UNIVERSITY OF KENTUCKY
CANNABIS CENTER

PROGRESS REPORT

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1. MISSION STATEMENT

Cannabis Center

The University of Kentucky Cannabis Center was established by KY House Bill 604 to advance the study of cannabis and its derivatives and determine the risk/benefit profile for select medical conditions.

MISSION STATEMENT

The mission of the Kentucky Cannabis Center is to accelerate cannabinoid science and conduct high quality research that is relevant to the health and well-being of the citizens of Kentucky. The research agenda has been established by the Center's advisory board, with the overarching goals of conducting and funding research, including controlled clinical studies, agriculture research pertaining to optimal growing conditions, examination of public health data and preclinical research on new and innovative applications. The Center aims to support faculty and trainees interested in conducting cannabinoid research to enhance the breadth of expertise at the University of Kentucky. The Center holds an annual symposium to present research findings and invites outside experts to report on cutting-edge, high impact research. Overall, the Center will continue to work with federal, state and local entities to advance research on the medical safety and efficacy of cannabinoids and will serve to help educate medical providers, legislators and citizens on the risks and benefits of the use of cannabis and cannabinoids.

2. CENTER HIGHLIGHTS

01

CENTER HIGHLIGHTS

Over the past year, the University of Kentucky Cannabis Center has achieved several key accomplishments:

01

Received $2.8 million federal NIH Grant

This grant will allow us to examine the effects of cannabis on outcomes related to opioid use disorder, including opioid withdrawal, response to high dose opioids and safety of opioid and cannabis combinations (PI: Shanna Babalonis, PhD)

02

Awarded $380,000 in Research Funding to UK Faculty Researchers

The Cannabis Center reviewed pilot grants from UK faculty conducting cannabis science. 4 faculty members were awarded pilot funds in the amount of $75,000 - $100,000 per award.

03

Established expert collaborations, clinical trial protocols

The Cannabis Center has partnered with the UK Markey Cancer Center and the Barnstable Brown Diabetes Center to develop clinical trial protocols; collaborations with other universities and other expert teams at UK were also established and studies are underway

04

Held a research symposium highlighting cannabis research

In collaboration with the UK Substance Use Priority Research Area, the Cannabis Center co-sponsored the Substance Use Research Event symposia - featuring a cannabis science track

3. ADVISORY BOARD

DIRECTOR

Shanna Babalonis, PhD

Shanna Babalonis, PhD is an Associate Professor with tenure in the Department of Behavioral Science and Center on Drug and Alcohol Research at the University of Kentucky College of Medicine. Her NIH-funded research focuses on clinical trials and human laboratory assessments of the abuse potential, risks and therapeutic effects of cannabis and opioids. She is the Scientist Representative on the Council for Governmental Relations Hemp and Cannabis Group and serves on the Program Committee for the International Cannabinoid Research Society. She is also a consulting editor for the scientific journal, *Cannabis*. UK President, Dr. Eli Capilouto appointed Dr. Babalonis as the Director of the Cannabis Center in July 2022.

ADVISORY BOARD

UK President, Dr. Eli Capilouto appointed a team of 12 multidisciplinary MD and PhD faculty members to serve on the Advisory Board:

The **Executive/Steering Committee** is composed of six faculty members who serve as the Center's core leadership. They work with the director to establish the Center's research goals/agenda and make key financial decisions.

The **Internal Advisory Committee** is comprised of six faculty members that advise the director and the Executive/Steering Committee. They provide feedback on the Center's progress and overall direction.

ADVISORY BOARD
EXECUTIVE/STEERING COMMITTEE

Peter Akpunonu, MD

Dr. Akpunonu is an Associate Professor in Emergency Medicine and is the Director of Medical Toxicology and the Director of Undersea and Hyperbaric Medicine. Dr. Akpunonu is also the Medical Director of the Kentucky Poison Control Center of Norton Children's Hospital. Dr. Akpunonu created an inpatient toxicology consultation service at the University of Kentucky which is the first and only in the state. As the Director of Undersea & Hyperbaric Medicine, he oversees the treatment of patients suffering from arterial gas embolism, carbon monoxide poisoning, dysbarism, and those in need of further wound care. Dr. Akpunonu specializes in the recognition, triage, and management of poisonings and holds a deep interest in the areas of environmental exposures, novel psychoactive substances of abuse, envenomation, and prescriber patterns.

Linda Dwoskin, PhD

Dr. Dwoskin is an Endowed Professor in Pharmaceutical Education at the University of Kentucky College of Pharmacy. She currently holds several academic appointments in the Department of Behavioral Science, UK Graduate Center, UK Center on Drug Abuse Translation, Multi-disciplinary Research Center on Drug and Alcohol Abuse and Center of Membrane Sciences. Her research has resulted in over 249 peer-reviewed research articles, 352 abstracts of research presentations and 110 patents and patent applications. Dr. Dwoskin's major research focus is drug discovery in neuropharmacology - the development of novel therapeutic candidates for the treatment of psychostimulant abuse, specifically for nicotine and methamphetamine abuse. Several drugs discovered in her laboratory at UK are currently in various phases of clinical development.

Laura Fanucchi, MD

Dr. Fanucchi is an Associate Professor of Medicine in the Division of Infectious Disease in the UK College of Medicine and the Center on Drug and Alcohol Research. She is board-certified in Internal Medicine and Addiction Medicine and is the Director of the UK Addiction Consult and Education Service. She provides treatment for opioid use disorder in the UK Bluegrass Care Clinic and in the UK First Bridge Clinic. She conducts clinical research on the integration of evidence-based treatment for opioid use disorder in general medical settings. Dr. Fanucchi is currently PI of a NIDA-funded R01 clinical trial evaluating an innovative outpatient treatment model for opioid use disorder and severe, injection-related infections. She is also a co-investigator on several studies, including those evaluating cannabis and opioid drug interactions.

ADVISORY BOARD

EXECUTIVE/STEERING COMMITTEE

Joshua Lile, PhD

Dr. Lile is a Professor of Behavioral Science in the UK College of Medicine, with appointments in Psychiatry and Psychology. Dr. Lile has a long history of conducting clinical research on cannabis use disorder, supported by several NIH awards (NIDA K01, K02 and R01 awards). This research aims to determine neuropharmacological mechanisms of the abuse-related effects of cannabis to identify targets for medications development, and then evaluate the effects of promising compounds on cannabis use decisions. Dr. Lile is an internationally recognized expert on the behavioral pharmacology of abused substances, with an emphasis on cannabis.

William Stoops, PhD

Dr. Stoops is a Professor in the Departments of Behavioral Science, Psychiatry and Psychology and a faculty member of the Center for Drug and Alcohol Research at the University of Kentucky. He is the Associate Director for Clinical Research of the UK Substance Use Priority Research Area and Director of the UK Clinical Research Support Office. Dr. Stoops has extensive experience in conducting human abuse liability studies across a wide range of drug classes. He has over 20 years of experience as a PI on numerous grants and a wealth of experience monitoring the safety of human laboratory studies and clinical trials. Dr. Stoops' research has been funded by the National Institute on Drug Abuse, National Institute on Alcohol Abuse and Alcoholism, the National Institute of General Medical Sciences and National Cancer Institute.

Sharon Walsh, PhD

Dr. Walsh is a Professor of Behavioral Science, Pharmacology, Pharmaceutical Sciences and Psychiatry in the University of Kentucky Colleges of Medicine and Pharmacy, director of the UK Center on Drug and Alcohol Research and director of the Substance Use Priority Research Center. She has been conducting clinical research on substance use disorders for nearly 30 years with a special emphasis on opioid use disorder and its treatment. Her research program has been continuously funded by the National Institute on Drug Abuse. Dr. Walsh is the principal investigator of the $87 million grant for NIH's HEALing Communities study. She has served as an advisor and reviewer for numerous agencies, including the National Institutes of Health, the Food and Drug Administration, the Centers for Disease Control and Prevention, the Veteran's Administration and the World Health Organization.

ADVISORY BOARD
INTERNAL ADVISORY COMMITTEE

Susanne Arnold, MD

Dr. Arnold is a Professor of Medical Oncology. Dr Arnold serves as Associate Director of Clinical Translation in Markey Cancer Center and holds the Buck-Kentucky Chair in Lung Cancer Research. Dr. Arnold's major research interests are in experimental therapeutics and clinical and translational studies of lung and head and neck cancers, as well as population-based cancer research in environmental carcinogens and precision medicine. She has over 23 years of experience as a medical oncologist and clinical researcher, having conducted over 16 investigator-initiated clinical trials in lung and head and neck cancer. She serves on the National Cancer Institute's Investigation Drug Steering Committee and has authored 127 original manuscripts and trained over 35 fellows in medical oncology. She oversees the clinical research endeavors of the Markey Cancer Center and assists other investigators with the development of investigator-initiated clinical trials.

Joseph Chappell, PhD

Dr. Chappell is Professor and Chair of Pharmaceutical Sciences in the College of Pharmacy. Dr. Chappell is an acclaimed natural product scientist and has developed UK's expertise in plant derived drug candidates. Dr. Chappell's research has been dedicated to studying all facets of isoprenoid (terpene) metabolism in plants and microbes. His team's goal is to develop new plant-based therapeutic agents by manipulating the genes and enzymes associated with the biosynthesis of putative therapeutic compounds in dietary supplements and medicinal plants. Dr. Chappell has been involved in commercializing intellectual property discovered in his lab, including the development of several start-up enterprises in Kentucky.

Patricia Freeman, PhD

Dr. Freeman is the Earl Platt Slone Endowed Professor in Pharmacy Practice and Science at the University of Kentucky College of Pharmacy. She is the Director of the Center for the Advancement of Pharmacy Practice and a University Research Professor. Currently, her work is centered on the impact of policies designed to increase access to the opioid overdose reversal agent naloxone. As a faculty affiliate of UK's Center on Drug and Alcohol Research, Dr. Freeman leads the HEALing Communities Study Prevention Team and pharmacy-based interventions designed to reduce the supply of excess opioids through increased disposal of unused medications, identify and reduce risky prescribing and dispensing behaviors among prescribers and pharmacists, and promote increased use of naloxone.

