

Cannabis Public Health Surveillance:

State of the Surveillance System Report

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Purpose

This report is a product of the Epidemiology Unit of the Connecticut Department of Public Health (DPH) Community, Family Health, and Prevention Section (CFHPS). The purpose of this report is to notify the Connecticut General Assembly Public Health Committee, state agency partners, local health departments, interested residents, and public health researchers and officials nationwide of DPH's plan for conducting epidemiologic surveillance concerning the impact of cannabis consumption on public health in Connecticut. In 2021, Connecticut passed legislation that legalizes and safely regulates the adult use of cannabis in Connecticut (Connecticut General Assembly, 2021). As part of that legislation, State of Connecticut Public Act 21-1 (June Special Session), Section 146 states:

(a) There is established, within the Department of Public Health, a program to collect and abstract timely public health information on cannabis associated illness and adverse events, nonfatal and fatal injuries and cannabis use poisoning data, from state and national data sources. Such program shall include, but need not be limited to, the following: (1) Serving as a data coordinator, analysis and reporting source of cannabis data and statistics that include, but are not limited to, illness, adverse events, injury, pregnancy outcomes, childhood poisoning, adult and youth use, cannabis-related emergency room visits and urgent care episodic mental health visits; (2) performing epidemiologic analysis on demographic, health and mortality data to identify risk factors and changes in trends; (3) working with the Departments of Consumer Protection and Mental Health and Addiction Services and any other entity that the Commissioner of Public Health deems necessary to disseminate public health alerts; and (4) sharing state-wide data to inform policy makers and citizens on the impact of cannabis legalization by posting public health prevention information and cannabis use associated morbidity and mortality statistics to the Department of Public Health's Internet web site.

(b) The Department of Public Health shall, not later than April 1, 2023, and annually thereafter, report in accordance with the provisions of section 11-4a of the general statutes, to the joint standing committees of the General Assembly with cognizance relating to public health, human services, and appropriations and the budgets of state agencies about the public health information on cannabis collected by the department under subsection (a) of this section.

The following report includes descriptions of the data sources potentially available to DPH for cannabis-related public health surveillance. The report is divided into two main sections: 1) Use and Risk Behaviors and 2) Morbidity and Mortality. Each section is further divided into subsections with general information about each data source as well as its relevance and limitations for cannabis public health surveillance. Throughout this report, the terms cannabis and marijuana are used interchangeably per Public Act 21-1 Section 1, Subsection 3 (Connecticut General Assembly, 2021).

Executive Summary

DPH has access to a wide range of data sources for cannabis-related public health surveillance. These data sources can be categorized into five distinct groups: survey data, regulatory data, administrative data, traffic data, and mortality data.

Survey Data

DPH uses survey data to estimate the prevalence of health diagnoses and behaviors in the general population (Connecticut Department of Public Health, 2022a; Connecticut Department of Public Health, 2022b). Survey data sources that were identified by DPH for cannabis-related public health surveillance include the Behavioral Risk Factor Surveillance System (BRFSS), the Youth Risk Behavior Surveillance System (YRBSS), the Pregnancy Risk Assessment Monitoring System (PRAMS), and the National Survey on Drug Use and Health (NSDUH). These surveys collect responses from the non-institutionalized adult population 18 years of age and older, 9th to 12th grade students enrolled in school, women who have recently given birth, and the non-institutionalized population 12 years of age and older, respectively (Centers for Disease Control and Prevention, 2013; Brener, et al., 2013; Shulman, D'Angelo, Harrison, Smith, & Warner, 2018; Substance Abuse and Mental Health Services Administration, 2021; Pierannunzi, Hu, & Balluz, 2013). Data from these surveys share many limitations, including 1) questionnaire responses are self-reported and may be affected by the sensitive nature and/or social desirability of the health behavior or outcome in question and 2) they are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis-related outcomes, but it is not possible to establish causation (Brener, et al., 2013; Centers for Disease Control and Prevention, 2013; Pierannunzi, Hu, & Balluz, 2013; Shulman, D'Angelo, Harrison, Smith, & Warner, 2018; Substance Abuse and Mental Health Services Administration, 2021; Underwood, et al., 2020).

