative. Analyses may underestimate the true impact of cannabis-attributed diagnoses or conditions.
    - CDPHE referenced studies[1-4] that examine the accuracy of cannabis-related ICD-10-CM codes in the data and how well they correctly identified health events caused by cannabis. All of these studies required review of individual medical records in order to confirm cannabis was at least partially attributable, a resource-intensive task. Regardless of the immense effort put forth in these studies, none were successful in identifying all cases involving cannabis use.
- Findings cannot infer causation between cannabis use and medical outcomes, including reason for visiting the hospital/ED, diagnoses, or conditions
- Patient intake data from hospitals and emergency departments is not currently collected by CHA.

    - C.R.S. 25-3-127 discusses the use of hospital and emergency room data to assess patients that presented with conditions or diagnosis reflecting marijuana use and concurrent use of marijuana, alcohol, and/or other drugs.

- Discharge data reported to CHA are from participating member hospitals or healthcare systems only and most are located in urban areas.

- Discharge data are primarily collected for billing purposes. Codes are subject to interpretation by those assigning them.

- Discharge data from CHA do not contain detailed information about patient cannabis use, such as type of product used, amount used, THC content of product (% THC), frequency of use, duration of use, and time of last use in relation to the health event.

    - This report originates from Colorado House Bill 21-1317, specific to regulating marijuana concentrates, a form of marijuana product consisting of high percentage THC content.

- ICD-10 diagnosis code categories indexed by the National Center for Health Statistics may appear to be directly correlated to cannabis use by how they are defined and indexed (e.g. cannabis abuse, cannabis dependence, cannabis induced, newborn affected by maternal cannabis use). However, assumptions cannot be made by the mere presence of these codes for several reasons. No studies have been conducted to validate the accurate use of these codes nor their ability to identify the correct diagnosis for which they infer. Like all cannabis codes, presence of one of these codes is not indicative of cause of the health ailment or reason for ED/hospital visit. For these reasons, we do not extract these specific codes for independent analyses.

Appendix C

Methods

Data source

CHA manages administrative data on hospitalization and ED discharges from participating member health care facilities in Colorado. The majority of acute care hospitals and EDs in Colorado are included in this data source. Both hospital and ED discharges are mutually exclusive. Location of patients discharged is specific to the patient's residence and **not** the health care facility where treated. All discharges are included regardless of residential status, including discharges with missing and out-of-state residency, unless otherwise noted. Individual patients cannot be linked to multiple discharges. Per statute, CDPHE is required to use this data source for this report.

Statistical analyses

Logic models were developed to examine the frequency of ICD-10-CM codes related to cannabis, alcohol, and/or other drug substances, including, cocaine, opioids, and other stimulants (Table 1). Each level of the logic models create mutually exclusive definitions using ICD-10-CM substance codes (Figures 1 and 2). The top levels consist of the total counts of ED or hospital discharges in Colorado during 2023. The second level of the model examines overall cannabis presence in discharges by separating the frequency of discharges that contain any cannabis codes from those with no cannabis codes. The next level branches from cannabis presence to examine overall substance presence. Any cannabis discharges are separated based on discharges that met the cannabis-only definition and those that met the cannabis plus alcohol and/or drug definition. Discharges that met the no cannabis definition are further separated based on discharges that met the no substance definition and those that met the alcohol and/or drug definition. The final and lowest level evaluates the cannabis-only discharges and branches those that met the definition for cannabis likely-attributed

and cannabis-mentioned into separate categories. The definitions of these two categories are based on the predictive value performance of cannabis codes as demonstrated in a single study[1].

Annual discharge rates of cannabis likely-attributed and cannabis-mentioned discharges were examined over a four-year period from 2020 to 2023 (Figures 3-4). Rates were calculated for both emergency department and hospital discharges separately. Numerators were the number of discharges that met the definition criteria for either cannabis likely-attributed or cannabis-mentioned. Denominators were the total annual number of discharges. The proportion was multiplied by 100,000 to obtain the discharge rates that were equitably comparable. The percentage of the total annual discharges that cannabis likely attributed and cannabis-mention codes represent were also calculated. All hospital and ED discharges were mutually exclusive.

Discharge rates were calculated for cannabis likely-attributed and cannabis-mentioned discharges by age, sex, and race/ethnicity (Tables 2-7). Rates were calculated for both emergency department and hospital discharges separately. Numerators were the number of discharges that met the definition criteria for either cannabis likely-attributed or cannabis-mentioned. Total discharges were stratified by demographic group for the denominators. The proportion was multiplied by 100,000 to obtain the discharge rates that were equitably comparable. The highest rate for each demographic group was compared to other demographic stratifications using non-overlapping 95% confidence intervals to determine significance. Numbers and rates were suppressed for all counts of cannabis-attributed or cannabis-mentioned discharges of less than 11. All hospital and ED discharges were mutually exclusive.

