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# Postmortem toxicological presence of marijuana among Colorado residents younger than 25 years

Report pursuant to 30-10-624 C.R.S.

January 2023



**COLORADO**  
Department of Public  
Health & Environment

[Marijuanahealthinfo.colorado.gov/reports-and-summaries](https://marijuanahealthinfo.colorado.gov/reports-and-summaries)

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# Executive Summary

This report contains the findings of postmortem toxicology results among non-natural, non-homicide deaths among Coloradans younger than age 25, referred to as the population of interest. The Colorado Department of Public Health and Environment (CDPHE) is required by § 30-10-624 of Colorado Revised Statute to produce this report every year by January 2. CDPHE is tasked with examining the data to determine whether THC, by itself or in conjunction with alcohol or other scheduled drugs, were present in postmortem toxicology test results of the population of interest.

From 2010 through part of 2022, there were 3,040 deaths that met statutory criteria of non-natural, non-homicide deaths among Coloradans younger than age 25. Suicide was the leading cause of death in this population of interest. Toxicology test results were available for 2,233 deaths; 68.2% had presence of a substance, marijuana was the substance most commonly found and present in 651 individuals or 29.2% of test results. Marijuana-only (without the presence of other substances) was present in 207 toxicology test results, amounting to 6.8% of the test results in the population of interest. Among suicide deaths in the population of interest, 9.3% had only marijuana present in toxicology test results.

The findings of this report are provisional, and need to be interpreted with caution as there are limitations. The data used in this report vary by source, year and amount of detail. Data from deaths that occurred in 2021 and 2022 are still being collected and are not finalized. Additionally, the data used in this report rarely contain information on marijuana product(s) consumed, often lacking information such as the type of marijuana product, the concentration (potency) of THC and the amount consumed. A major limitation is the non-existence of a standardized interpretation of postmortem THC toxicology test result values. This prevents any determination of the level of THC impairment based on toxicology test results.

Due to the preliminary nature of the data and the limitations noted, CDPHE does not provide any recommendations at this time.

# Introduction

In 2021, [House Bill 21-1317](#), codified in §30-10-624, Colorado Revised Statutes (CRS) mandated drug toxicology testing in each case of non-natural deaths, excluding homicides, among Colorado residents younger than 25 years. Beginning Jan. 1, 2022, Colorado coroners were required to complete a full toxicology screen on people meeting this criteria, specifically testing for the presence of tetrahydrocannabinol (THC), alcohol, and federally scheduled drugs. Statute also requires coroners to share this information with the Colorado Department of Public Health and Environment (CDPHE) for inclusion into the violent death reporting system.

As part of this bill, CDPHE is required to produce a report on the toxicological findings from non-natural deaths, excluding homicide, among Colorado decedents younger than 25 years, by Jan. 2, 2023, and annually each year thereafter. CDPHE is tasked with examining the data to determine whether THC, by itself or in conjunction with alcohol or other scheduled drugs, was present in postmortem toxicology test results of this population of interest.

The data used to produce this report reflect the expert, medical opinions of the coroners, medical examiners that performed the postmortem examination and tests on the people identified within the data. It is the coroners/medical examiners who process the information available to them and report the facts regarding the events leading up to death to CDPHE.

## Authors

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# Limitations

**Information presented in this report should be interpreted with caution due to the following limitations:**

- Data collection for deaths that occurred in calendar years 2021 and 2022 were incomplete at the time of analyses and production of this report. Data collection and entry for those deaths continues and will be included in future iterations of this report.
  - Data collected in the State Unintentional Drug Overdose Reporting System (SUDORS) will reflect the growing numbers of deadly drug overdoses in recent years, including the significant increases since 2019 largely due to fentanyl-involved overdoses.
- Data collected and the amount of detail vary by source and year. Changes to reporting structures and surveillance systems have led to differences in completeness of data and available detail over time.
- Data rarely contain information on the type of marijuana product, concentration (percentage) of THC the product contained, method of consumption, amount consumed, or where the product was obtained.
- Standardized interpretation of postmortem THC toxicology test result values does not exist. This is largely due to uncontrollable factors related to sample condition and an incomplete understanding of cannabinoid postmortem redistribution. Therefore, the level of THC impairment based on toxicology test result values cannot be determined at this time.
- Variation in toxicology tests and result reporting, specimen type (including postmortem interval), sensitivity, and detection levels all may impact the final test result reported.
- Prior to January 2022, postmortem toxicology screening of this population of interest was at the discretion of the attending coroner/medical examiner, which may impact the interpretation of trends over time.
- Presence of marijuana, with or without other substances present, in toxicology test results cannot be assumed to be the causal factor that led to death. Determining the elements that contributed to a person's death is a complex process that often involves multiple factors.
- Procedures and medical opinions can vary among coroners/medical examiners.

# Methods

The methods used to identify cases and analyze the data in this report are provisional and may be altered in future reports pending new methodology, guidance and/or knowledge.

## Inclusion and exclusion criteria

Our inclusion criteria were defined in §30-10-624, C.R.S. as non-natural deaths, excluding homicide, among Colorado residents younger than 25 years. The authors of the report interpret non-natural death to mean those that occur by suicide, accident, or undetermined manner as determined by a coroner, medical examiner, or medical doctor. The authors of the report used the International Classification of Diseases 10<sup>th</sup> Revision (ICD-10) codes for external causes of morbidity and mortality to find cases that met our definition of non-natural death (Table A1). Cases were excluded when the case met at least one of the following criteria: Homicide was the external cause of death classification, age was unknown or greater than or equal to 25 years, and state of residence was not Colorado (Figure 1). Colorado residents who met the inclusion criteria that died outside of Colorado were not included.

## Data sources

**Source one: The Colorado Violent Death Reporting System (CoVDRS)** is an enhanced public health surveillance system in place since 2004, and it is housed in the Center for Health and Environmental Data at CDPHE. It is designed to obtain a complete census of all violent deaths occurring in Colorado. A violent death includes any death by suicide, homicide, firearm-related deaths regardless of manner, and undetermined deaths that may have been caused by violent means. CoVDRS collects data from multiple sources, including death certificates. Data collection is completed through a combination of routine data extraction from death certificates completed through routine vital records registration, coroner/medical examiner reports, and law enforcement investigations. These data include enhanced demographics, injury specifics, method of injury, contributing circumstances, and toxicology information. Deaths documented in CoVDRS that met our criteria were included if they occurred as of 2010 and beyond. However, data for deaths occurring in 2021 and 2022 are considered incomplete, but were included as preliminary if available as of October 2022.