Regulatory Data

Public Act 21-1, Section 56 requires cannabis to be tracked from seed to sale. These tracking data can be used to estimate trends in cannabis consumption based on retail sales volume. Information from the cannabis industry is limited in that it does not provide any insight into the illegal market and includes no information about the customers purchasing cannabis products (Biotrack, 2022).

Healthcare Administrative Data

Encounters at healthcare organizations generate an enormous volume of clinical, demographic, and billing data that are utilized by DPH for public health surveillance purposes (Connecticut Department of Public Health, 2021a; Connecticut Department of Public Health, 2021b; Connecticut Department of Public Health, 2022d). A variety of sources of healthcare administrative data have been recommended by the Council of State and Territorial Epidemiologists (CSTE) for investigating trends in cannabis-related healthcare encounters due to injuries, poisonings, substance use treatment admissions, and other health events (Council of State and Territorial Epidemiologists, 2020; Council of State and Territorial Epidemiologists, 2021). DPH has or may obtain access to multiple sources of these data for cannabis-related public health surveillance, including 1) emergency department, urgent care center, and hospital data, 2) poison control center call data, and 3) substance use treatment center data (Connecticut Department of Public Health, 2021a; Connecticut Hospital Association, 2022; Connecticut Poison Control Center, 2022; Health Monitoring Systems, 2008; Substance Abuse and Mental Health Services Administration, 2022c). Unfortunately, because these data are collected for administrative purposes and not with public health goals in mind, they often do not include certain desirable data points such as

household income or self-reported mental health status, etc. Changes in medical billing processes within and across healthcare organizations over time may also affect the data (Centers for Disease Control and Prevention, 2015).

Traffic Data

Cannabis-related motor vehicle traffic injuries are a topic of interest for multiple stakeholders. The Connecticut Crash Data Repository (CTCDR) is a developing resource that may take time to become of maximum utility for cannabis-related public health surveillance purposes (University of Connecticut, 2022). The National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) provides publicly available data on fatal motor vehicle crashes in Connecticut and nationwide, including drug test results (National Highway Traffic Safety Administration, 2022).

Mortality Data

Cannabis consumption is unlikely to appear as a direct cause of death in mortality data, but it may or may not be associated with certain fatal incidents, aside from motor vehicle crashes (Drummer, Gerostamoulos, & Woodford, 2019; National Academies of Sciences, Engineering, and Medicine, 2017). DPH can use antemortem and postmortem toxicology results to monitor changes in the prevalence of substance involvement among certain deaths such as suicides and drug overdoses over time, though this data has primarily been applied to investigate the presence of substances other than cannabis in the past (e.g., fentanyl, xylazine) (Connecticut Department of Public Health, 2022c; Office of the Chief Medical Examiner, 2022; Thangada, et al., 2021). Unfortunately, determining the role of cannabis in mortality is not straightforward, and standard methods for reporting on cannabis-related deaths have yet to be established at the time of writing (Council of State and Territorial Epidemiologists, 2016).

Table 1: Cannabis-Related Public Health Surveillance Data Sources

Data Source	Type	DPH Access	Years Available
BRFSS	Survey	Yes	2017, 2021+
YRBSS/CSHS	Survey	Yes	2005+
PRAMS	Survey	Yes	2019, 2022+
NSDUH	Survey	Yes PUF, Pending RUF	1971+
CATS	Regulatory	Pending	From Inception
CIEDVD	Healthcare Administrative	Yes	2000+
EpiCenter	Healthcare Administrative	Pending	Unknown
ToxiCALL	Healthcare Administrative	Pending	Unknown
TEDS	Healthcare Administrative	Yes	1992+
CTCDR	Traffic	Pending	1995+
FARS	Traffic/Mortality	Yes	1975+
NVDRS	Mortality	Yes	2015+
SUDORS	Mortality	Yes	2015+

Data Sources

Table 1 presents an outline of data sources DPH currently uses or is considering for cannabis-related public health surveillance. Details of these data sources are described below.