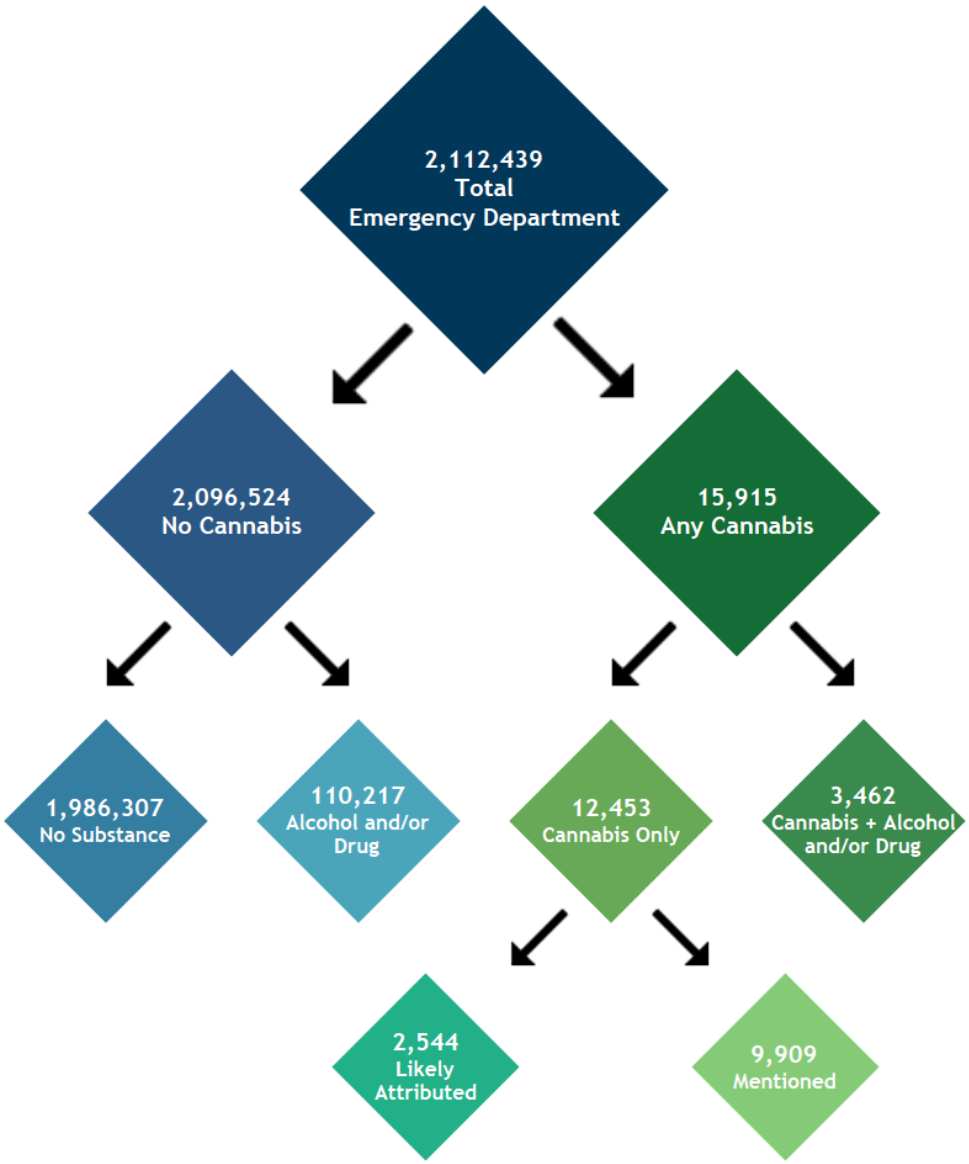
Age-adjusted, county population rates were used to examine geographic differences in cannabis-only discharges (Figures 5-6, Tables 8-9). These rates were calculated to account for variance in county populations around the state. Rates were calculated for both emergency department and hospital discharges separately. The numerator reflects the number of cannabis-only discharges among residents of each specific

county. The denominators are population based estimates using the direct method and standardized for age according to the 2000 United States standard population. The proportion was multiplied by 1,000 for county level to obtain the rates that were equitably comparable. The highest county rate was compared to other counties using non-overlapping 95% confidence intervals to determine significance. Numbers and rates were suppressed for counties that had less than 11 cannabis-only discharges or total discharges for the year less than 50. Discharges with missing or out-of-state residential information were excluded from geographic analyses. All hospital and ED discharges were mutually exclusive.

Appendix D

Tables and figures

Figure1. Logic model of number of emergency department discharges with and without ICD-10 CM substance codes, Colorado 2023‡