**Source two: The State Unintentional Drug Overdose Reporting System (SUDORS)** is an enhanced public health surveillance system, also housed in the Center for Health and Environmental Data at CDPHE, designed to collect data on all deadly drug overdose deaths, including those that were unintentional, accidental, and undetermined intent. SUDORS also collects data from death certificates and coroner/medical examiner reports, which includes information from a variety of documents, including autopsy reports, toxicology reports, investigation summaries, and scene of death descriptions. Deaths documented in SUDORS that met our criteria were included if they occurred as of July 2019, when SUDORS was first implemented in Colorado.

**Source three: Colorado death certificate data** that are reported to the state Vital Records Office at CDPHE were used to obtain data for non-natural deaths that were not previously captured in CoVDRS or SUDORS; namely deadly, unintentional injuries or non-violent injuries of undetermined intent, where the manner of death was classified as accidental (excluding overdose) or undetermined manner without involving a violent component.

## Toxicology information

Postmortem toxicology test result data were used to identify the presence of marijuana, with and without the presence of other substances. Among the deaths that were identified using the criteria, toxicology test results were examined for those that had 1) toxicology tests performed, and 2) been tested for at least one substance and had results available. “Present” results indicate a substance was detected in the toxicology test and are defined as any results having a numeric level greater than zero or text indicating “positive” or “present” (Table 1). Beginning with deaths occurring in 2021, additional data was collected on the nanograms of THC compound(s) present per milliliter of blood (ng/ml), where available. Femoral blood tests measured THC compound concentrations for 11-Hydroxy Delta-9 THC, Delta-9 Carboxy THC, and Delta-9 THC (Table 2).

## Statistical analyses

Marijuana presence was examined by proportion of occurrences with any marijuana present in the total population compared to presence of other toxicology results. To further explore marijuana presence with other substances, the number of toxicology results were grouped to define marijuana only (one toxicology result with marijuana present), marijuana + other (two or more toxicology results with marijuana and one or more present), other (one or more



toxicology result with no marijuana present or tested), no substance (one or more toxicology result with none present), or not tested (zero toxicology results).

Marijuana presence was examined annually to assess toxicology testing trends over time from 2010 to 2021 (2022 data were excluded from time trends due to incompleteness).

- Percentage present (number of present toxicology test results/total number of toxicology tests)\*100
- Crude mortality rate (number present toxicology test results/total Colorado population younger than 25 years)\*100,000

The State Demography Office's (SDO) report of Colorado's population estimates were used for the population denominator. Crude mortality rates were compared to the prior year to determine significant annual increases or decreases using non-overlapping 95% confidence intervals.

Descriptive statistics were calculated for ng/mL of THC compound starting in 2021 and when available. THC compound results are incomplete and results are preliminary.

Characteristics were presented as counts and percentages of the total deaths of Colorado residents younger than 25 years combined from 2010-2022. Total counts were stratified by toxicology results to examine cause of death and demographics by age, sex, race, ethnicity, and education level. Categories with frequency of one or two were suppressed, and when easily discerned, suppression was increased to frequencies less than five.

# Findings

## Population of interest

From January 2010 through Oct. 1, 2022, there were 23,814 non-natural deaths reported to CDPHE (Figure 1). Of those, 2,957 homicides, 823 non-residents or unknown state of residence, and 16,994 people 25 years and older or age unknown were excluded. The remaining 3,040 deaths met the inclusion criteria of non-natural, non-homicide deaths among Coloradans younger than 25 years and were considered the population of interest for this report (Figure 2). There was a higher percentage of males (75.0%) compared to females, non-Hispanic (69.4%) compared to Hispanic, and White (86.2%) compared to all other race categories (Table 5). The majority of decedents (62.3%) had an education of high school diploma or less. These characteristics remained similar when stratified by toxicology test results.

## Toxicology test results

Toxicology test results were available on 2,233 (73.5%) deaths among the population of interest since 2010 (Figure 2). Nearly one third (31.9%) of test results indicated no substances were present (n=713, Table 3). Over this time period, marijuana was the most common substance present in test results, followed by alcohol and opioids. Presence of marijuana was indicated in the toxicology test results of 651 people (29.2%), and of those, 444 (68.2%) had at least one other substance also present. Of toxicology test results showing marijuana plus another substance present, 47.3% (n=210) had opioids present and 39.0% (n=173) had alcohol present (Figure 3). Among the population of interest, 6.8% (n=207) had test results indicating marijuana only present (Figure 2).

The proportion of toxicology test results indicating substance presence has changed in recent years. Comparing data from 2019 to 2021, toxicological presence of other substances and marijuana plus other substances increased, while the presence of marijuana only and no substance present decreased (Figure 6). Although provisional, data from 2021 indicate more than half (50.8%) of toxicology test results in the population of interest had presence of a substance other than marijuana. However, trends or patterns in testing should not be inferred by these data since data collection has varied over time. To this point, CoVDRS has been in place since 2004, but SUDORS only since 2019. Thus, the availability of toxicology for SUDORS cases (i.e., accidental overdoses) is less prior to 2019 and based solely on mentions of specific substances recorded on death certificates.

When examining the crude rate of substance present in postmortem toxicology test results over time in the population of interest, the rates of all substances remained stable from 2010 to 2018 (Figure 5). From 2018 to 2019, rates of toxicology test results with other substances began to rise. Between 2019 and 2020, the crude rate of marijuana plus another substance increased significantly from 2.7 per 100,000 deaths in 2019 to 5.8 in 2020. The crude rate of other substances (not marijuana) also rose (but not significantly) to 7.7 per 100,000 deaths. The rate of marijuana only remained stable at 1.6 per 100,000 deaths. SUDORS data were integrated starting in 2019, and the rise in rates during this time period may be a direct result of the addition of these data. Data from 2021 and 2022 were incomplete and therefore not included in these analyses.

Between 2021 and 2022, there were 108 postmortem toxicology test results that specified the quantity of THC or THC metabolites in blood. The preliminary data indicate test result ranges of 10.0-87.0 ng/mL blood for 11-Hydroxy Delta-9 THC, 13.0-260.0 ng/mL for Delta-9 Carboxy THC, and 10.0-381.0 ng/mL for Delta-9 THC.