Use and Risk Behaviors

Survey Data

Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System (BRFSS) is the largest continuously conducted health survey system in the world with over 400,000 interviews conducted each year nationwide (Centers for Disease Control and Prevention, 2022a). The Centers for Disease Control and Prevention (CDC) coordinates with all 50 U.S. states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and Palau to administer the annual BRFSS questionnaire (Centers for Disease Control and Prevention, 2022a). Its purpose is to collect uniform data on a variety of health risk behaviors, chronic diseases and health conditions, and use of preventive services among the non-institutionalized population 18 years of age and older (Centers for Disease Control and Prevention, 2021a). The BRFSS is telephone-based, and the Connecticut survey is conducted by DPH via a contractor (Connecticut Department of Public Health, 2022a). Questionnaires from years 2017 and 2021 onward include questions on cannabis use, which allow for estimation of the prevalence of adult cannabis use in Connecticut (Connecticut Department of Public Health, 2016; Connecticut Department of Public Health, 2020). Responses are weighted to be representative of the state's adult population (Centers for Disease Control and Prevention, 2013). Some limitations of the BRFSS for monitoring trends in cannabis use include 1) cannabis-related questions are not asked uniformly by all states, so it is not possible to compare Connecticut prevalence to national prevalence, 2) the only full pre-legalization questionnaire that included cannabis-related questions was 2017, and these questions were asked on a post-survey, meaning there were fewer responses than if they had been included in the main questionnaire and confidence in prevalence estimates is fairly low for some smaller demographic groups, 3) the wording of cannabis-related questions has changed slightly over time, 4) all data are self-reported and thus subject to reporting bias, and 5) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis use, but it is not possible to establish causation (Centers for Disease Control and Prevention, 2013; Connecticut Department of Public Health, 2016; Connecticut Department of Public Health, 2020; Connecticut Department of Public Health, 2022a; Pierannunzi, Hu, & Balluz, 2013).

Youth Risk Behavior Surveillance System (YRBSS)/Connecticut School Health Survey (CSHS)

The Youth Risk Behavior Surveillance System (YRBSS) is a surveillance system coordinated by the CDC. Its purpose is to collect data on specific health risk behaviors that contribute to leading causes of death, disability, and social problems among youth and adults in the United States. There is one national survey as well as multiple state, local, territorial, and tribal-level surveys (referred to as site-level surveys) (Centers for Disease Control and Prevention, 2020; Underwood, et al., 2020). The Connecticut site-level survey is called the Connecticut School Health Survey (CSHS) (Connecticut Department of Public Health, 2022b). Surveys are administered every other year on odd years, with a sampling frame representative of 9th through 12th grade students (Brener, et al., 2013; Underwood, et al., 2020). Questionnaires have included cannabis-related questions since 2005, which makes it possible to estimate the prevalence of youth cannabis use and related risk behaviors over 15+ years (Connecticut Department of Public Health,

2022b). Some limitations of the YRBSS include 1) data collection is not uniform across all states, so it is not possible to compare all Connecticut questionnaire responses with national data, 2) there have been changes in the wording or inclusion of certain cannabis-related questions over the lifetime of the survey, 3) the prevalence of these behaviors in the total youth population may be slightly under- or overestimated by the CSHS because the sampling frame does not include adolescents not enrolled in school, who may have a lower or higher prevalence of risk behaviors of interest, 4) all data are self-reported and thus subject to reporting bias, and 5) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis use, but it is not possible to establish causation (Brenner, et al., 2013; Underwood, et al., 2020).