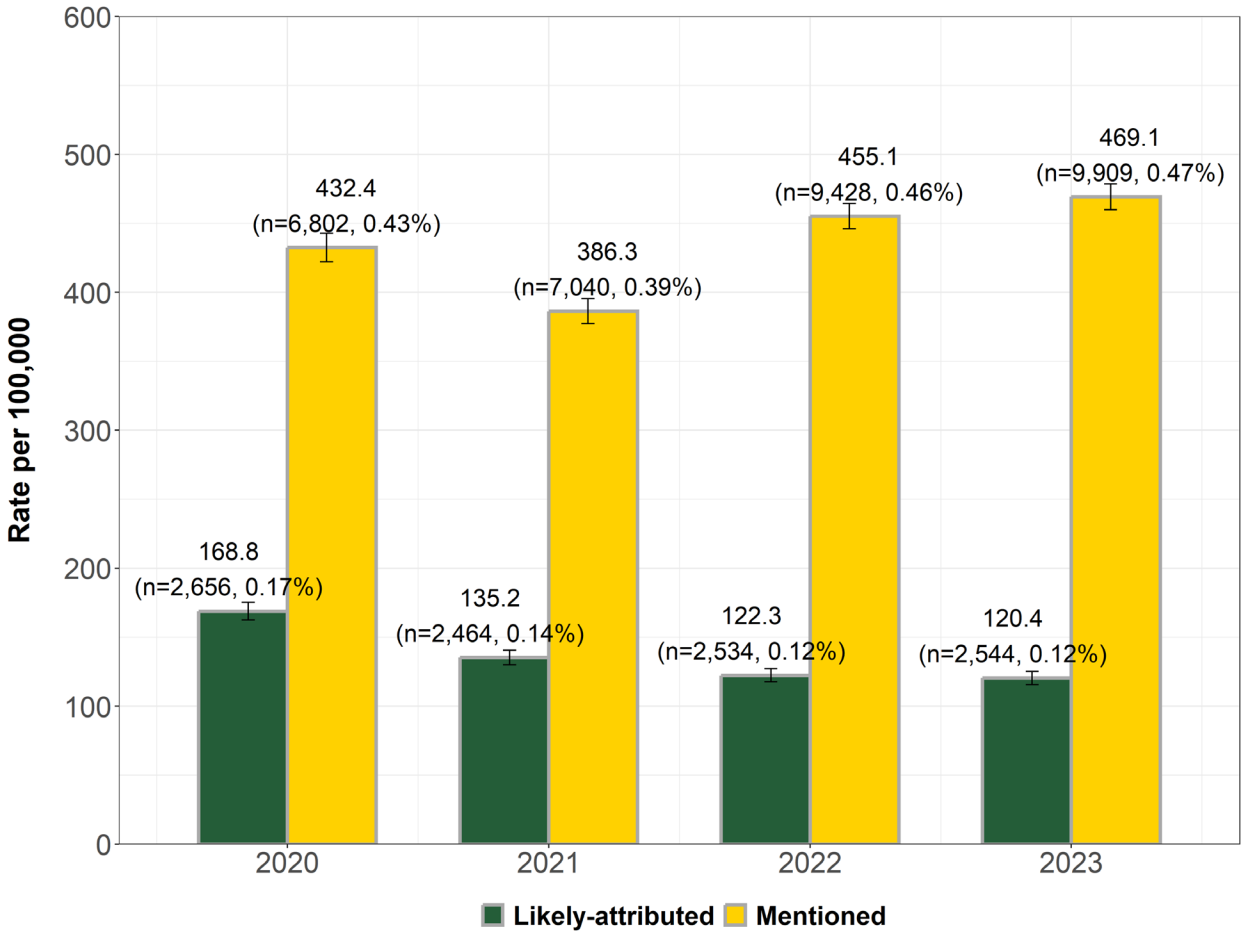


‡ Colorado Hospital Association, 2023 dataset

Figure 2. Logic model of number of hospital discharges with and without ICD-10 CM substance codes, Colorado 2023‡

‡ Colorado Hospital Association, 2023 dataset

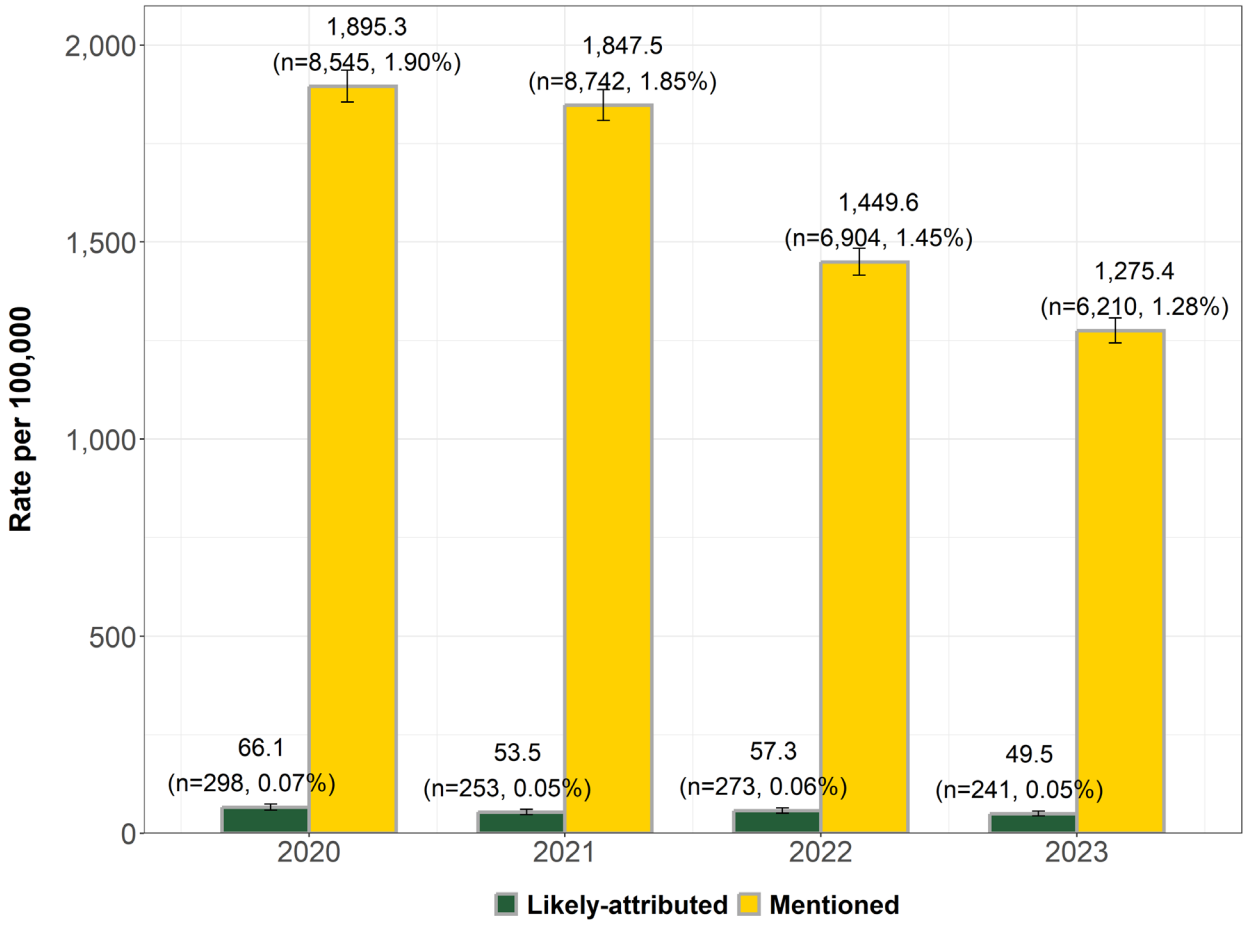
Figure 3. Annual emergency department discharge rates of cannabis likely-attributed and mentioned per 100,000 discharges, Colorado, 2020-2023‡