## Causes of death

Since 2010, two-thirds (66.3%) of the deaths among the population of interest and included in this report were caused by suicide (Table 4). Suicide remained the leading cause of death category when stratified by toxicology test results. However, this likely is a function of accidental overdoses not being included in the CoVDRS system prior to 2019. When comparing toxicology test result categories, marijuana only (90.3%) and no substances present (87.0%) had the highest proportions among the suicide deaths in the population of interest. Unintentional overdoses was the second leading cause of death category, accounting for 37.4% of toxicology test results indicating marijuana plus another substance and 28.9% of tests indicating another substance (no marijuana) present.

## Key takeaways

- Since 2010, there have been 207 non-natural, non-homicide deaths among Colorado residents younger than 25 years that had toxicology test results indicating the presence of marijuana only (no other substances present). These account for 6.8% of the deaths among the population of interest. Of these deaths:
  - 39.1% were between the ages of 21-24.
  - 66.7% were non-Hispanic.

- 84.1% were white.
- 84.1% were male.
- 58.5% had a high school education or less.
- Of the 2,014 suicide deaths among Colorado residents younger than 25 years since 2010:
  - 30.8% had no substance present.
  - 25.9% had another substance present other than marijuana.
  - 9.3% had marijuana only present.
- Of the 2,233 non-natural, non-homicide deaths since 2010 among Colorado residents younger than 25 years in which toxicology results were available:
  - 68.2% had presence of a substance, including but not limited to marijuana.
  - 29.2% indicated presence of marijuana, more than any other substance.
- Presence of marijuana plus another substance (14.6%) was more common than presence of marijuana only (6.8%).
  - Marijuana present with opioids (47.3%) or alcohol (39.0%) were the most common substances found in combination with marijuana.

# Discussion

Starting in 2022, Colorado coroners/medical examiners were required to perform full toxicology tests on people meeting the criteria described in statute. These toxicology test results are required to be sent to CDPHE and documented in CoVDRS, also starting in 2022. Due to this mandate, the authors of the report anticipate the number of death records containing toxicology test results to rise in response. However, not all deaths meeting statutory criteria will be documented in CoVDRS. Therefore, the authors of the report expanded data sources to include the SUDORS and death certificate registry data to create a more comprehensive report. Additionally, for this inaugural report, we included historical toxicology data, dating back to 2010, to establish a baseline of the frequency of toxicology testing results prior to testing mandated in 2022.

Toxicology test result findings in this report are considered preliminary due to time delays in the reporting of the data. Data collection on mortality data can span many months and may take up to a year to finalize, often crossing into new calendar years. The data presented from 2021 and 2022 were considered incomplete for these reasons. The trends seen in toxicology testing may be influenced by or in direct response to the current opioid epidemic, especially among this population of interest.

The toxicology test results on the quantity of marijuana compounds (THC and THC metabolites) were also considered preliminary in this report since mandatory reporting of those results was only implemented in January 2022. Additionally, there is currently no guidance on how to interpret these results. Determining what these results mean in relation to impairment is an area where more research is needed and is beyond the scope of this report.

Concerning the suicide deaths in this report, although the majority of marijuana only toxicology test results came from suicide deaths, marijuana only toxicology results accounted for only 9.3% of all suicides in our population of interest. The data indicate that either no substance or substances other than marijuana were more often found in toxicology results of people of this population who died by suicide.

There are many complexities involved when analyzing mortality data. The authors of the report acknowledge and respect that the numbers contained within this report are people, who tragically lost their lives at a relatively young age. The purpose of the data utilized in

this report are to document and categorize the physiological, and sometimes physical, events that led directly to death. However, these data alone cannot tell the complete story of each individual. Relevant information may be missing, such as the particular circumstances, the individual's state of mind, their medical and/or mental health history, etc. It should be emphasized that every individual's situation was unique. In respect to marijuana consumption, people can respond differently to the effects of THC. The science, however, is in its infancy on what THC toxicology test results can be interpreted to mean. It is for these reasons that the authors of the report do not attempt to interpret toxicology test results further than indicating presence and why conclusions are not drawn from the data in this report.

# Tables and figures

**Table 1. Description of toxicology test result categories**

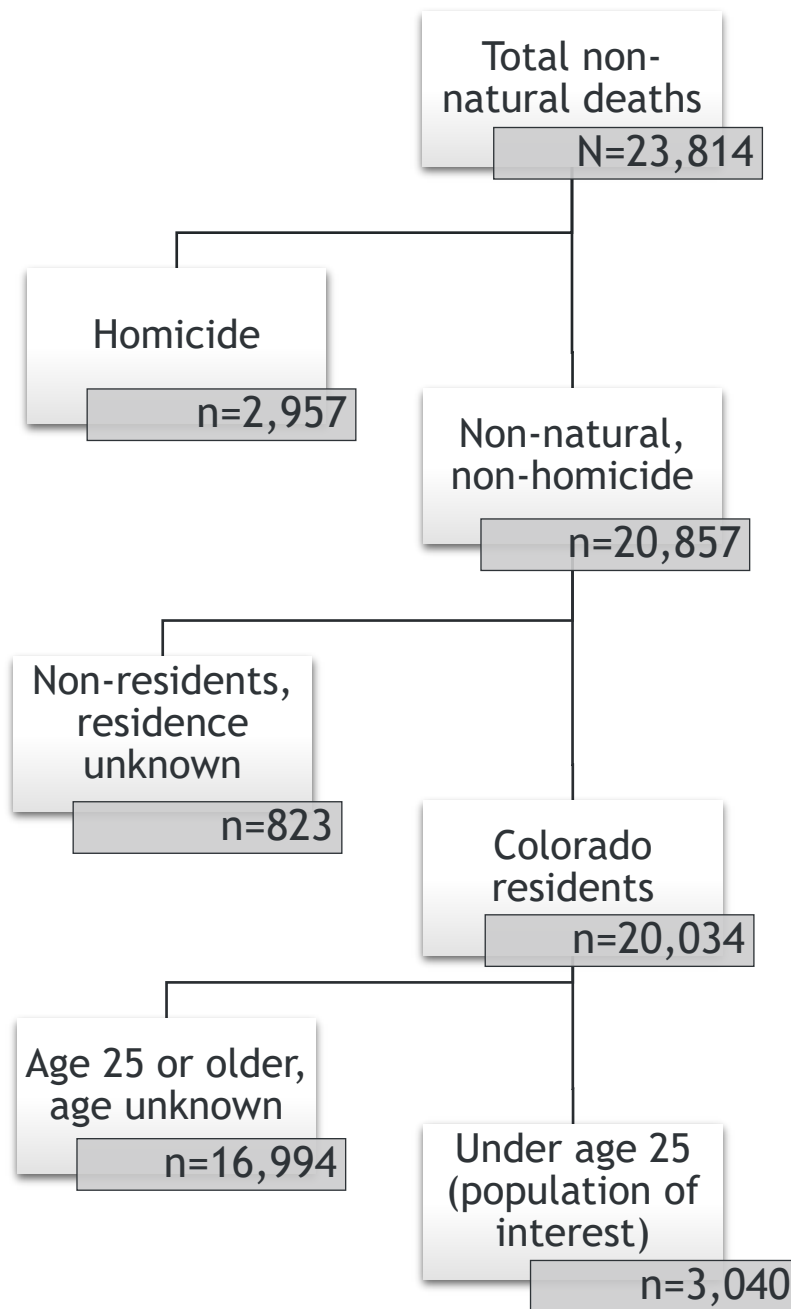
Result	Description
Marijuana present	At least one toxicology test performed indicating the presence of THC
Other present	At least one toxicology test performed indicating the presence of alcohol, opioids, amphetamine, cocaine, benzodiazepines, antidepressant, anticonvulsants, carbon monoxide, antipsychotics, muscle relaxants or barbiturates
No substance present	At least one toxicology test performed indicating no presence of any substance or unknown/inconclusive results
No results	No toxicology information available; includes instances when no testing was performed and/or no results were reported