ADVISORY BOARD
INTERNAL ADVISORY COMMITTEE

Michelle Lofwall, MD

Dr. Lofwall is a Professor of Psychiatry and Behavioral Science and the Center on Drug and Alcohol Research in the UK College of Medicine. She is the Bell Alcohol and Addictions Chair and the Medical Director of the Straus Clinic and the First Bridge Clinic which provide rapid access to comprehensive opioid use disorder treatment for patients with serious health complications. Dr. Lofwall is the one of the lead investigators on the HEALing Communities Study and serves on the opioid use disorder (OUD) treatment team. She is a past board member of the American Society of Addiction Medicine, has been an invited speaker to the National Academy of Medicine, and has received numerous teaching and mentorship awards. She was the recipient of the 2022 Marie Nyswander/Dole Award from the American Association for the Treatment of Opioid Dependence.

James Matthews, PhD

Dr. Matthews is a Professor and Associate Dean for Research in the UK College of Agriculture, Food and Environment. His program of research in nutritional physiology has focused on the molecular study and characterization of nutrient transporters, and enzymes that either produce or metabolize transporter substrates. Dr. Matthews' current research foci are (1) to identify the mechanisms by which different forms of selenium in free-choice vitamin-mineral mixes ameliorate the negative effects of fescue toxicosis on growth and fertility of cattle, and (2) to discover how the expression and function of amino acid transporters and metabolizing enzymes are coordinated to support the development and finishing of cattle and pigs.

Danelle Stevens-Watkins, PhD

Dr. Stevens-Watkins is a licensed psychologist in the Commonwealth of Kentucky, Professor of Counseling Psychology and Associate Vice President for Research (Diversity and Inclusion). She is a core faculty member of the Center for Health Equity Transformation and a faculty affiliate of the Center for Drug and Alcohol Research. Dr. Stevens-Watkins has a over decade of funding from NIDA as PI or Co-I. Her projects have focused on criminality, drug use, and HIV risk among African American women. She completed an NIH (K08) Mentored Career Development Award with a research emphasis on mental health drug use and HIV risk behaviors among Black male prisoners. She currently has an NIH R01 from NIDA titled: Research Examining Factors Associated with the Opioid Crisis among Under-served African Americans (REFOCUS). Dr. Stevens-Watkins is also a MPI on a NIMHD grant collaboration with Morehouse School of Medicine focused on increasing PrEP uptake among Black women at high risk for HIV. In addition, she is an MPI on a NIGMS R25 collaboration with Vanderbilt designed to enhance Faculty of Color success at PWIs.

4. CLINICAL TRIALS

CLINICAL TRIALS

The primary goal of the Cannabis Center is to conduct cutting-edge clinical trials to:

1) ***determine the risk and benefit of cannabis for various medical conditions***

2) ***begin to identify effective dose regimens for specific medical conditions***

3) ***determine if cannabis can be beneficial for medical conditions that are relevant to the citizens of Kentucky - including cancer, obesity/metabolic disease and opioid use disorder***

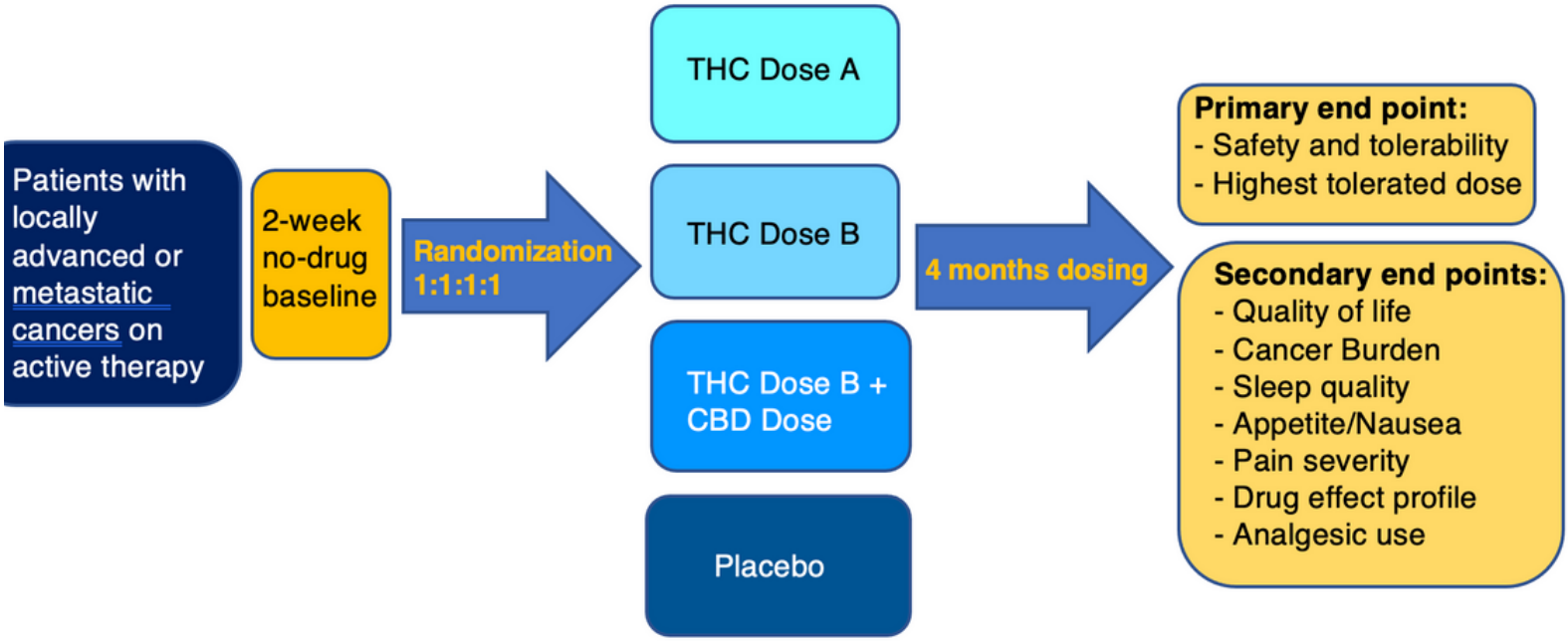
The University of Kentucky Cannabis Center is one of approximately 5 Centers in the country with the capability to conduct double-blind, placebo-controlled, randomized trials administering controlled doses of a Schedule I drug (cannabis).

A. CANCER TRIAL

In collaboration with the University of Kentucky Markey Cancer Center, the Cannabis Center is preparing to conduct one of the first double-blind, placebo-controlled, randomized controlled trials of repeated doses of cannabis and placebo in patients with cancer.

Study Overview

UK Cannabis Cancer Trial
- Once daily dosing for 4 months (cannabis gummy)
- Doses titrated at study start; tapered at end
- Daily check-ins with study staff
- Daily data collection with OnTracka data app
- Observed daily dosing on FaceTime
- Once monthly in-person visits



CANCER TRIAL

Principal Investigators

Zin Myint, MD

Dr. Myint is a medical oncologist focusing on genitourinary malignancies – prostate, kidney, bladder, and testicular cancers. She is an active clinical researcher and her interest is to develop early phase clinical trials in prostate, bladder and kidney cancers. Her ultimate goal is to provide treatments that improve quality and prolong the lives of patients. Dr. Myint recently published a study on the effects of CBD on prostate cancer:

Myint ZW et al (2023). A Phase I Dose Escalation and Expansion Study of Epidiolex (Cannabidiol) in Patients with Biochemically Recurrent Prostate Cancer. *Cancers (Basel); Apr 27;15(9):2505. doi: 10.3390/cancers15092505.*

Shanna Babalonis, PhD

Drs. Myint and Babalonis have worked closely together for nearly two years to develop the protocol and the medical and safety monitoring plan for this trial. Dr. Myint is the medical expert and Dr. Babalonis is the scientific lead for the study. They recently attended the International Cannabinoid Research Society meeting in Toronto, Canada where they were able to hear a series of talks on new studies involving cannabinoids and cancer.

Co-Investigators & Collaborators

Donglin Yan, PhD
Statistician
UK Markey Cancer Center

Jerod Stapleton, PhD
Prevention Scientist
Markey Cancer Center
UK College of Public Health

Jill Kolesar, PhD
Pharmacology Expert
UK College of Pharmacy

CANCER TRIAL

Study Progress

- The study protocol is currently under review at UK Markey Cancer Center

- After Markey Cancer Center review, we will submit the protocol for other regulatory reviews (UK Institutional Review Board (IRB), US FDA and DEA).

- We experienced some delays with drug supply (as described below); however, we have a new supplier and anticipate receiving drug supply in the beginning of 2024.

Projected Start Date (first participant enrolled): February 2024

Barriers and Solutions:

Drug Supply: We had been working with a cannabis company for over one year to secure drug supply for this study (and other studies). The company's research operation collapsed (Spring 2023) and they were unable to fulfill their supply commitments. Importantly - *we did not lose any money* (we had not paid them anything per our agreement); however, we lost a great deal of time.

New Drug Supply: We are now working with a highly reputable company, ElSohly Laboratories, to obtain drug supply. The CEO of the company, Mahmoud ElSohly, also serves as the Director of the NIDA Marijuana Farm at the University of Mississippi.

Preparing for Study Launch:

Study Staff: We have hired a research nurse (Lelia Andrews, RN, BSN) and a study coordinator (Grayson Fuller, BS, MPH) for this study. UK Center on Drug and Alcohol Research Project Director, Paul Nuzzo, MA is also contributing to this study. This team meets regularly to develop protocols for drug delivery and security, safety assessments, data collection and daily dosing.

Markey Cancer Center

Cannabis Center

B. OBESITY/METABOLIC HEALTH TRIAL

The Cannabis Center is collaborating with the UK Barnstable Brown Diabetes Center and the UK Department of Endocrinology to conduct the first double-blind, placebo-controlled, randomized trial of daily cannabis doses in patients with pre-diabetes and obesity.