Pregnancy Risk Assessment Monitoring System (PRAMS)

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a population-based surveillance system for monitoring multiple maternal and infant health indicators conducted in 46 states, the District of Columbia, New York City, Northern Mariana Islands, and Puerto Rico, representing approximately 81% of all U.S. live births (Centers for Disease Control and Prevention, 2022b; Centers for Disease Control and Prevention, 2022d). The national sampling frame is representative of US women who have recently given birth and Connecticut's sampling frame is limited to in-state deliveries. The survey is conducted via telephone and mail (Centers for Disease Control and Prevention, 2022b; Shulman, D'Angelo, Harrison, Smith, & Warner, 2018). In 2019, Connecticut's PRAMS questionnaire included one question on cannabis use during pregnancy. In 2022, Connecticut added a marijuana supplement to the PRAMS questionnaire (Connecticut Department of Public Health, 2022e). These questions allow for the estimation of the prevalence of cannabis use during pregnancy over time. Some limitations of PRAMS for monitoring trends in cannabis use include 1) cannabis-related data collection is not uniform across all states, so it is not possible to compare Connecticut data with national data, 2) there is little historical data for establishing baseline pre-legalization trends in cannabis use among pregnant women in Connecticut, 3) all data are self-reported and thus subject to reporting bias, and 4) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis use, but it is not possible to establish causation (Connecticut Department of Public Health, 2022e; Shulman, D'Angelo, Harrison, Smith, & Warner, 2018).

National Survey on Drug Use and Health (NSDUH)

The purpose of the National Survey on Drug Use and Health (NSDUH) is to measure the prevalence of substance use and mental health issues nationwide. The survey is conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). The target population is the civilian, non-institutionalized population of the United States aged 12 years or older. The survey is conducted via in-person interviews (or online for some respondents during the COVID-19 pandemic). The NSDUH has been conducted periodically since 1971 and annually since 1990 and provides long-term state and national substance use and substance use disorder prevalence estimates (Substance Abuse and Mental Health Services Administration, 2021; U.S. Department of Health and Human Services, 2022a). Some limitations of the NSDUH for monitoring trends in cannabis use include 1) the public use file (PUF) does not contain any geographic identifiers including state, and though SAMHSA publishes state-level prevalence estimates, these values are from combined years, e.g., the prevalence of cannabis use from 2019 and 2020 pooled together, 2) it is possible to apply for access to a restricted use file (RUF), but it is unknown if or when DPH will receive access to these restricted data, 3) the NSDUH sampling frame does not include certain populations who may have a higher prevalence of substance use and substance use

disorders including people who are not stably housed and are not living in shelters or people who are incarcerated, though this may pose more of a problem for estimating the prevalence of more stigmatized behaviors, such as opioid use, 4) all data are self-reported and thus subject to reporting bias, and 5) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis use, but it is not possible to establish causation (Nesoff, Martins, & Palamar, 2022; Substance Abuse and Mental Health Services Administration, 2021; Substance Abuse and Mental Health Services Administration, 2022a; U.S. Department of Health and Human Services, 2022b).

Regulatory Data

Cannabis Analytic Tracking System (CATS)

Pubic Act 21-1, section 56 includes a provision that requires cannabis business establishments to track cannabis from seed to sale. The Department of Consumer Protection (DCP) is working with vendor Biotrack to develop the Cannabis Analytic Tracking System (CATS) to meet this statutory requirement. The date of sale, retailer information, product specifications, and product amount will be recorded in this system at each sale (Biotrack, 2022). Per Public Act 21-1, Section 56, DPH may be granted access to aggregate data from this system for public health surveillance purposes. These data will allow DPH to estimate trends in consumption of cannabis over time. This system tracks legal sales only and does not include information about the customer purchasing the products, so any estimates of cannabis consumption based on these data will not account for purchases from the illegal market and will be unable to provide insight into the demographic characteristics of consumers (including their state residency status).