**Table 2. Presence of THC further defined by chemical compound**

Compound	Description	Peak levels*	Long term/chronic levels
11-Hydroxy Delta-9 THC	Psychoactive THC metabolite	Beginning smoking: 1.9 (0.5-8.7) ng/mL After: <10%	May be present over 72 hours in chronic, frequent cannabis users.
Delta-9 Carboxy THC	Inactive metabolite of THC (THCC)	After 32-240 minutes: 10-101 ng/mL	May be present substantially longer in chronic users
Delta-9 THC	Principal psychoactive ingredient	Beginning smoking: 50-270 ng/mL After 2 hours: <5 ng/mL	

\*Source: NMS

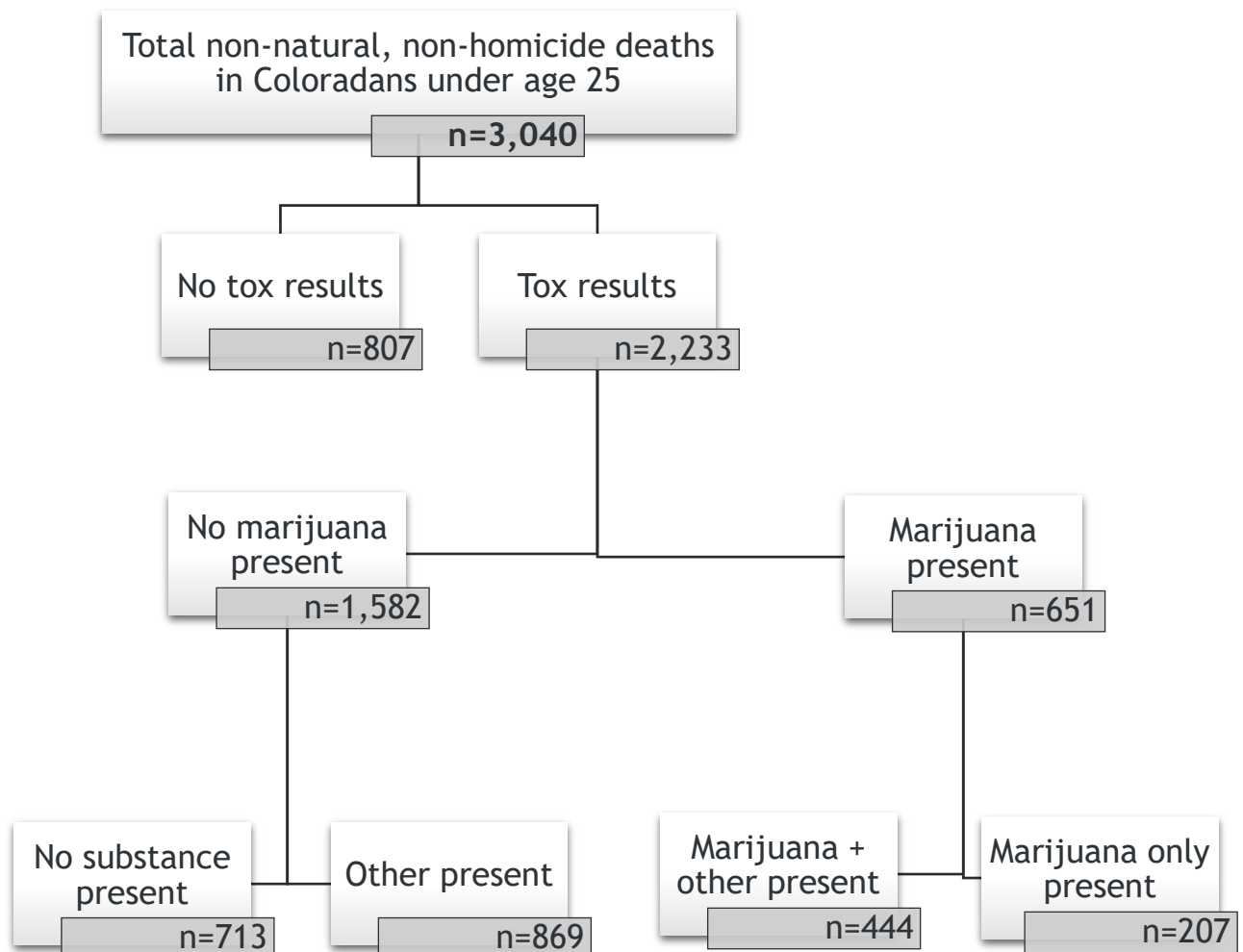
**Figure 1. Exclusion criteria leading to non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), Colorado 2010-2022<sup>‡</sup>**



<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional



**Figure 2. Toxicology test results by substance present, among non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), 2010-2022<sup>‡</sup>**