STUDY RATIONALE

- **Kentucky is #2 in the US for the highest rates of adult obesity, with 4 in 10 adults meeting criteria for obesity**
- **Obesity increases the risk of many medical conditions, including stroke, type 2 diabetes, hypertension, heart disease, cancer and several others** [1]
- **The Cannabis Center recognizes that there are existing FDA-approved treatments for obesity and related conditions; however, additional treatments should be investigated**
- **Population-based studies consistently report that *frequent cannabis users have lower BMIs and better metabolic health than controls*** [2]
- **However, there have been no controlled studies in humans to determine if this protective effect is produced by cannabis use itself or if this finding may be attributed to another factor**

1. Trust for America's Health. The State of Obesity: Better Policies for a Healthier America (2022). https://www.tfah.org/report-details/state-of-obesity-2022/
2. Murphy T, Le Foll B. Targeting the Endocannabinoid CB1 Receptor to Treat Body Weight Disorders: A Preclinical and Clinical Review of the Therapeutic Potential of Past and Present CB1 Drugs. Biomolecules. 2020 Jun 4;10(6):855.

OBESITY & METABOLIC HEALTH TRIAL

OBJECTIVES:

The goal of this study is to determine the safety, tolerability and initial efficacy of once daily oral cannabis for weight loss and metabolic health in obese individuals.

STUDY DESIGN:

A randomized, double-blind, placebo-controlled, between-subject trial of cannabis (oral cannabis preparation vs. placebo) for the treatment of obesity.

PRIMARY OUTCOMES:

1) Safety and tolerability of daily cannabis doses
2) Changes in body weight

SECONDARY OUTCOMES:

Cannabis-induced changes in:

- Waist circumference
- Heart rate and blood pressure
- Insulin
- Blood glucose
- Lipids (triglycerides, HDL and LDL cholesterol)
- Omega-6 and omega-3 fatty acids
- Hemoglobin A1C (HbA1c)
- Hunger hormones (leptin, ghrelin, PYY)
- Drug use patterns (licit and illicit drug use)
- Endogenous cannabinoids (AEA, 2-AG)

OBESITY & METABOLIC HEALTH TRIAL

Investigator Team

Joshua Lile, PhD
Principal Investigator
Professor, Department of Behavioral Science
UK College of Medicine

Simon Fisher, MD, PhD
Chief, Division of Endocrinology, Diabetes and Metabolism
Acting Director, Barnstable Brown Diabetes Center

Kamyar Asadipooya, MD
Assistant Professor
Division of Endocrinology, Diabetes and Metabolism
UK College of Medicine

Christopher Alcorn, DO
Fellow, Department of Internal Medicine
Division of Endocrinology, Diabetes and Metabolism
UK College of Medicine

Shanna Babalonis, PhD
Associate Professor
Department of Behavioral Science
UK College of Medicine
UK Cannabis Center

UK HealthCare
BARNSTABLE BROWN DIABETES CENTER

UK College of Medicine
Internal Medicine

OBESITY & METABOLIC HEALTH TRIAL

Study Progress

- The study has been approved by the UK Medical IRB
- We are preparing applications for additional regulatory reviews (US FDA and DEA)
- The Center experienced some delays with drug supply (as described in the Cancer Trial section); however, we anticipate receiving drug supply in the beginning of 2024.

Projected Start Date (first participant enrolled): February 2024

Preparing for Study Launch:

Study Staff and Research Preparation: Karen Shearer from the UK Barnstable Brown Diabetes Center will serve as the lead study coordinator for this study.

Similar to the Cancer Trial, this study will utilize app-base data collection methodology through OnTracka (an encrypted, HIPAA-compliant, secure service).

The research team meets regularly to develop protocols for drug delivery and security, safety assessments, data collection and daily dosing protocols.

C. NIH FUNDED TRIALS

Researchers at the Center on Drug and Alcohol Research and the UK Cannabis Center received an $2.8 million NIH Grant in 2022 (NIH R01 DA 054347).

The Effects of Cannabis on Outcomes Related to Opioid Use Disorder: Opioid Withdrawal, Abuse Potential and Safety

INVESTIGATORS:

Shanna Babalonis, PhD

Michelle Lofwall, MD

Sharon Walsh, PhD

Laura Fanucchi, MD

Kevin Hatton, MD, PhD

OBJECTIVES:

The goal of this study is to examine the effects of inhaled cannabis across a wide dose range to determine how these doses modulate 1) opioid withdrawal severity, 2) opioid abuse potential, and 3) opioid physiological effects/safety outcomes.

STUDY PROGRESS: The study protocol has been approved by all necessary regulatory bodies (UK Medical IRB, FDA, DEA)

The Center experienced some delays with drug supply; however, we anticipate receiving drug supply in the beginning of 2024

Projected Start Date (first participant enrolled): February 2024

NIH National Institute on Drug Abuse
Advancing Addiction Science

C. NIH FUNDED TRIALS

The team at the UK Cannabis Center and Center on Drug and Alcohol Research have recently completed two NIH-funded research studies. We are presenting an overview of the data here to 1) inform the state of our recent findings and 2) demonstrate the capabilities of our multidisciplinary research team as we expand our cannabis research portfolio.

Key Finding	Data
Cannabidiol (CBD) does not decrease the high or abuse potential of cannabis	• Cannabis containing THC alone and cannabis containing THC+ CBD was tested • The addition of CBD did not decrease the THC-related high reported by participants • In some cases, THC+CBD *increased* the subjective effects relative to THC alone
At high doses, cannabis + opioid combinations produce increased abuse potential	• Inhaled cannabis combined with intranasal oxycodone increases participant ratings of drug liking and feeling high • This study joins several others with similar findings; these data are potentially concerning for those who use these drugs together for therapeutic or non-medical use
Cannabis did not alter the safety profile of opioids and did not alter opioid analgesia	• Cannabis did not change the physiological risk of opioids - there were no changes in opioid-induced respiratory function • Cannabis did not alter opioid analgesia, suggesting it may not provide additional benefit to those taking opioids • These findings suggest these are safe drug combinations to explore for therapeutic effects

- *Unpublished data from NIH grants R01 DA045700 and R21 DA045101*

5. UK FACULTY PILOT GRANTS

CANNABIS CENTER PILOT GRANT AWARDS

- The Cannabis Center issued a call for pilot grant applications in October 2022
- Grant applications were reviewed by an expert panel
- Four grants were awarded in the Spring of 2023
- ***All grants are reporting Kentucky-based data***

1 **THE EVOLUTION OF CANNABIS CONSUMPTION: EVIDENCE FROM TRAFFIC FATALITIES**

CAROLYN WEBER, PHD (PI)

2 **IMPACT OF CANNABIS LAWS ON OPIOID AND BENZODIAZEPINE PRESCRIPTIONS AND ASSOCIATED HEALTH OUTCOMES IN OLDER ADULTS**

JAYANI JAYAWARDHANA, PHD (PI)
DANIELA MOGA, PHD
PATRICIA FREEMAN ,PHD

3 **PERINATAL CANNABIS: PERCEPTIONS, USE PATTERNS, AND POLICY IMPLICATIONS**

KRISTIN ASHFORD, PHD (PI)

4 **POPULATION-BASED ANALYSIS OF CANNABIS USE AMONG CANCER PATIENTS & SURVIVORS IN KENTUCKY**

JAY CHRISTIAN, PHD (PI)
JESSICA BURRIS, PHD
ARADHANA KAUSHAL, MD
SHYANIKA ROSE, PHD

Highlights from each project are presented here; please see appendix materials for full progress reports.

CAROLINE WEBER, PhD

Associate Professor
Martin School for Public Policy & Administration
University of Kentucky

PILOT PROJECT #1

The Evolution of Cannabis Consumption: Evidence from Traffic Fatalities

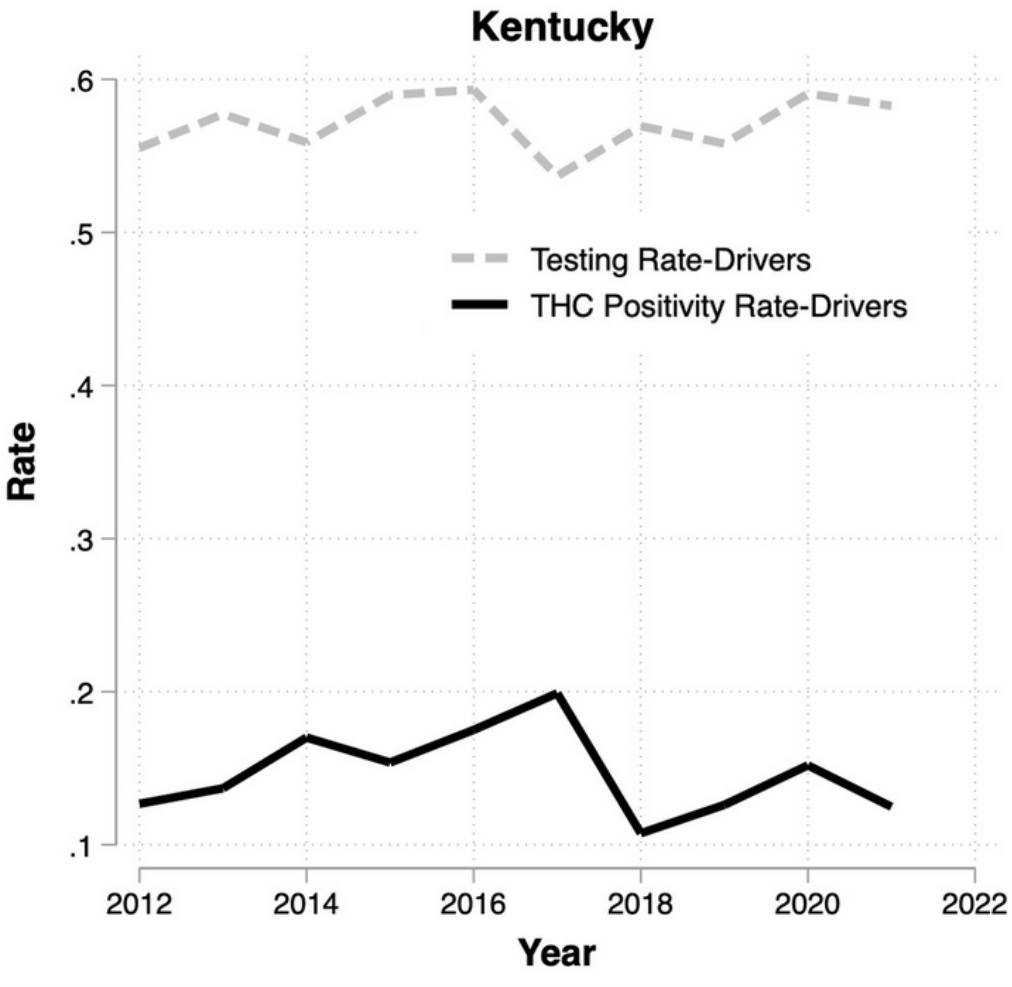
The rapid expansion of recreational cannabis access in the United States has dramatically increased legal recreational cannabis consumption. However, increased legal recreational consumption likely coincides with a decrease in black market and legal medical cannabis; hence, it's theoretically ambiguous how much overall cannabis consumption has changed in states that have legalized recreational cannabis. We generate a new annual proxy for the proportion of adults consuming cannabis using blood and urine tetrahydrocannabinol (THC) test results from the Fatality Analysis Reporting System (FARS) data for the period 2010 - 2021. THC tests from traffic fatality records are possible to use as a broader measure of THC consumption because THC remains in the bloodstream after impairment from cannabis consumption has dissipated for regular cannabis users. We select states that frequently test drivers in fatal crashes and reliably test for THC. We explore how our measure varies by demographics and engagement in risky behaviors (e.g. testing positive for alcohol or hard drugs). We benchmark our measure against existing usage measures, such as the Behavioral Risk Surveillance System Survey (BRFSS). These existing measures are self-reported which may limit their ability to fully capture overall usage and precise responses to cannabis law changes. We can then use our new proxy for cannabis consumption to study how consumption changes when recreational cannabis is legalized.