Footnotes:
Errata: 2020 data have been corrected from previous reports.
n= the number of discharges.
%= the corresponding percentage of all ED discharges for that year.
Error bars indicate 95% confidence intervals for the rate.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2020-2023 datasets

Figure 4. Annual hospital discharge rates of cannabis likely-attributed and mentioned per 100,000 discharges, Colorado, 2020-2023‡



Footnotes:
Errata: 2020 data have been corrected from previous reports.
n= the number of discharges.
%= the corresponding percentage of all hospital discharges for that year.
Error bars indicate 95% confidence intervals for the rate.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2020-2023 datasets

Table 1. ICD-10-CM substance codes

Substance category	Description	ICD-10-CM Codes
Cannabis	Cannabis abuse, dependence, or use	F12
	Cannabis poisoning	T40.7 from Jan. 1, 2021 – Sept. 30, 2021 T40.71 from Oct. 1, 2021 – Dec. 31, 2023
	Newborn affected by maternal cannabis use	P04.81
Alcohol and/or drug	Alcohol	E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K85.2, K86.0, O35.4, O99.31, P04.3, Q86.0, T51.0, Y90.[4-8]
	Cocaine	F14, T40.5, R78.2
	Opioid	F11, T40.[0-4], T40.6, Z79.891
	Stimulant	F15, T43.6

Table 2. Rate of emergency department discharges with cannabis likely-attributed and mentioned ICD-10-CM codes per 100,000 discharges by age, Colorado 2023‡

Age group	Total ED	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
<6 years	192,097	147	76.5	64.7-89.9	-*		
6-12 years	128,228	85	66.3	53.0-82.0	23	17.9	11.4-26.9
13-17 years	109,690	540	492.3†	451.7-535.5	789	719.3	670.1-771.1
18-20 years	89,600	235	262.3	229.8-298.0	895	998.9¥	934.8-1,066.2
21-25 years	167,283	375	224.2	202.1-248.0	1,709	1,021.6‡	974.0-1,071.0
26-35 years	346,366	508	146.7	134.2-160.0	2,589	747.5	719.1-776.7
36-55 years	503,554	434	86.2	78.3-94.7	2,617	519.7	500.0-540.0
56-65 years	209,454	120	57.3	47.5-68.5	725	346.1	321.4-372.2
66+ years	366,160	100	27.3	22.2-33.2	559	152.7	140.3-165.9

Footnotes:
N= the number of discharges.
-*Age groups with n<11 are suppressed.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
¥ No significant difference compared to highest rate due to overlapping confidence intervals.
Discharge rate calculated with total discharges in age group per 100,000 ED discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Table 3. Rate of emergency department discharges with cannabis likely-attributed and mentioned ICD-10-CM codes by sex, Colorado 2023‡

Sex	Total ED	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
Male	967,574	1,437	148.5†	140.9-156.4	5,119	529.1‡	514.7-543.7
Female	1,144,422	1,107	96.7	91.1-102.6	4,787	418.3	406.5-430.3
Unknown	443	-*			-*		

Footnotes:
N= the number of discharges.
-*Sex groups with n<11 are suppressed.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
Discharge rate calculated with total discharges in sex group per 100,000 ED discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Table 4. Rate of emergency department discharges with cannabis likely-attributed and mentioned ICD-10-CM codes by race and ethnicity, Colorado 2023‡

Race/ethnicity	Total ED	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
American Indian/Alaskan Native	20,535	19	92.5	55.7-144.5	110	535.7¥	440.5-645.3
Asian/Pacific Islander	36,911	43	116.5	84.3-156.9	91	246.5	198.5-302.6
Black	158,263	309	195.2†	174.1-218.2	897	566.8‡	530.4-605.0
Hispanic	463,061	655	141.5	130.8-152.7	2,461	531.5	510.7-552.8
White, non-Hispanic	1,241,995	1,201	96.7	91.3-102.3	5,745	462.6	450.7-474.7
Other	109,493	179	163.5	140.4-189.2	326	297.7	266.3-331.8
Unknown	82,181	138	167.9¥	141.1-198.4	279	339.5	300.9-381.7

Footnotes:
N= the number of discharges.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
¥ No significant difference compared to highest rate due to overlapping confidence intervals.
Discharge rate calculated with total discharges in race and ethnicity group per 100,000 ED discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Table 5. Rate of hospital discharges with cannabis likely-attributed and mentioned ICD-10-CM codes by age, Colorado 2023‡