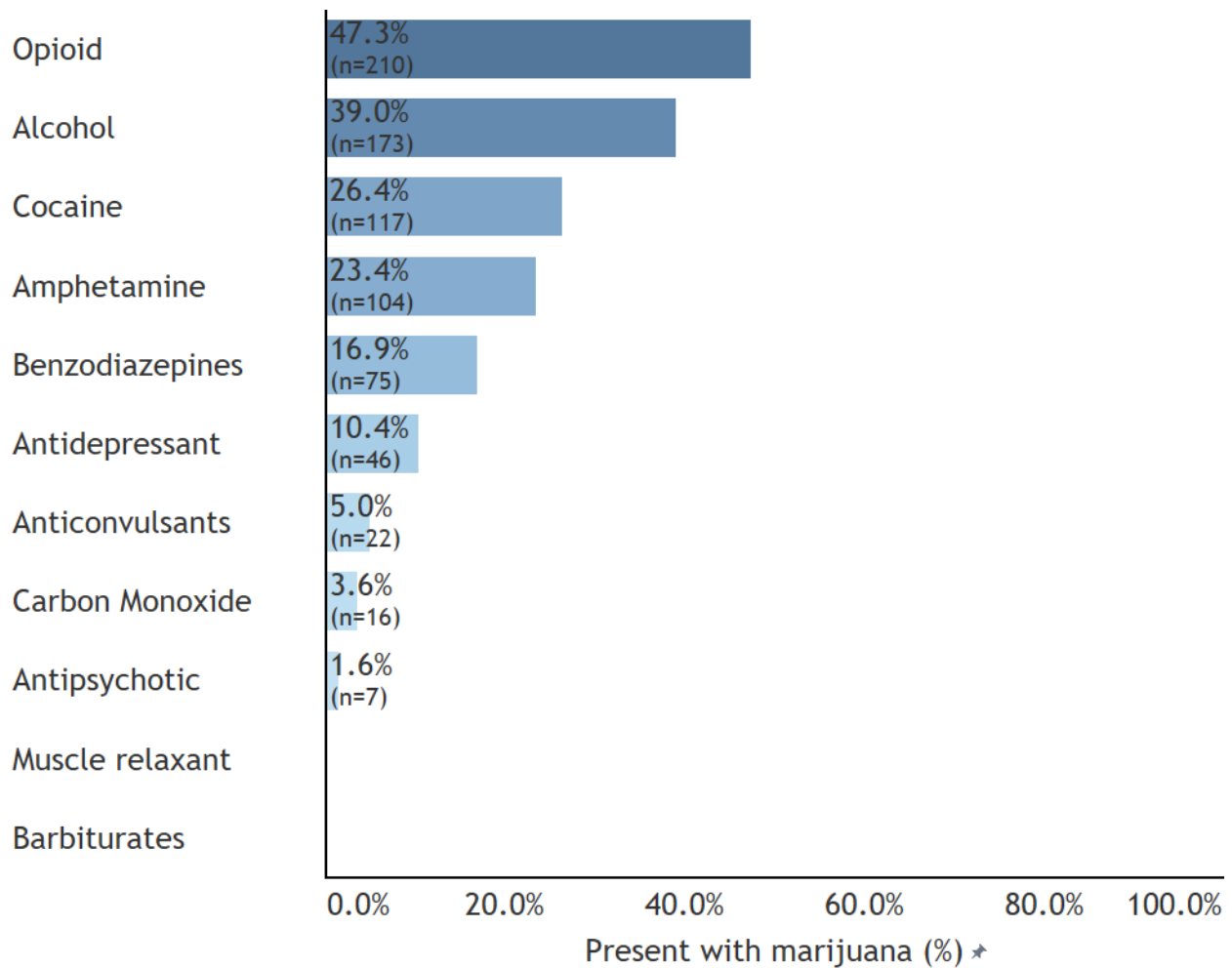
<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional

**Table 3. Toxicology test results among non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), 2010-2022<sup>‡</sup>**

Toxicology result	Frequency	Percent (%) (n=2,233)
Toxicology test results available	2,223	
No substance	713	31.9%
Marijuana present	651	29.2%
Alcohol present	560	25.1%
Opioid present	558	25.0%
Amphetamine present	255	11.4%
Cocaine present	254	11.4%
Benzodiazepines present	185	8.3%
Antidepressant present	180	8.1%
Anticonvulsants present	72	3.2%
Antipsychotic present	51	2.3%
Carbon monoxide present	38	1.7%
Muscle relaxant present	9	0.4%
Barbiturates present	6	0.3%

<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional

**Figure 3. Other substance present with marijuana in toxicology test results (n=444) among non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), 2010-2022<sup>‡</sup>**



<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional

**Table 4. External cause of death (ECD) categories by toxicology test results, non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), 2010-2022<sup>‡</sup>**

ECD category	Total (n=3,040)	No substance (n=713)	Marijuana only (n=207)	Marijuana + other (n=444)	Other present (n=869)	Not tested (n=807)
Unintentional overdose	449 (14.8%)	3 (0.4%)	-*	166 (37.4%)	251 (28.9%)	28 (3.5%)
Undetermined overdose	34 (1.1%)	0 (0.0%)	-*	11 (2.5%)	19 (2.2%)	3 (0.4%)
Suicide	2,014 (66.3%)	620 (87.0%)	187 (90.3%)	230 (51.8%)	522 (60.1%)	455 (56.4%)
Legal intervention	38 (1.3%)	5 (0.7%)	-*	12 (2.7%)	9 (1.0%)	8 (1.0%)
Unintentional firearm	43 (1.4%)	9 (1.3%)	-*	8 (1.8%)	8 (0.9%)	15 (1.9%)
Undetermined intent	85 (2.8%)	32 (4.5%)	-*	10 (2.3%)	19 (2.2%)	20 (2.5%)
Other	377 (12.4%)	44 (6.2%)	7 (3.4%)	7 (1.6%)	41 (4.7%)	278 4.4%)