CAROLINE WEBER, PhD

Associate Professor
Martin School for Public Policy & Administration
University of Kentucky

PRELIMINARY DATA

The Evolution of Cannabis Consumption: Evidence from Traffic Fatalities



This figure plots FARS data over time in Kentucky from 2012 - 2021. The gray dashed line marks the fraction of drivers that Kentucky has tested for drugs via blood or urine tests and the black line marks the fraction of individuals tested for drugs that test positive for THC.

CAROLINE WEBER, PhD

Associate Professor
Martin School for Public Policy & Administration
University of Kentucky

PRELIMINARY DATA

State Fractions for 2017 - 2021

	State	Drivers Tested for Drugs (%)	Tested Drivers Positive for THC (%)
1	Montana	75.72	16.88
2	New Hampshire	68.12	18.55
3	Arkansas	67.04	17.98
4	Oklahoma	58.17	9.80
5	Louisiana	57.02	15.78
6	**Kentucky**	**56.75**	**14.20**
7	South Dakota	53.93	7.31
8	Utah	53.08	11.51
9	Vermont**	49.56	30.36
10	Connecticut	48.63	20.44
11	West Virginia	48.04	11.46
12	Hawaii	47.11	16.73
13	Pennsylvania	46.86	8.51
14	Colorado**	46.74	21.73
15	New Jersey**	46.45	17.05
16	Washington**	46.31	20.39
17	Idaho	45.79	14.85
18	Indiana	45.23	7.40
19	North Dakota	44.83	5.86
20	District of Columbia**	44.60	28.25
21	Alabama	43.94	14.48
22	Rhode Island	43.13	27.33
23	Ohio	42.70	19.92
24	Tennessee	40.94	16.11
25	Wisconsin	40.71	16.45

This table presents the percent of drivers in the FARS data (all drivers involved in a car crash with at least one fatality) that are administered a blood or urine drug test by state for all states who test at least 40 percent of drivers in the years 2017 - 2021. It also presents the fraction of drivers administered one of these tests that test positive for THC. ∗ ∗ indicates that recreational cannabis was legalized during the time period of valid data for that state (5 states).

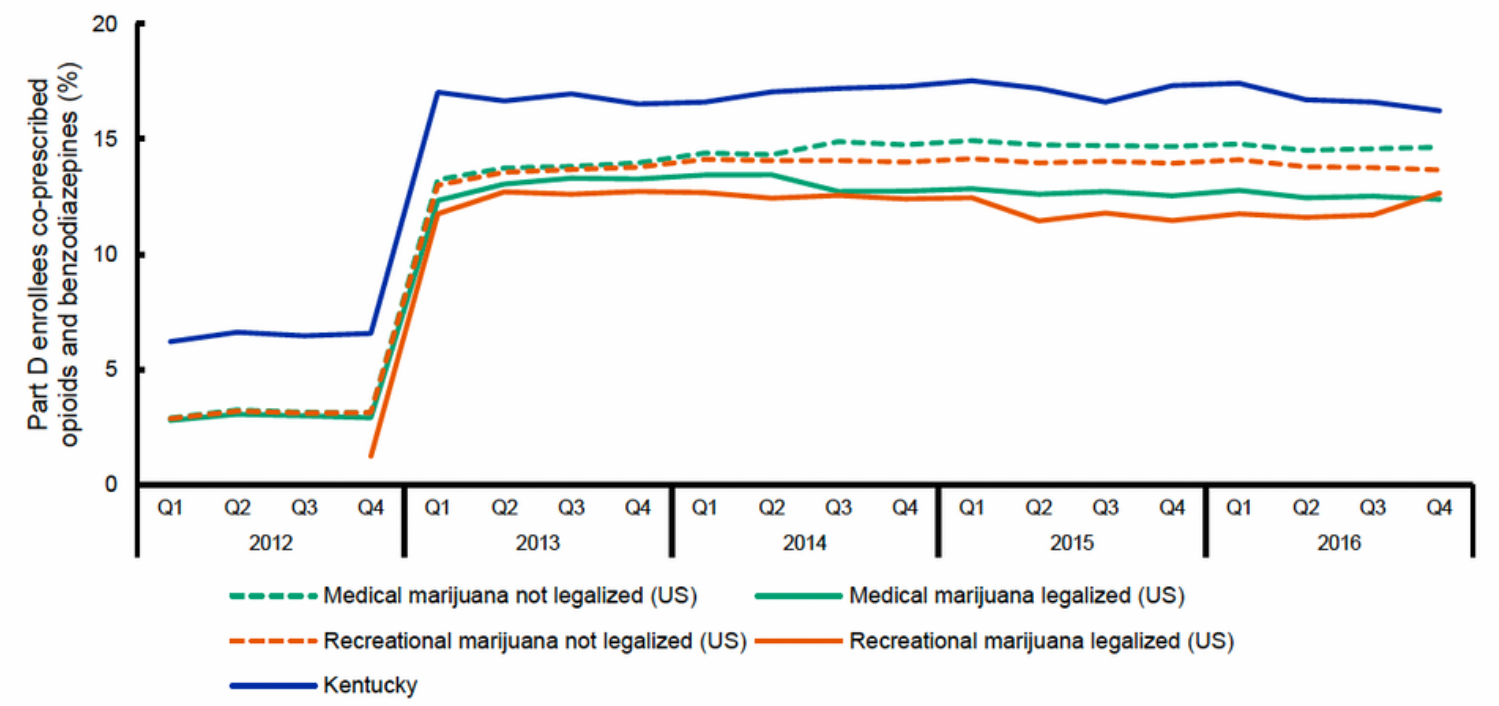
JAYANI JAYAWARDHANA, PhD

Associate Professor
Department of Health Management and Policy
College of Public Health
University of Kentucky

PILOT PROJECT #2

Impact of Cannabis Laws on Opioid and Benzodiazepine Prescriptions and Associated Health Outcomes in Older Adults

This study examines the effects of cannabis laws (medical and recreational) on co-prescriptions of opioid and benzodiazepine (i.e., at least one day of overlap between an opioid and a benzodiazepine prescription) and diagnoses of opioid use disorder (OUD), benzodiazepine use disorder (BUD), and cannabis use disorder (CUD) among older adults (≥65). The study utilizes patient-level Medicare claims data (i.e., The Medicare Provider Analysis and Review (MEDPAR) and Prescription Drug Event (PDE) files for 2012-2016) and state-level socio-economic and policy variables to achieve these aims.

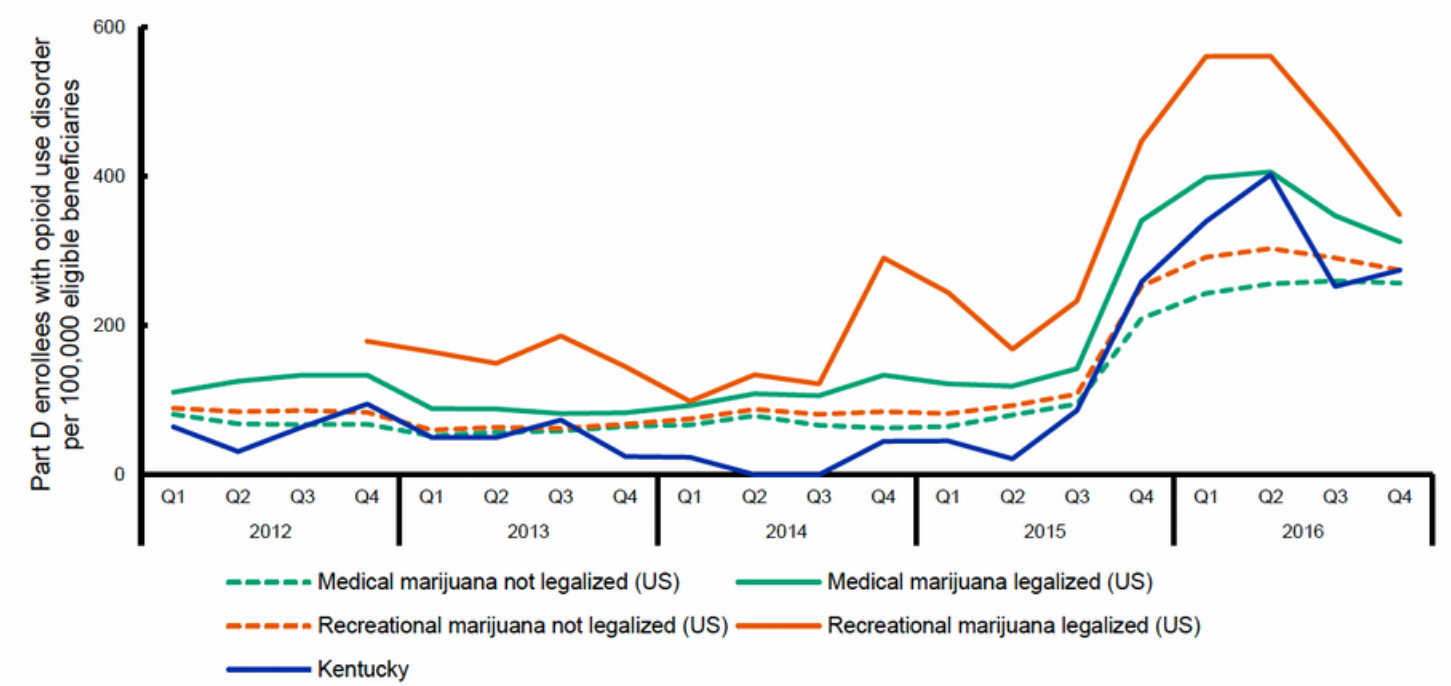


Percent of Medicare enrollees (in Part D) with co-prescriptions of opioids and benzodiazepines in the US and KY by quarter and cannabis legalization (medical and recreational) status