Morbidity and Mortality

Healthcare Administrative Data

Connecticut Inpatient and Emergency Department Visit Dataset (CIEDVD)

The Connecticut Inpatient and Emergency Department Visit Dataset (CIEDVD) is a comprehensive dataset with information on millions of patient encounters from 2000 to present. CIEDVD is received from two different sources: 1) Connecticut Hospital Association (CHA) submitting Connecticut Hospital Information Management Exchange (CHIME) data on behalf of its member hospitals to DPH and 2) individual hospitals who are not members of CHA submitting their own data to DPH. These data contain data points such as patient demographic information, up to 15 diagnosis codes, and the chief complaint documented for each patient encounter (Connecticut Department of Public Health, 2021a). CSTE has published standards for identifying cannabis-related healthcare visits using diagnosis codes; applying these methods allows DPH to monitor trends in healthcare utilization related to (but not necessarily caused by) cannabis use (Council of State and Territorial Epidemiologists, 2021). Using this data, DPH can estimate the number and rate of cannabis-related injuries (including traffic and self-harm injuries), poisonings, hospital and emergency department visits for abuse and dependence, and complications in newborns, among other health outcomes. The CIEDVD is of higher quality than what is available via syndromic surveillance (see next section), but it is only provided to DPH on an annual basis, so it is not suitable for real time or near-real time analysis of trends in cannabis-related healthcare utilization. Further limitations to this data include 1) it is administrative in nature – the data is not collected with public health goals in mind, so certain variables such as household income or self-reported quality of mental health, etc. that may be of interest for analysis are not present, 2) the data is affected by

changes in medical coding procedures over time, 3) the data only include records for emergency department and hospital visits, and 4) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis-related healthcare visits, but it is not possible to establish causation (Centers for Disease Control and Prevention, 2015; Connecticut Department of Public Health, 2021a; Connecticut Hospital Association, 2022).

Syndromic Surveillance (EpiCenter)

Syndromic surveillance systems were originally developed for the early detection of emerging infections and illnesses caused by the release of biologic agents such as anthrax (Henning, 2004). Traditional medical provider reporting systems rely on the submission of clinical laboratory results to public health authorities once a diagnosis has been confirmed, but this can result in a long lag between a patient encounter and the report of an illness to government public health agencies (Conway, Dowling, & Chapman, 2013). Syndromic surveillance systems identify potential cases based on symptoms recorded before a formal diagnosis is made (Conway, Dowling, & Chapman, 2013; Henning, 2004). Syndromes (combinations of related diagnosis codes and medical terms from free text fields) are applied to detect suspicious patterns of care seeking at emergency departments and urgent care centers, making it possible for public health officials to identify potential outbreaks and other public health events before formal diagnoses are confirmed (Conway, Dowling, & Chapman, 2013; DeYoung, et al., 2017; Henning, 2004; Jones, et al., 2020). These systems typically rely on real time or near-real time data from healthcare facilities (DeYoung, et al., 2017). Health Monitoring Systems (HMS) develops and maintains an online syndromic surveillance product (EpiCenter) for public health officials that is used by multiple programs within DPH (Health Monitoring Systems, 2008). A cannabis-specific data dashboard will allow for the early detection of and response to unusual clusters of cannabis-related health events presenting at emergency departments and urgent care centers throughout the state (DeYoung, et al., 2017; Jones, et al., 2020). Limitations to syndromic surveillance data include 1) it is administrative in nature, so certain variables that may be of interest for analysis are not always present, 2) the data is affected by changes in diagnosis coding procedures over time, 3) because the data is near-real time, it is often of poorer quality than more curated data sources such as CIEDVD, 4) the data only include records from emergency departments and urgent care facilities, and 5) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis-related patient encounters, but it is not possible to establish causation (Centers for Disease Control and Prevention, 2015).

Connecticut Poison Control Center (CPCC)/ToxiCALL

The Connecticut Poison Control Center (CPCC) provides free emergency poison information to the public. They can be reached 24 hours per day, 365 days per year by phone at 1-800-222-1222. The CFHPS Epidemiology Unit has established a relationship with CPCC and plans to obtain aggregate poison control center call data from their data collection system (ToxiCALL) related to cannabis-related poisoning events. These data may be applied to monitor trends in cannabis product ingestion and/or poisoning, especially by young children (Connecticut Poison Control Center, 2022).