<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional

-\* Number is suppressed due to low count

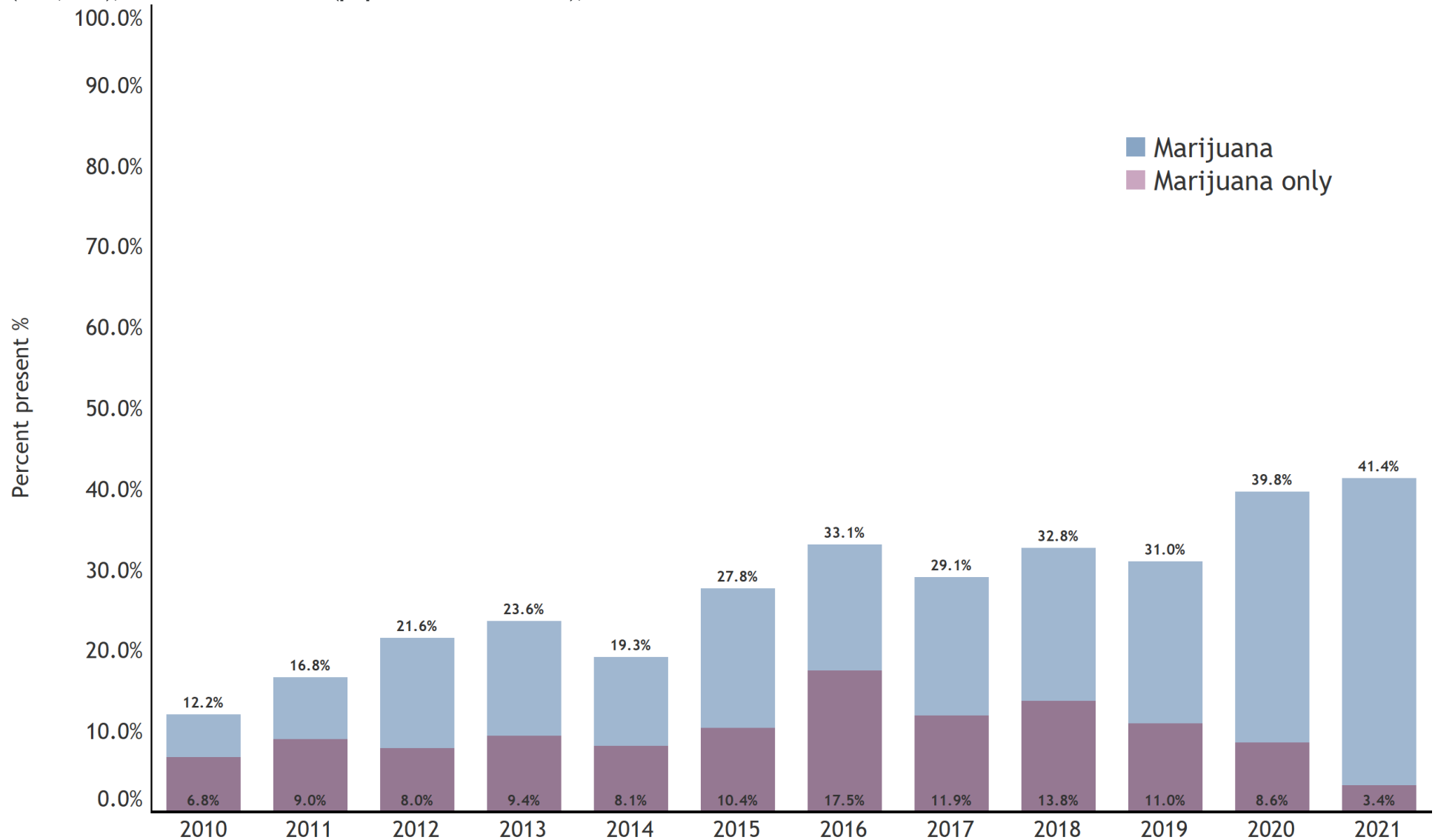
**Table 5. Demographics by toxicology results, among non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), 2010-2022<sup>‡</sup>**

Demographic	Total (n=3,040)	No substance (n=713)	Marijuana only (n=207)	Marijuana + other (n=444)	Other present (n=869)	Not tested (n=807)
<b>Age</b>						
0-10 years old	146 (4.8%)	59 (8.3%)	-*	-*	28 (3.2%)	56 (6.9%)
10-14 years old	247 (8.1%)	130 (18.2%)	12 (5.8%)	-*	33 (3.8%)	67 (8.3%)
15-17 years old	506 (16.6%)	182 (25.5%)	48 (23.2%)	58 (13.1%)	113 (13.0%)	105 (13.0%)
18-20 years old	766 (25.2%)	145 (20.3%)	64 (30.9%)	146 (32.9%)	189 (21.7%)	222 (27.5%)
21-24 years old	1,375 (45.2%)	197 (27.6%)	81 (39.1%)	234 (52.7%)	506 (58.2%)	357 (44.2%)
<b>Ethnicity</b>						
Hispanic	927 (30.5%)	185 (25.9%)	69 (33.3%)	150 (33.8%)	276 (31.8%)	247 (30.6%)
Non-Hispanic	2,109 (69.4%)	527 (73.9%)	138 (66.7%)	294 (66.2%)	591 (68.0%)	559 (69.3%)
Unknown	-*	-*	-*	-*	-*	-*
<b>Race</b>						
Asian/Pacific Islander	65 (2.1%)	12 (1.7%)	9 (4.3%)	18 (4.1%)	10 (1.2%)	16 (2.0%)
American Indian/Alaskan Native	73 (2.4%)	20 (2.8%)	6 (2.9%)	13 (2.9%)	16 (1.8%)	18 (2.2%)
Black	241 (7.9%)	50 (7.0%)	18 (8.7%)	32 (7.2%)	55 (6.3%)	86 (10.7%)
White	2,620 (86.2%)	630 (88.4%)	174 (84.1%)	377 (84.9%)	773 (89.0%)	666 (82.5%)
Unknown	41 (1.3%)	-*	0 (0.0%)	-*	15 (1.7%)	21 (2.6%)
<b>Sex</b>						
Female	760 (25.0%)	189 (26.5%)	33 (15.9%)	81 (18.2%)	268 (30.8%)	189 (23.4%)
Male	2,280 (75.0%)	524 (73.5%)	174 (84.1%)	363 (81.8%)	601 (69.2%)	618 (76.6%)
<b>Education</b>						
High school diploma or less	1,893 (62.3%)	379 (53.2%)	121 (58.5%)	297 (66.9%)	515 (59.3%)	581 (72.0%)
Some college or college degree	443 (14.6%)	73 (10.2%)	32 (15.5%)	73 (16.4%)	140 (16.1%)	125 (15.5%)
Unknown education	704 (23.2%)	261 (36.6%)	54 (26.1%)	74 (16.7%)	214 (24.6%)	101 (12.5%)