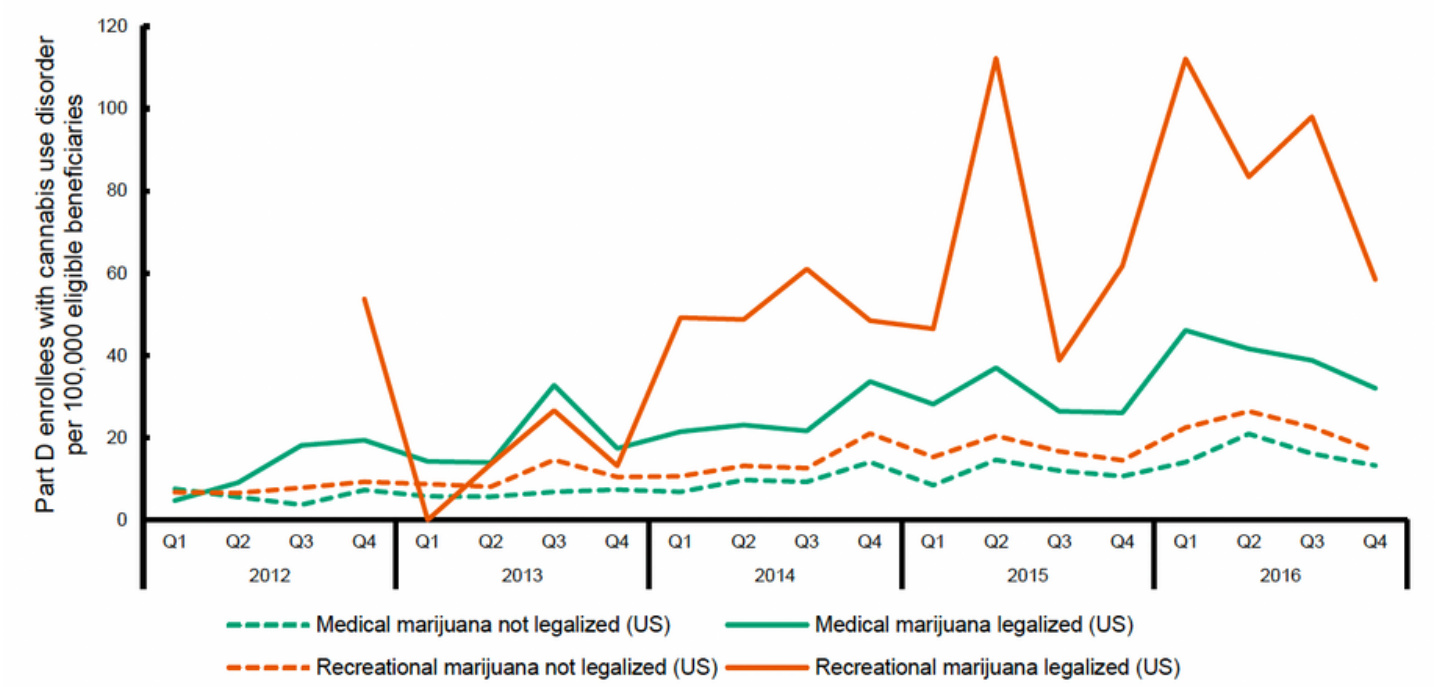
JAYANI JAYAWARDHANA, PhD

Associate Professor
Department of Health Management and Policy
College of Public Health
University of Kentucky

PRELIMINARY DATA



Medicare enrollees (in Part D) with opioid use disorder (OUD) per 100,000 eligible beneficiaries in the US and in KY by quarter and cannabis legalization (medical and recreational) status.



Medicare enrollees (in Part D) with cannabis use disorder (CUD) per 100,000 eligible beneficiaries by quarter and cannabis legalization (medical and recreational) status

KRISTIN ASHFORD, PHD, WHNP-BC, FAAN

Professor
Associate Dean for Undergraduate Faculty
and Interprofessional Education Affairs
College of Nursing
University of Kentucky

PILOT PROJECT #3

Perinatal Cannabis: Perceptions, Use Patterns, and Policy Implications

The Perinatal Research and Wellness Team will examine perinatal cannabis use patterns (dose, frequency, and route of administration) and dependency in Kentucky by analyzing UKHC de-identified patient data over a 5-year period. We will also enroll patients at UKHC clinics and invite them to complete an online survey and participate in a virtual focus group to explore perceptions, motivations, and hesitations for perinatal cannabis use in Kentucky.

Cannabis Use & Infant Outcomes: What We Know

Cannabis use and cannabis use disorder during pregnancy increase risk of:

- likelihood of low birth weight (Gabrhelik et al., 2021)
- infant being small for gestational age (Bandoli et al., 2021)
- intrauterine growth restriction (Benevenuto et al., 2017)
- gastrointestinal malformation (Bandoli et al., 2021)
- preterm birth (Bandoli et al., 2021)

KRISTIN ASHFORD, PHD, WHNP-BC, FAAN

Professor
Associate Dean for Undergraduate Faculty
and Interprofessional Education Affairs
College of Nursing
University of Kentucky

PILOT PROJECT #3

STUDY AIMS & PROGRESS

1

Describe perinatal cannabis use patterns (dose, frequency, and route of administration) and dependency in Kentucky

Analyze data from a 5-year Retrospective chart review of de-identified perinatal patient UKHC data

- **Our research team is working with the UK Center for Clinical and Translational Sciences to obtain data from patients seen at UKHC facilities. The data query will include demographics and variables on drug use, prenatal statistics, and birth outcomes.**

- **We have prepared a codebook template for the anticipated dataset to guide data cleaning, visualization, and analysis, as well as future data sharing.**

KRISTIN ASHFORD, PHD, WHNP-BC, FAAN

Professor
Associate Dean for Undergraduate Faculty
and Interprofessional Education Affairs
College of Nursing
University of Kentucky

PILOT PROJECT #3

STUDY AIMS & PROGRESS

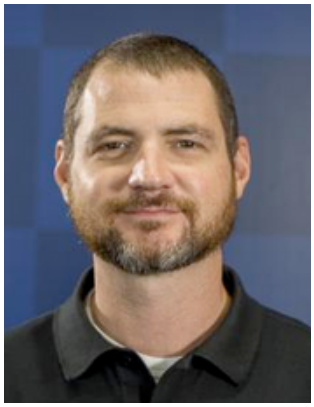
2

Identify perceptions, motivations, and hesitations for perinatal cannabis use in Kentucky

- **Study details: Recruit patients at UKHC OB-GYN clinics to participate in the study. Inclusion criteria: currently pregnant, self-reported cannabis use at any point during the current pregnancy, between 18-45 years old, able to read and understand English.**
- **Data collection launched in late July 2023**
- **7 participants have been enrolled thus far**
- **We will randomly select eligible participants from the study and invite them to take part in a focus group discussion to further explore perinatal cannabis use**

W. JAY CHRISTIAN, PHD, MPH

Associate Professor
Department of Epidemiology & Environmental Health
College of Public Health
University of Kentucky



PILOT PROJECT #4

Population-Based Analysis of Cannabis Use among Cancer Patients and Survivors in Kentucky

This study will examine cannabis use among Kentuckians who are being treated for cancer, or who were recently treated for cancer. These patients and survivors will answer a survey to determine how often they are using cannabis, which types of products they are using, and where they obtain it, including both during and after treatment. Up to 500 participants will be selected from the approximately 55,000 Kentuckians diagnosed with cancer over the past two years.

INITIAL PROGRESS

- received approval from UK Medical IRB (June 2023)
- finalizing online survey and recruitment materials
- plan to apply for an NIH Certificate of Confidentiality

- experienced doctoral student, Sydney Shafer, will join the team
- biostatistician, Dr. Huang is finalizing sampling technique to capture patients who are using cannabis
- projected start: September 2023

6. CANNABIS GROWING FACILITY

CANNABIS GROWING FACILITY

- **The Cannabis Center is working closely with the UK College of Agriculture, Food and Environment (CAFE) and the Kentucky Tobacco Research and Development Center (KTRDC)**

PROGRESS

- **An indoor growing facility has been established**
- **Schedule I drug security system has been installed**

CURRENT WORK

- **We are working with experts across the country to prepare a DEA Schedule I growing application**
- **If approved, we will order seeds/starters and begin a pilot phase of a cannabis growing project**