Age group	Total hospital	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
<6 years	72,389	31	42.8	29.1-60.8	551	761.2	699.1-827.2
6-12 years	4,795	-*			20	417.1	255.0-643.4
13-17 years	8,405	20	238.0†	145.4-367.3	631	7,507.4‡	6,952.9-8,091.6
18-20 years	7,697	14	181.9¥	99.5-305.0	433	5,625.6	5,121.2-6,163.9
21-25 years	19,832	32	161.4	110.4-227.7	875	4,412.1	4,130.4-4,707.2
26-35 years	62,612	50	79.9	59.3-105.3	1,287	2,055.5	1,945.8-2,169.7
36-55 years	84,491	48	56.8	41.9-75.3	1,310	1,550.5	1,468.2-1,636.0
56-65 years	59,778	18	30.1	17.8-47.6	571	955.2	878.8-1,036.4
66+ years	166,898	23	13.8	8.7-20.7	532	318.8	292.3-347.0

Footnotes:
N= the number of discharges.
-*Age groups with n<11 are suppressed.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
¥ No significant difference compared to highest rate due to overlapping confidence intervals.
Discharge rate calculated with total discharges in age group per 100,000 hospital discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Table 6. Rate of hospital discharges with cannabis likely-attributed and mentioned ICD-10-CM codes by sex, Colorado 2023‡

Sex	Total hospital	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
Male	216,977	145	66.8†	56.4-78.6	3,094	1,426.0‡	1,376.5-1,476.7
Female	269,681	96	35.6	28.8-43.5	3,112	1,154.0	1,114.0-1,195.0
Unknown	241	-*			-*		

Footnotes:
N= the number of discharges.
-*Sex groups with n<11 are suppressed.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
Discharge rate calculated with total discharges in sex group per 100,000 hospital discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

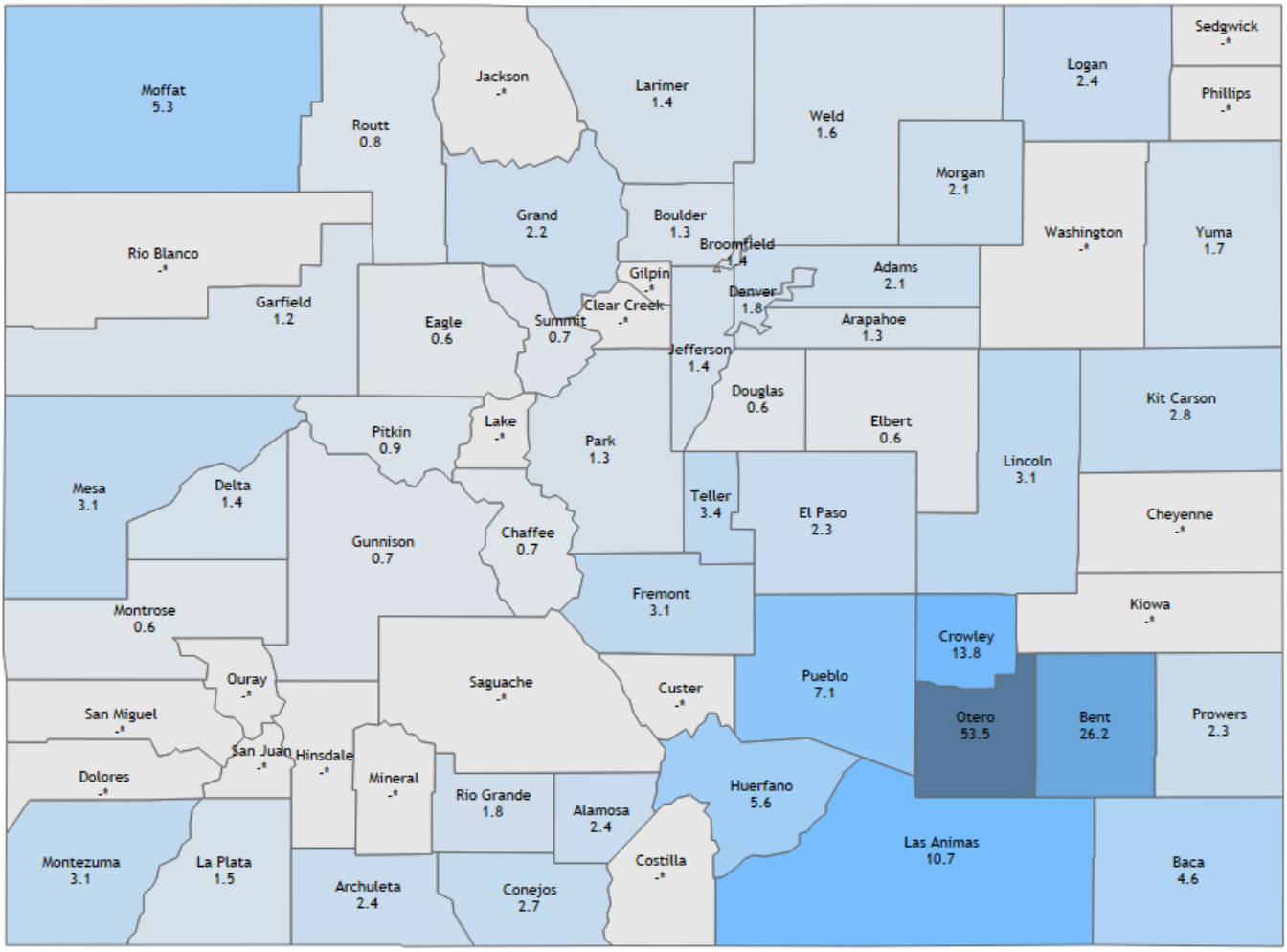
Table 7. Rate of hospital discharges with cannabis likely-attributed and mentioned ICD-10-CM codes by race and ethnicity, Colorado 2023‡