<sup>‡</sup> Data for deaths occurring 2021-2022 are incomplete and provisional

-\* Number is suppressed due to low count

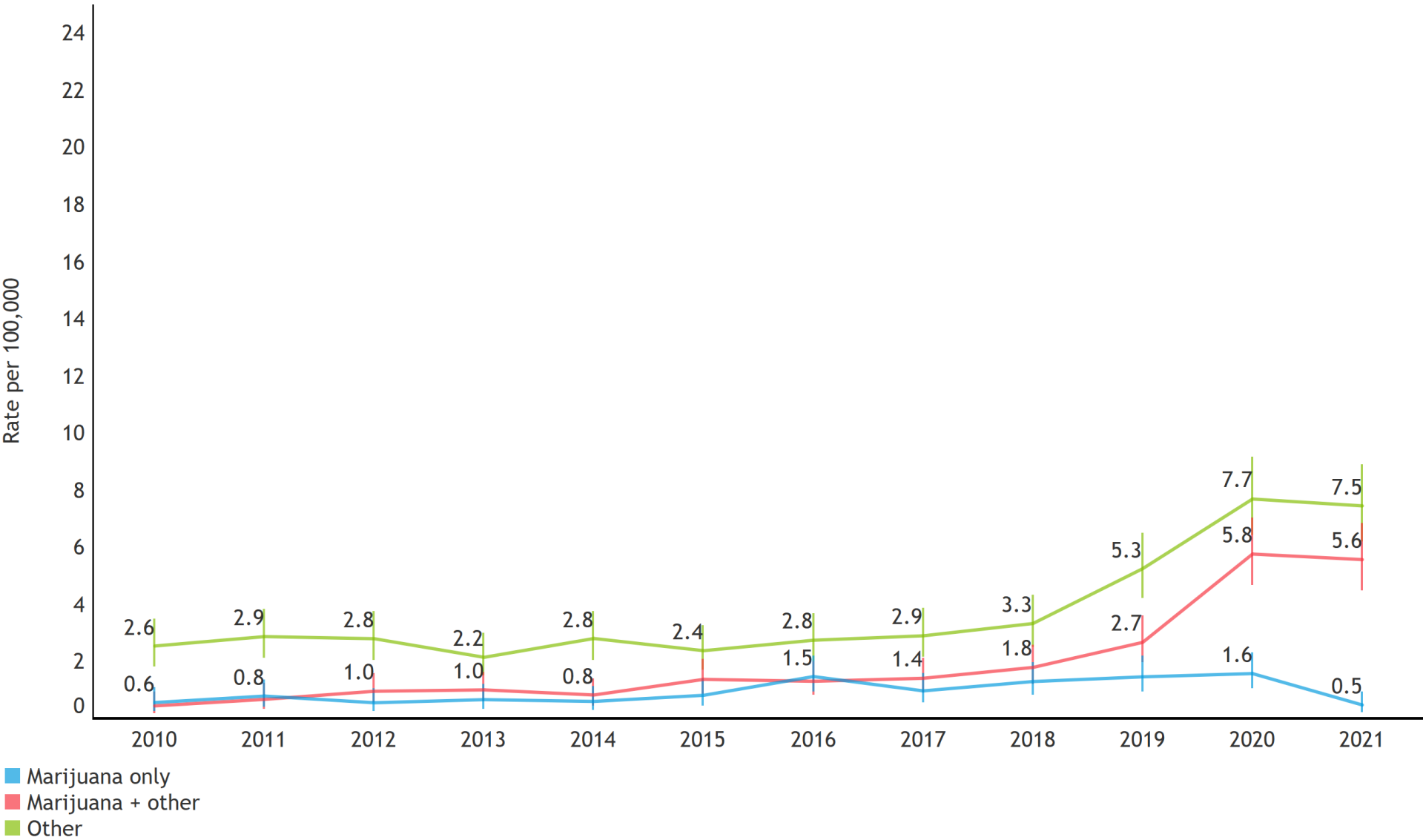
**Figure 4. Marijuana presence among non-natural, non-homicide deaths, younger than 25 years with toxicology test performed (n=2,223), Colorado residents (population of interest), 2010-2021<sup>‡†</sup>**



<sup>‡</sup>Data for deaths occurring in 2021 are incomplete and provisional

<sup>†</sup>SUDORS occurrences added in 2019

Figure 5. Crude mortality rate with substances present in postmortem toxicology test results per 100,000 Colorado residents younger than 25 years, Colorado, 2010-2021†‡