KEY UK COLLABORATORS

LING YUAN, PhD

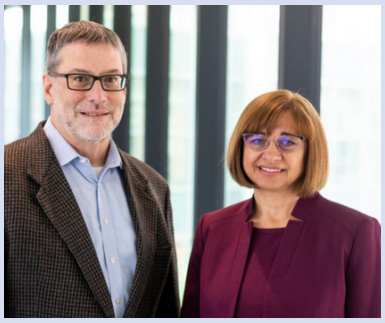
DAVID ZAITLIN, PhD

JAMES MATTHEWS, PhD

CHARLIE HAMM

7. COLLABORATIONS AND ADDITIONAL RESEARCH PROJECTS

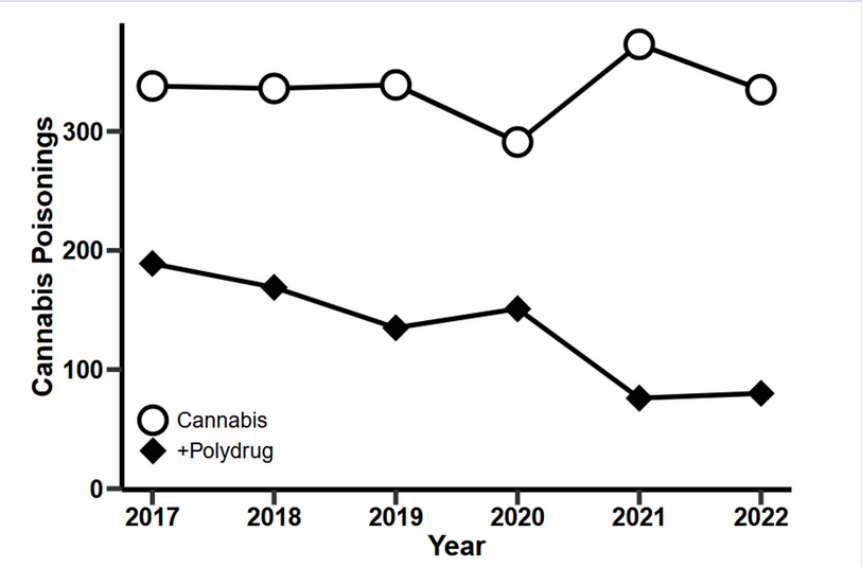
RADOR-KY TEAM



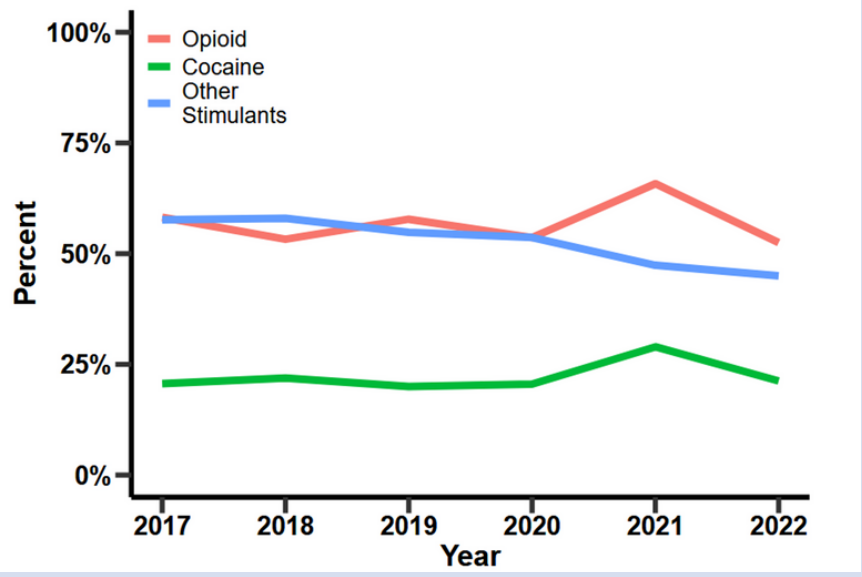
Jeff Talbert, PhD
Svetla Slavova, PhD

- RADOR-KY is an NIH-funded research grant; the project integrates large data sets from various sources to answer important public health questions
- Principal Investigators: Drs. Jeff Talbert and Svetla Slavova
- Data Science Team: Aaron Smith, Drew Speer, Amber Kizewski, Peter Rock, Daniel Harris

Number of Cannabis Poisonings by Discharge Year: Kentucky Residents, 2017-2022



Percentage of Cannabis Poisonings (Emergency Department Visits and Hospitalizations) with Concurrent Involvement of Opioids, Cocaine, or Other Stimulants, by Discharge Year, Kentucky, 2017-2022



A full description of the source data and data displayed in the graphs is available in the appendix materials.

KIPRC, RADOR-KY AND OTHERS

The Cannabis Center has established collaborations with several research groups to access and analyze large data sets to better understand patterns of cannabis use and rates of cannabis-related harms.

The goal of these projects is to examine public health data:

- **across the past 5 years (as a baseline assessment) to determine how frequently cannabinoids have been involved in injuries/medical events**
- **to continue to assess over the next several years to determine the impact of cannabis policy (e.g., medical marijuana laws)**

CANNABINOID INVOLVEMENT IN:

1. **OPIOID OVERDOSE DEATHS**
2. **CAR CRASHES, FATAL ACCIDENTS**
3. **DUI ARRESTS**
4. **PEDIATRIC POISONINGS**

CDC-FUNDED OVERDOSE TO ACTION GROUP (OD2A)

- **The Kentucky Injury Prevention and Research Center (KIPRC) received an OD2A Project Grant (Dana Quesinberry, PI) from the CDC to carry out a full program of research on opioid overdose surveillance studies**
- **The Cannabis Center has paired with this team on one project to examine the presence of cannabinoids in remnant serum and urine samples from patients treated at the University of Kentucky Medical Center Emergency Department**

UK Investigator Team, Cannabis Project:

Dana Quesinberry, JD, DrPH

OD2A Grant Principal Investigator
Assistant Professor, Department of Health Management and Policy

Peter D. Akpunonu, MD

Associate Professor, Emergency Medicine
Medical Director, Undersea and Hyperbaric Medicine
Medical Director, Medical Toxicology
Medical Director, Radiation Injury Treatment Network
Emergency Medicine & Medical Toxicology

Regan Baum, PharmD

Associate Professor, Pharmacy Practice & Science
Emergency Medicine & Medical Toxicology
Emergency Medicine Clinical Pharmacist

Julia Martin, MD

Professor, Emergency Medicine
State Medical Advisor, KY Board of EMS

Min Yu, MD, PhD

Associate Professor, Pathology and Laboratory Medicine
Co-Director, Clinical Chemistry

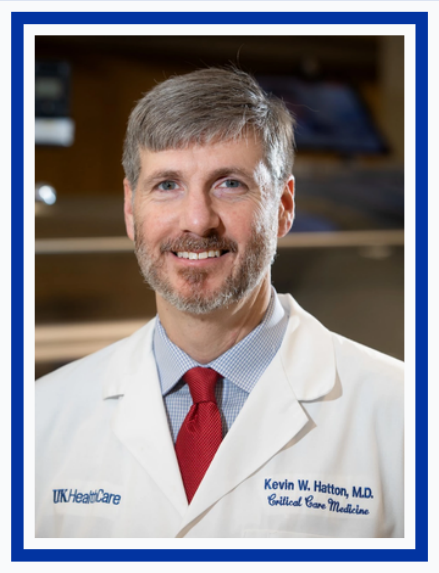
Shanna Babalonis, PhD

Associate Professor, Behavioral Science
Director, UK Cannabis Center

Kentucky Injury Prevention and Research Center

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

UK ANESTHESIOLOGY



Kevin W. Hatton, MD, PhD
Professor and Division Chief
Anesthesiology and Critical Care
eICU Medical Director
Senior Medical Director for
Critical Care Services

Preoperative Illicit Substance Use Evaluation: Comparing Current Screening Methods vs. Structured Evaluation

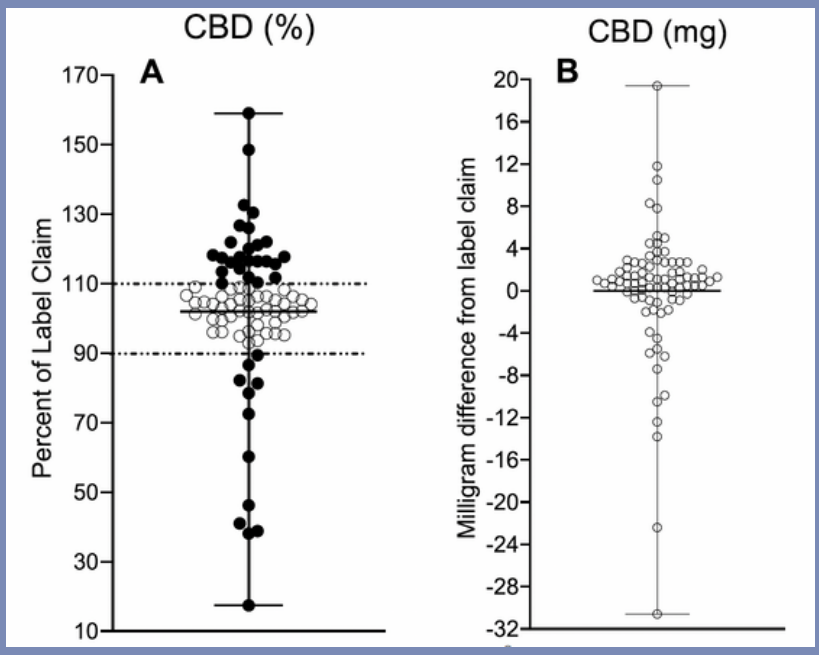
- **Investigators: Dr. Kevin Hatton, Dr. Shanna Babalonis, and 4th year medical student, Mel Zakharia**
- **Study objective: To determine the best method of assessing illicit drug use prior to surgery**
- **Medical concern: Illicit drug use can place patients at higher risk for surgery and anesthesia-related harms**
- **Public health impact: This study will help us determine how to best respond to new anesthesia recommendations regarding evaluation of cannabis use**

EVALUATION OF CBD PRODUCT CONTENTS

Across a series of studies, our team (project lead: Erin Johnson, PhD) analyzed 80 CBD oil-based products that were purchased in Kentucky stores and popular online retailers.