Race/ethnicity	Total hospital	Cannabis likely-attributed			Cannabis-mentioned		
		N	Rate per 100,000	95% Confidence intervals	N	Rate per 100,000	95% Confidence intervals
American Indian/Alaskan Native	4,400	-*			58	1,318.2	1,002.4-1,700.8
Asian/Pacific Islander	9,337	-*			50	535.5	397.7-705.4
Black	26,336	26	98.7†	64.5-144.6	682	2,589.6‡	2,401.1-2,788.6
Hispanic	83,501	54	64.7	48.6-84.4	1,106	1,324.5	1,248.1-1,404.4
White, non-Hispanic	312,525	126	40.3	33.6-48.0	3,639	1,164.4	1,127.1-1,202.6
Other	19,794	16	80.8¥	46.2-131.2	329	1,662.1	1,488.6-1,850.0
Unknown	31,006	16	51.6	29.5-83.8	346	1,115.9	1,002.0-1,239.1

Footnotes:
N= the number of discharges.
-*Race/ethnicity groups with n<11 are suppressed.
† Highest rate in demographic group among cannabis likely-attributed.
‡ Highest rate in demographic group among cannabis-mentioned.
¥ No significant difference compared to highest rate due to overlapping confidence intervals.
Discharge rate calculated with total discharges in race and ethnicity group per 100,000 hospital discharges.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Figure 5: County level heat map of age-adjusted rates of emergency department discharges with cannabis-only ICD-10 CM codes per 1,000 county residents, Colorado 2023‡



Footnotes:
Additional details available in Table 8, including numbers of discharges, crude rate, and age-adjusted rate with corresponding 95% confidence intervals.
Discharges with missing or out-of-state residential information excluded.
-*Counties with number of cannabis-only discharges <11 or total discharges <50 are suppressed.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

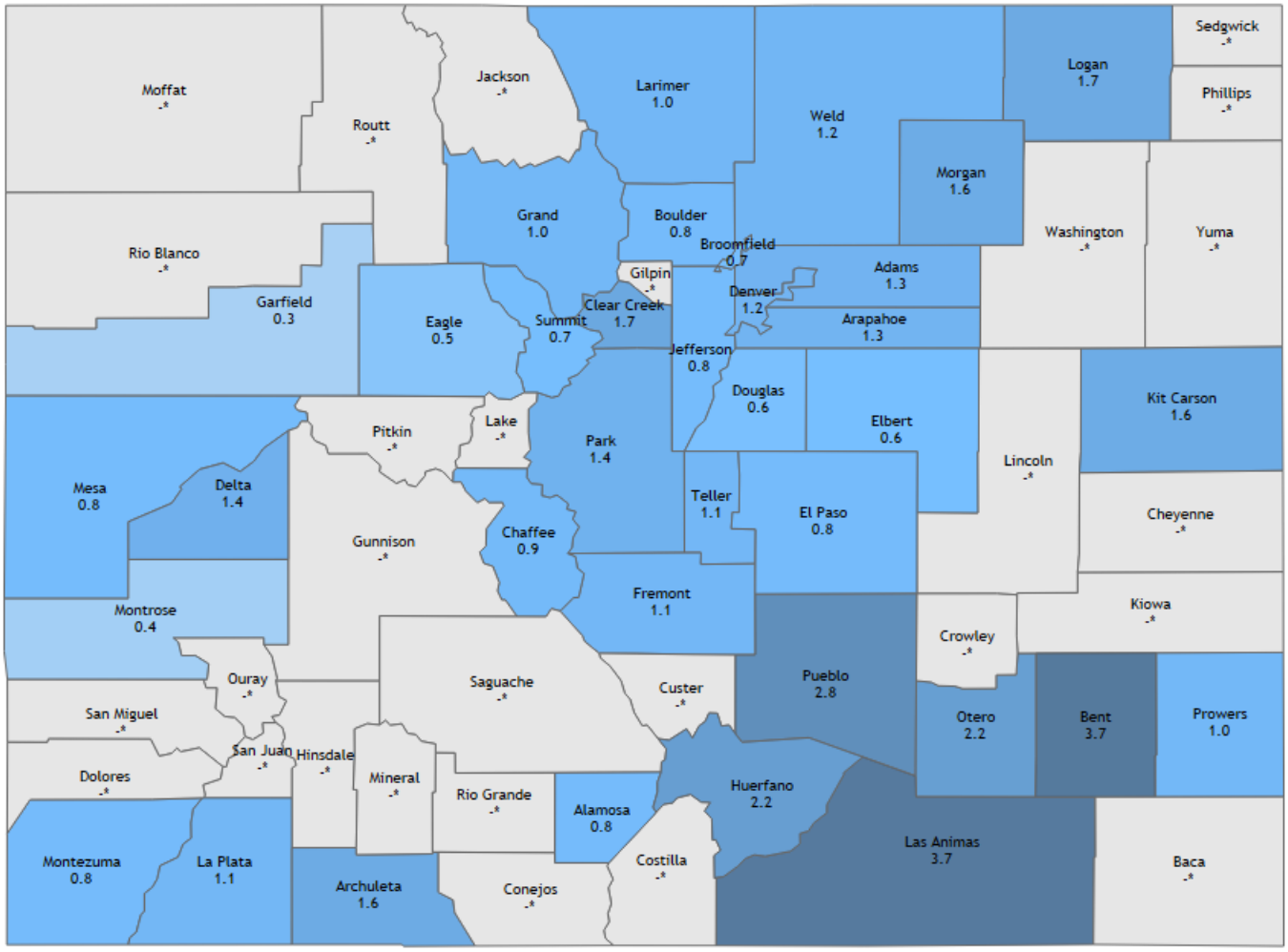
Table 8. Rates of emergency room discharges with cannabis-only ICD-10-CM codes per 1,000 residents by county, Colorado 2023‡