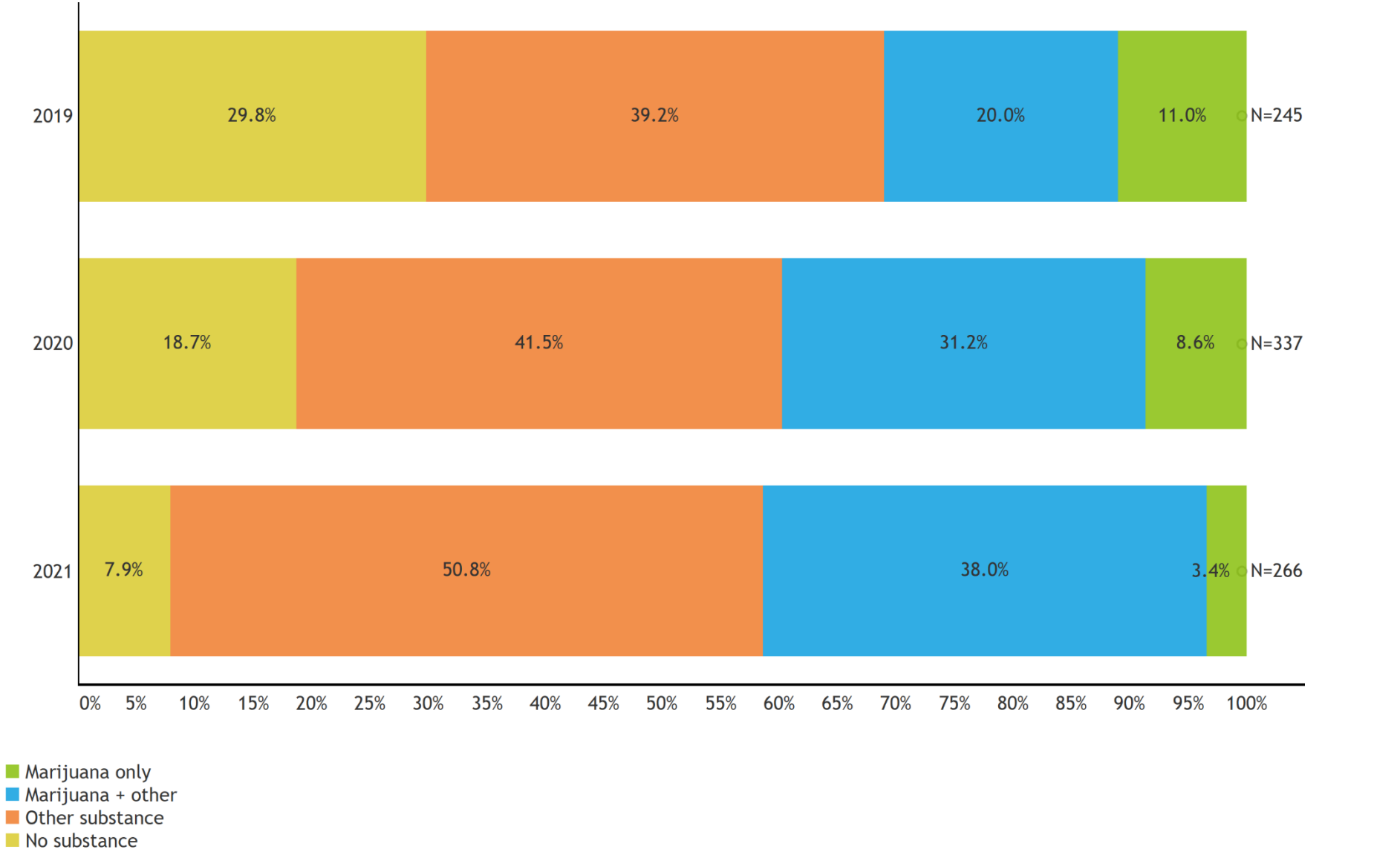


‡ Data for deaths occurring in 2021 are incomplete and provisional

† SUDORS occurrences added in 2019



Figure 6. Annual toxicology test result proportion by substance, among non-natural, non-homicide deaths, Colorado residents younger than 25 years (population of interest), with available test results, 2019-2021<sup>‡</sup>



<sup>‡</sup> Data for deaths occurring in 2021 are incomplete and provisional





**Table 6. Preliminary statistics on the quantity of THC compounds among non-natural, non-homicide deaths with available marijuana toxicology, Colorado residents younger than 25 years (population of interest), 2021-2022<sup>‡</sup>**

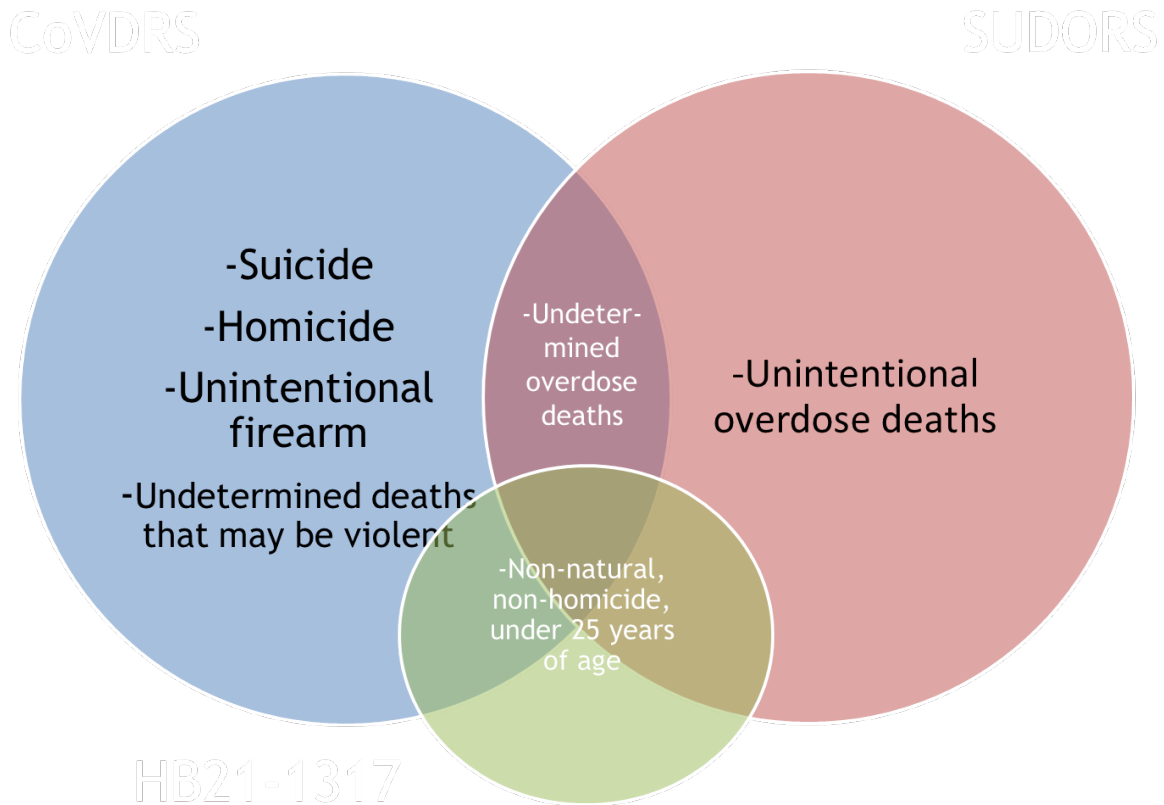
Compound	N	Range (ng/mL)*	Mean (ng/mL)*	Mode (ng/mL)*
11-Hydroxy Delta-9 THC (active metabolite)	27	10.0-87.0	39.0	17.0
Delta-9 Carboxy THC (inactive metabolite)	42	13.0-260.0	62.6	31.0
Delta-9 THC (active ingredient)	39	10.0-381.0	53.0	29.0

\*Concentration of compound in blood when compound was present and recorded as a numeric value. Unknown, not present, missing and preassigned categorical results were excluded.

<sup>‡</sup> Data for deaths occurring in 2021 are incomplete and provisional

# Appendix

Figure A1: Data collection by source and overlap



**Table A1: External causes of death classification description and ICD-10 codes utilized**

Classification description	ICD-10 external cause of death code
Unintentional overdose	X40-X44
Undetermined intent, overdose	Y10-Y14
Intentional self-harm, suicide	X60-X84, Y87.0, U03
Accidents	V01-X59
Assault, homicide	X85-X99, Y00-Y09, Y87.1, U01, U02
Unintentional firearm	W32-W34, Y86
Legal intervention	Y35.0-Y35.4, Y35.6, Y35.7
Event of undetermined intent, excluding overdose	Y15-Y34, Y87.2, Y89.9