OVER-THE-COUNTER CBD PRODUCTS:

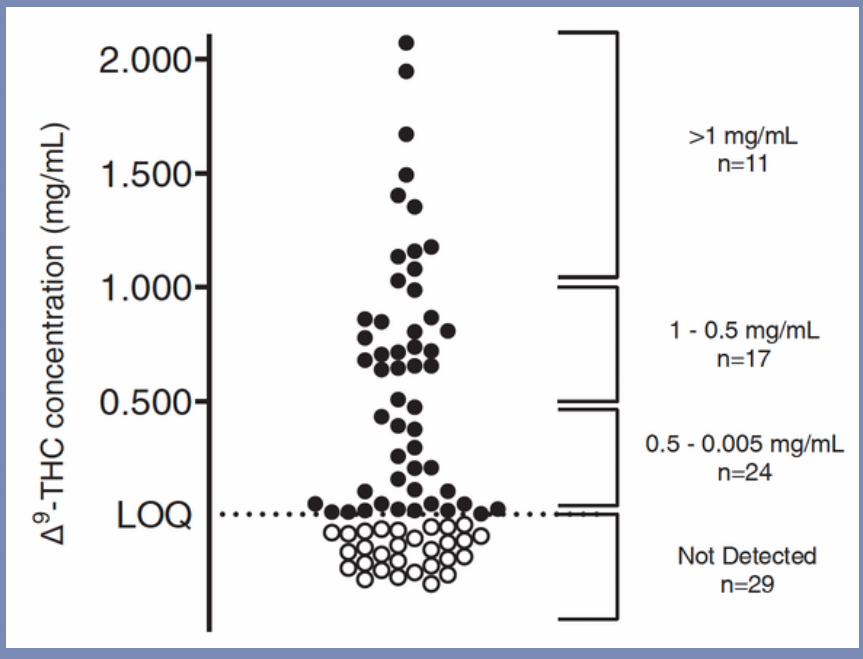
- **Product labels do not list all of the cannabinoids present in the product - *including Δ9-THC***
- **The labels are often incorrect - the amount of CBD in the product is frequently inaccurate**



A) The percentage of CBD label claim content with ± 10% tolerance denoting under-labelling (> 110%) and over-labelling (< 90%). B) Deviation from CBD label claim in milligrams. Johnson E, Kilgore M, Babalonis S (2022). Label accuracy of unregulated cannabidiol (CBD) products: measured concentration vs. label claim. J Cannabis Res. doi: 10.1186/s42238-022-00140-1.

THC CONTAMINATION

- **52 out of the 80 samples tested contained Δ9-THC**
- **Δ9-THC ranged from 0.008 to 2.07 mg/mL**
- **Estimates suggest 0.021 - 0.4 mg of Δ9-THC may produce a THC-positive drug test**
- **60% of products were above 0.021 mg limit; 37% of samples were above the 0.4 mg limit**
- **5 out of 21 products labeled "THC Free" contained Δ9-THC**



Δ9-THC concentrations in 80 commercially available products. Johnson E, Kilgore M, Babalonis S (2022). Cannabidiol (CBD) product contamination: Quantitative analysis of Δ9-tetrahydrocannabinol (Δ9-THC) concentrations found in commercially available CBD products. Drug Alcohol Depend. doi: 10.1016/j.drugalcdep.2022.109522.

COLLABORATION WITH OTHER UNIVERSITIES

The Cannabis Center is collaborating on an NIH-funded project with cannabinoid scientists at Indiana University Bloomington - they are internationally recognized experts in the cannabinoid neuroscience

- We plan to examine endocannabinoid and lipid profiles in participants with opioid use disorder
- The Cannabis Center expects to receive approximately $50,000 for this project
- We are waiting on the official notice of award; we expect to receive notification in September 2023

The Cannabis Center is planning to host a cannabinoid science retreat with faculty from Johns Hopkins. This research group is comprised of internationally recognized experts in the human behavioral pharmacology of cannabinoids

- UK will host the Johns Hopkins team in Lexington for several days of workshops and presentations; teams will share data from their current/ongoing projects
- Tentatively scheduled for November 2023
- Ultimate goal of this event - to plan a collaborative project and grant application

8. SYMPOSIA, PRESENTATIONS, PUBLICATIONS & GRANTS

RESEARCH SYMPOSIA

In collaboration with the Substance Use Priority Research Area (SUPRA), the Cannabis Center held its first annual research symposium at the Substance Use Research Event (SURE) on April 24, 2023 at the UK Gatton Student Center.

The cannabis science track included: 1) a keynote speaker, 2) a breakout session with early career investigators, 3) featured posters and 4) two travel awards for two trainees presenting posters.

SURE
SUBSTANCE USE RESEARCH EVENT

SUPRA
SUBSTANCE USE PRIORITY RESEARCH AREA

UK Cannabis Center

Cannabis Center sponsored activities:

<u>Keynote Speaker</u>: Alan Budney, PhD
Cannabis and Public Health: Knowns, Unknowns and Nonsense

<u>Breakout Session</u>:
Cannabis and Cannabinoid Research: Data from New and Emerging Investigators

<u>Sponsored trainee travel awards:</u>
Ashley Dowd (Johns Hopkins) and Brandon Miller (Kansas St.)

RESEARCH SYMPOSIA

SURE 2023

5TH ANNUAL SUBSTANCE USE RESEARCH EVENT

MONDAY
APRIL 24, 2023
8 AM TO 5 PM

GATTON STUDENT CENTER
UNIVERSITY OF KENTUCKY

THEMATIC SYMPOSIA:

- "Understanding the roles of biological sex and gonadal hormones on motivated behavior: implications for substance use disorder research"
  Chairs: Dr. Jess Santollo and Dr. Jill Turner
- "Cannabis and cannabinoid research: data from new and emerging investigators"
  Chairs: Dr. Shanna Babalonis and Dr. Josh Lile
- "The future of substance use disorder surveillance in Kentucky and beyond"
  Chairs: Dr. Svetla Slavova and Dr. Chris Delcher
- "Implementing overdose prevention in the community: successes and opportunities"
  Chairs: Dr. Katie Marks and Dr. April Young

T32 Trainee Data Blitz
Chairs: Dr. Mark Prendergast, Dr. Mark Fillmore and Dr. William Stoops

Dr. Kathleen A. Grant
Chief and Professor, Division of Neuroscience, Oregon National Primate Research Center

Integrating behavioral, brain imaging, and synaptic function data to assess risk for excessive alcohol intake

Dr. Alan J. Budney
Professor, Center for Technology and Behavioral Health, Geisel School of Medicine at Dartmouth

Cannabis and the Public Health: Knowns, Unknowns and Nonsense

Poster Abstract Submission and Travel Award Application (closes February 15, 2023) CLICK HERE

Conference Registration (closes April 1, 2023) CLICK HERE

University of Kentucky.
SURE SUBSTANCE USE RESEARCH EVENT
UK Cannabis Center
SUPRA
UK Research

Travel awards will be available for trainees and early career researchers presenting on cannabis-related research.

Event sponsored by the Office of the Vice President for Research. An equal opportunity university.

UK CANNABIS SCIENCE SEMINAR SERIES

The Cannabis Center sponsors a series of Zoom seminars featuring national and international experts on cannabis science. This series provides UK students, faculty and the general public the chance to hear cutting-edge cannabinoid science across a wide variety of specialties (medicine, pharmacology, public health, impaired driving science, agriculture, legal and social justice).

These presentations are free to attend and are open to the public.

Ashley Brooks-Russell, PhD
Univ. of Colorado

Cannabis Impaired Driving: Policy Challenges & Emerging Solutions

June 13, 2023

LaTrice Montgomery, PhD
Univ. of Cincinnati

Research Discoveries in the Recreational and Medical Worlds of Cannabis

August 22, 2023

In collaboration with the Center on Health Equity and Transformation

In collaboration with the Substance Use Priority Research Area:

Tom Freeman, PhD
Bath University, United Kingdom

Novel Treatment & Harm Reduction Strategies for Cannabis Use Disorder

April 13, 2023

Andrea Hohmann, PhD
Indiana University

Studies on Preclinical Examination of the Neuropharmaology and Analgesic Effects of Cannabinoids

October 23, 2023

PRESENTATIONS, PUBLICATIONS AND GRANTS

Current Cannabis Grants

1. Cannabis Modulation of Outcomes Related to Opioid Use Disorder: Opioid Withdrawal, Abuse Potential & Safety; Principal Investigator: Shanna Babalonis, Ph.D.; 04/01/2022 – 03/31/2026; $2,860,600; NIH R01 DA054347
2. Evaluation of Marijuana and Opioid Drug Interactions: Assessment of the Safety Profile, Abuse-Related Pharmacodynamic Effects and Models of Drug Intake; Principal Investigator: Shanna Babalonis, Ph.D. 08/01/2018 – 07/31/2024; $2,348,996; NIH R01 DA045700
3. NIH P30 Grant: IU Bloomington Center for Cannabis, Cannabinoids and Addiction (IUB C3A) (2023) - pending UK subaward; UK Site Principal Investigator: Shanna Babalonis, Ph.D.; 09/01/2023 - 08/30/2024; projected total for UK project: $50,000.

Recent Cannabis Publications

1. Britch SC, Walsh SL, Vickers-Smith R, Babalonis S, Slavova S (2023). Cannabis toxicity-related inpatient hospitalizations and emergency department visits in Kentucky, 2017 to 2019. *Substance Use & Misuse*. 58(1):66-76. doi: 10.1080/10826084.2022.2148478. PMID: 36453437; PMCID: PMC9890590.
2. Johnson EJ, Kilgore MW, Babalonis S (2022). Label accuracy of unregulated cannabidiol (CBD) products: measured concentration vs. label claim. *Journal of Cannabis Research. 4(1):28. doi: 10.1186/s42238-022-00140-1. PMID: 35658956; PMCID: PMC9169299.*
3. Johnson EJ, Kilgore MW, Babalonis S (2022). Cannabidiol (CBD) product contamination: Quantitative analysis of Δ9-tetrahydrocannabinol (Δ9-THC) concentrations found in commercially available CBD products. *Drug and Alcohol Dependence. 237:109522. doi: 10.1016/j.drugalcdep.2022.109522. PMID: 35690015; PMCID: PMC9899037.*
4. Costales B, Babalonis S, Brown J, Goodin A (2023). Cannabis impairment on driving performance: Clinical considerations. *Medical Cannabis and Cannabinoids*, 2023 Jan 30;6(1):8-14. doi: 10.1159/000528714. PMID: 36814685; PMCID: PMC9940647.
5. Peters EN, MacNair L, Harrison A, Feldner MT, Eglit GML, Babalonis S, Turcotte C, Bonn-Miller MO (2023). A Two-Phase, Dose-Ranging, Placebo-Controlled Study of the Safety and Preliminary Test of Acute Effects of Oral Tetrahydrocannabivarin (THCV) in Healthy Participants. *Cannabis and Cannabinoid Research, in press.*
6. Lile JA, Turner BW, Cox DH, Bonn-Miller MO, Katz NR, Shellenberg TP, Stoops WW, Strickland JC (2023). Cannabis use disorder treatment preference: a pilot survey in current users of cannabis. *Journal of Addiction Medicine, in press*. PMID: 36731101.