County	N	Population	Crude Rate	Age-adjusted Rate	LCI	UCI
Adams	1115	533580	2.1	2.1	1.9	2.2
Alamosa	36	16648	2.2	2.4	1.7	3.3
Arapahoe	835	655760	1.3	1.3	1.2	1.4
Archuleta	23	14178	1.6	2.4	1.5	3.7
Baca	12	3374	3.6	4.6	2.3	8.1
Bent	156	5686	27.4	26.2	22.1	31
Boulder	437	326663	1.3	1.3	1.2	1.4
Broomfield	105	76853	1.4	1.4	1.1	1.7
Chaffee	13	20598	0.6	0.7	0.3	1.3
Cheyenne	-*	1719	-*	-*	-*	-*
Clear Creek	-*	9153	-*	-*	-*	-*
Conejos	18	7497	2.4	2.7	1.6	4.3
Costilla	-*	3636	-*	-*	-*	-*
Crowley	85	5638	15.1	13.8	10.9	17.7
Custer	-*	5546	-*	-*	-*	-*
Delta	37	31778	1.2	1.4	1	2
Denver	1327	715636	1.9	1.8	1.7	1.9
Dolores	-*	2270	-*	-*	-*	-*
Douglas	209	383911	0.5	0.6	0.5	0.7
Eagle	31	54411	0.6	0.6	0.4	0.9
El Paso	1752	744153	2.4	2.3	2.2	2.4
Elbert	12	28795	0.4	0.6	0.3	1
Fremont	135	50359	2.7	3.1	2.6	3.7
Garfield	71	62722	1.1	1.2	0.9	1.5
Gilpin	-*	5925	-*	-*	-*	-*
Grand	33	15971	2.1	2.2	1.5	3.2
Gunnison	14	17321	0.8	0.7	0.4	1.3
Hinsdale	-*	772	-*	-*	-*	-*
Huerfano	31	7063	4.4	5.6	3.7	8.4
Jackson	-*	1311	-*	-*	-*	-*
Jefferson	765	576381	1.3	1.4	1.3	1.5
Kiowa	-*	1376	-*	-*	-*	-*
Kit Carson	15	7007	2.1	2.8	1.5	4.6
La Plata	79	56453	1.4	1.5	1.2	1.9
Lake	-*	7376	-*	-*	-*	-*
Larimer	541	370639	1.5	1.4	1.3	1.5
Las Animas	150	14373	10.4	10.7	9	12.8
Lincoln	18	5500	3.3	3.1	1.8	5.1
Logan	47	20607	2.3	2.4	1.8	3.3
Mesa	459	159637	2.9	3.1	2.8	3.4
Mineral	-*	935	-*	-*	-*	-*
Moffat	65	13317	4.9	5.3	4.1	6.8
Montezuma	70	26563	2.6	3.1	2.4	3.9
Montrose	24	44167	0.5	0.6	0.4	0.9
Morgan	58	29559	2	2.1	1.6	2.8
Otero	885	18115	48.9	53.5†	50	57.3
Ouray	-*	5160	-*	-*	-*	-*
Park	20	18101	1.1	1.3	0.8	2.2
Phillips	-*	4465	-*	-*	-*	-*
Pitkin	14	16642	0.8	0.9	0.5	1.6
Prowers	25	11745	2.1	2.3	1.5	3.4
Pueblo	1072	169427	6.3	7.1	6.6	7.5
Rio Blanco	-*	6576	-*	-*	-*	-*
Rio Grande	17	11210	1.5	1.8	1.1	3
Routt	21	25064	0.8	0.8	0.5	1.3
Saguache	-*	6681	-*	-*	-*	-*
San Juan	-*	803	-*	-*	-*	-*
San Miguel	-*	7855	-*	-*	-*	-*
Sedgwick	-*	2313	-*	-*	-*	-*
Summit	22	30441	0.7	0.7	0.5	1.3
Teller	63	24631	2.6	3.4	2.5	4.4
Washington	-*	4843	-*	-*	-*	-*
Weld	569	359530	1.6	1.6	1.4	1.7
Yuma	15	9881	1.5	1.7	0.9	2.8

Footnotes:
Discharges with missing or out-of-state residential information excluded.
N= the number of cannabis-only discharges.
Crude rate= number of cannabis-only discharges per 1,000 county residents (unadjusted for age).
Age-adjusted rate calculated using the direct method and standardized according to the 2000 United States standard population.
LCI=Lower 95% confidence interval.
UCI=Upper 95% confidence interval.
-*Counties with number of cannabis-only discharges <11 or total discharges for the year <50 are suppressed.
† Highest adjusted rate in cannabis-only emergency department discharges among all the counties.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Figure 6. County level heat map of age-adjusted rates of hospital discharges with cannabis-only ICD-10 CM codes per 1,000 county residents, Colorado 2023‡



Footnotes:
Additional details available in Table 9, including numbers of discharges, crude rate, and age-adjusted rate with corresponding 95% confidence intervals.
Discharges with missing or out-of-state residential information excluded.
-*Counties with number of cannabis-only discharges <11 or total discharges <50 are suppressed.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).