Treatment Episode Data Set (TEDS)

The Treatment Episode Data Set (TEDS) is a public use file published annually by the Substance Abuse and Mental Health Services Administration (SAMHSA) (Substance Abuse and Mental Health Services Administration, 2022c). The admissions dataset (TEDS-A) includes information on substance use treatment admissions to facilities that receive public funds (Substance Abuse and Mental Health

Services Administration, 2022b). This data makes it possible to monitor trends in substance use treatment episodes based on the primary substance relevant to the admission. Some limitations of the TEDS-A data include 1) it only includes admissions to facilities that receive public funds, 2) the scope of coverage varies by state depending on differences in licensure and allocation of funds, and 3) all data are cross-sectional, which means it is possible to establish associations between certain demographic or health characteristics and cannabis substance use visits, but it is not possible to establish causation (Substance Abuse and Mental Health Services Administration, 2022b).

Traffic Data

Connecticut Crash Data Repository (CTCDR)

In 2011, engineers and information technologists at the Connecticut Transportation Institute at the University of Connecticut (UConn) developed a traffic crash information system called the Connecticut Crash Data Repository (CTCDR) with funding from the Traffic Records Coordinating Committee (TRCC), which is managed by the Connecticut Department of Transportation's (DOT) Highway Safety Office (HSO) (Connecticut Transportation Safety Research Center, 2020). This system includes data from the Department of Public Safety (DPS) and the DOT and provides access to motor vehicle crash information collected by state and local police. The CTCDR is a developing resource, which may be of limited utility for cannabis-related public health surveillance in the short term but could become a rich source of cannabis-related motor vehicle crash data in the future (University of Connecticut, 2022).

Fatality Analysis Reporting System (FARS)

The National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) provides publicly available data on fatal motor vehicle crashes in Connecticut and nationwide (National Highway Traffic Safety Administration, 2022). FARS includes drug test reports for drivers, and it has been used by state public health officials and other researchers to monitor the number of cannabis-related fatal motor vehicle crashes over time (Masten & Guenzburger, 2014; Oregon Public Health Division, 2016).

Mortality Data

National Violent Death Reporting System (NVDRS) and State Unintentional Drug Overdose Reporting System (SUDORS)

The National Violent Death Reporting System (NVDRS) and State Unintentional Drug Overdose Reporting System (SUDORS) are surveillance systems used to track mortality due to specific causes, such as homicide, suicide, and fatal drug overdose (Centers for Disease Control and Prevention, 2021; Centers for Disease Control and Prevention, 2022). In Connecticut, these systems primarily rely on data from the Office of the Chief Medical Examiner (OCME) (Office of the Chief Medical Examiner, 2022). DPH staff manually abstract data from antemortem and postmortem toxicology reports and enter it into these systems, making it possible to determine which (if any) substances were detected by the medical examiner among certain deaths. Some limitations of these systems include 1) they only contain toxicology information on deaths resulting from a narrow range of specific causes and 2) all data are cross-sectional, which means it is possible to establish associations between certain situational or demographic characteristics and the presence of tetrahydrocannabinol (THC), the major psychoactive component of cannabis, or related metabolites at the time of death, but it is not possible to establish causation (Huestis, Henningfield, & Cone, 1992; Office of the Chief Medical Examiner, 2022).

Conclusion

DPH has access to a wide range of data sources for epidemiologic surveillance related to cannabis consumption in Connecticut. As DPH continues to develop relationships with community stakeholders and agency partners and expands its capacity for cannabis-related public health surveillance, the list of available sources of data is likely to grow. The CFHPS Epidemiology Unit will be analyzing these data and publishing statistical reports and data briefs on the DPH website. Suggestions for additional research questions or potential sources of data are welcome.

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