‡ Colorado Hospital Association, 2023 dataset

Table 9. Rates of hospital discharges with cannabis-only ICD-10-CM codes per 1,000 residents by county, Colorado 2023‡

County	N	Population	Crude Rate	Age-adjusted Rate	LCI	UCI
Adams	695	533580	1.3	1.3	1.2	1.4
Alamosa	13	16648	0.8	0.8	0.4	1.5
Arapahoe	818	655760	1.2	1.3	1.2	1.3
Archuleta	15	14178	1.1	1.6	0.9	2.8
Baca	-*	3374	-*	-*	-*	-*
Bent	20	5686	3.5	3.7	2.2	6
Boulder	287	326663	0.9	0.8	0.7	0.9
Broomfield	53	76853	0.7	0.7	0.5	0.9
Chaffee	12	20598	0.6	0.9	0.5	1.7
Cheyenne	-*	1719	-*	-*	-*	-*
Clear Creek	12	9153	1.3	1.7	0.9	3.2
Conejos	-*	7497	-*	-*	-*	-*
Costilla	-*	3636	-*	-*	-*	-*
Crowley	-*	5638	-*	-*	-*	-*
Custer	-*	5546	-*	-*	-*	-*
Delta	37	31778	1.2	1.4	1	2
Denver	900	715636	1.3	1.2	1.2	1.3
Dolores	-*	2270	-*	-*	-*	-*
Douglas	222	383911	0.6	0.6	0.5	0.7
Eagle	27	54411	0.5	0.5	0.3	0.8
El Paso	607	744153	0.8	0.8	0.8	0.9
Elbert	18	28795	0.6	0.6	0.4	1.1
Fremont	53	50359	1.1	1.1	0.8	1.4
Garfield	20	62722	0.3	0.3	0.2	0.5
Gilpin	-*	5925	-*	-*	-*	-*
Grand	15	15971	0.9	1	0.5	1.8
Gunnison	-*	17321	-*	-*	-*	-*
Hinsdale	-*	772	-*	-*	-*	-*
Huerfano	11	7063	1.6	2.2	0.9	4.5
Jackson	-*	1311	-*	-*	-*	-*
Jefferson	434	576381	0.8	0.8	0.7	0.9
Kiowa	-*	1376	-*	-*	-*	-*
Kit Carson	11	7007	1.6	1.6	0.8	2.9
La Plata	48	56453	0.9	1.1	0.8	1.5
Lake	-*	7376	-*	-*	-*	-*
Larimer	392	370639	1.1	1	0.9	1.2

‡ Colorado Hospital Association, 2023 dataset

Las Animas	55	14373	3.8	3.7	2.7	5
Lincoln	-*	5500	-*	-*	-*	-*
Logan	29	20607	1.4	1.7	1.1	2.4
Mesa	114	159637	0.7	0.8	0.6	0.9
Mineral	-*	935	-*	-*	-*	-*
Moffat	-*	13317	-*	-*	-*	-*
Montezuma	19	26563	0.7	0.8	0.5	1.4
Montrose	15	44167	0.3	0.4	0.2	0.6
Morgan	44	29559	1.5	1.6	1.1	2.1
Otero	37	18115	2	2.2	1.5	3.1
Ouray	-*	5160	-*	-*	-*	-*
Park	20	18101	1.1	1.4	0.8	2.2
Phillips	-*	4465	-*	-*	-*	-*
Pitkin	-*	16642	-*	-*	-*	-*
Prowers	11	11745	0.9	1	0.5	1.9
Pueblo	410	169427	2.4	2.8	2.5	3.1
Rio Blanco	-*	6576	-*	-*	-*	-*
Rio Grande	-*	11210	-*	-*	-*	-*
Routt	-*	25064	-*	-*	-*	-*
Saguache	-*	6681	-*	-*	-*	-*
San Juan	-*	803	-*	-*	-*	-*
San Miguel	-*	7855	-*	-*	-*	-*
Sedgwick	-*	2313	-*	-*	-*	-*
Summit	23	30441	0.8	0.7	0.4	1.2
Teller	24	24631	1	1.1	0.6	1.7
Washington	-*	4843	-*	-*	-*	-*
Weld	426	359530	1.2	1.2	1.1	1.3
Yuma	-*	9881	-*	-*	-*	-*

Footnotes:
Discharges with missing or out-of-state residential information excluded.
N= the number of cannabis-only discharges.
Crude rate= number of cannabis-only discharges per 1,000 county residents (unadjusted for age).
Age-adjusted rate calculated using the direct method and standardized according to the 2000 United States standard population.
LCI=Lower 95% confidence interval.
UCI=Upper 95% confidence interval.
-*Counties with number of cannabis-only discharges <11 or total discharges for the year <50 are suppressed.
† Highest adjusted rate in cannabis-only hospital discharges among all the counties.
¥ No significant difference compared to highest rate due to overlapping confidence intervals.
Hospital and ED discharges are mutually exclusive.
Findings need to be interpreted with caution (see Limitations).