PRESENTATIONS, PUBLICATIONS AND GRANTS

Medical Education (CME Events)

Kentucky Psychiatric Medical Association
Louisville, KY; CME Event, March 2023
Invited Presentation: Medical Cannabis in Kentucky: Pharmacology, Legal Status, Product Overview
Presenter: Shanna Babalonis, PhD

HEALing Communities Presentation, KY OPEN
Lexington, KY; CME Event, July 2023
Invited Presentation; Cannabis in Kentucky: Focus on Opioid Interactions and Clinical Impact
Presenter: Shanna Babalonis, PhD

National Presentation/Medical Education (CME Event)

Cannabis Clinical Outcomes Research Conference
Medical Marijuana Consortium, University of Florida
Orlando, FL; CME Event; May 2023
Invited Keynote Speaker: Opioid and Cannabinoid Interactions: Abuse Potential and Clinical Implications
Presenter: Shanna Babalonis, PhD

National Conference Presentation

Lile JA, Turner BW, Cox DH, Bonn-Miller MO, Katz NR, Shellenberg TP, Stoops WW, Strickland JC (2023). Cannabis use disorder treatment preference: a pilot survey in current users of cannabis. College on Problems of Drug Dependence, Denver, CO, June 2023.

International Conference Presentations

Babalonis S, Lofwall MR, Nuzzo PA, Fanucchi LC, Walsh SL. Intranasal Opioids and Inhaled Cannabis: Abuse Potential, Physiological Effects and safety Profile in Humans.Plenary talk; podium presentation; International Cannabinoid Research Society, Toronto Canada, June 2023.

Johnson E, Kilgore M, Babalonis S. Quantitation of 17 Phytocannabinoids in Hemp-Derived Oils: LC-MS/MS Method Validation and Product Data. International Cannabinoid Research Society, Galway, Ireland. July 2022.

9. FUTURE DIRECTIONS

FUTURE DIRECTIONS

The Cannabis Center is committed to conducting research that can impact the health and well-being of the citizens of the Commonwealth. With continued funding, we hope to explore the risk/benefit of cannabis for other serious disease conditions.

NIH Grants

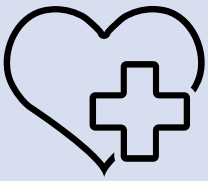
- We plan to apply for additional NIH grants to sustain and grow our portfolio of federally funded research

Autoimmune Disease

- Animal and cellular studies suggest that cannabinoids may help with inflammation caused by autoimmune diseases (e.g., lupus, multiple sclerosis)
- Controlled trials are needed to determine efficacy, safety, dosing regimens

Autism Spectrum Disorder

- Early trials from Israel suggest that CBD combined with low concentrations of THC may help some of the severe disruptive behaviors that can occur with ASD
- We have been in communication with Mr. Kevin Murray (CEO & Founder of Entoura; BOD at Autism Speaks) about conducting a controlled trial for ASD



Lung Health

- There are little to no controlled data on how cannabis smoking or vaping affects lung health
- The Cannabis Center is planning a controlled study to examine inflammation and immune biomarkers during various types/routes of cannabis use (e.g., smoking plant material, vaping)

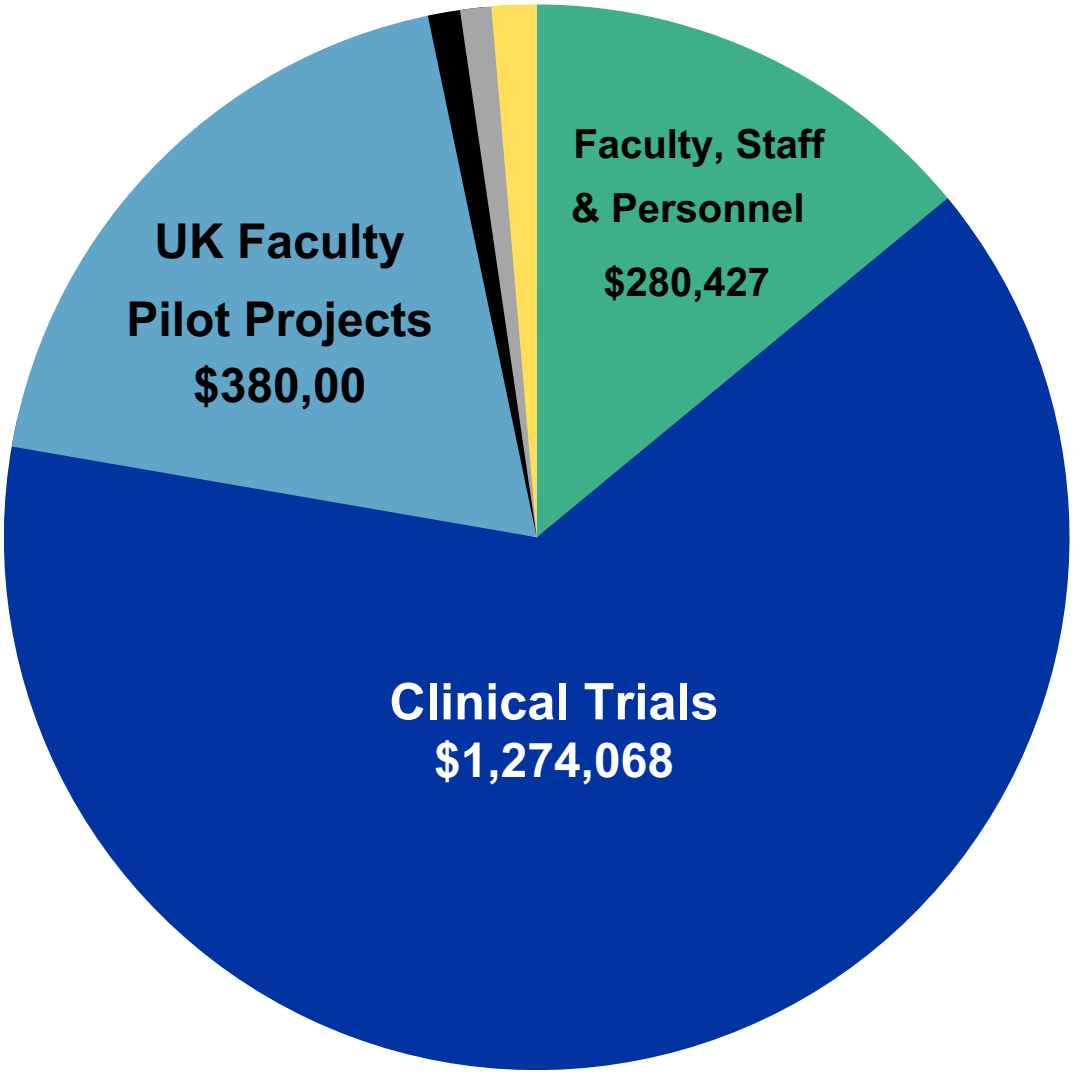
Palliative Care

- A recent systematic review indicated some therapeutic benefit of cannabis in palliative care settings; however, all of the research to date has been low quality
- Controlled trials are needed to determine if cannabis products are recommended for this setting

10. BUDGET REPORT

BUDGET REPORT

ALLOCATED FUNDS



- Tech, Supplies $18,824
- Speakers, Travel $19,469
- Cannabis Growing Facility $27,212

BUDGET REPORT

UK CANNABIS CENTER					
ALLOCATED FUNDS (07/01/22 - 06/30/23)					
	EXPENSES (through 07/31/23)		**COMMITTED**		**OVERALL TOTALS**
FACULTY, STAFF & PERSONNEL	$	130,427.17	$	150,000.00	**$ 280,427.17**
(*note: Board Members are unpaid and volunteer their time and efforts)					
CLINICAL TRIALS			$	1,042,968.27	**$ 1,042,968.27**
CANNABIS GROWING FACILITY	$	17,212.00	$	10,000.00	**$ 27,212.00**
UK FACULTY PILOT GRANTS	$	380,000.00			**$ 380,000.00**
VISITING SPEAKERS, TRAVEL	$	3,700.24	$	7,500.00	**$ 11,200.24**
TECH, SUPPLIES, STUDY DRUG	$	16,916.49	$	231,100.00	**$ 248,016.49**
Other Expenses (study supplies, postage, printing, fees)	$	5,175.83	$	5,000.00	**$ 10,175.83**
TOTALS	$	553,431.73	$	1,446,568.27	**$ 2,000,000.00**

ACKNOWLEDGEMENTS

The UK Cannabis Center would like to acknowledge the following individuals who have contributed their time and efforts:

Drew Speer, DrPH, UK Cannabis Center Director of Operations

Tammy Minor

Alicia Colliver

Amy Atkerson

Michelle Hunt

Bart Hardin

We sincerely thank the Kentucky State Legislature for establishing the UK Cannabis Center and providing generous funding and continued support.

CONTACT

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Lexington, KY 40508

cannabiscenter@uky.edu

11. APPENDIX MATERIALS

The Evolution of Cannabis Consumption: Evidence from Traffic Fatalities

PI: Caroline Weber, Associate Professor, Martin School for Public Policy & Administration

August 2023 Update

1. Brief Project Description

The rapid expansion of recreational cannabis access in the United States has dramatically increased legal recreational cannabis consumption. However, increased legal recreational consumption likely coincides with a decrease in black market and legal medical cannabis; hence, it's theoretically ambiguous how much overall cannabis consumption has changed in states that have legalized recreational cannabis. We generate a new annual proxy for the proportion of adults consuming cannabis using blood and urine Tetrahydrocannabinol (THC) test results from the Fatality Analysis Reporting System (FARS) data for the period 2010 - 2021. THC tests from traffic fatality records are possible to use as a broader measure of THC consumption because THC remains in the bloodstream after impairment from cannabis consumption has dissipated for regular cannabis users.[1] We select states that frequently test drivers in fatal crashes and reliably test for THC. We explore how our measure varies by demographics and engagement in risky behaviors (e.g. testing positive for alcohol or hard drugs). We benchmark our measure against existing usage measures, such as the Behavioral Risk Surveilance System Survey (BRFSS). These existing measures are self-reported which may limit their ability to fully capture overall usage and precise responses to cannabis law changes. We can then use our new proxy for cannabis consumption to study how consumption changes when recreational cannabis is legalized.

2. Brief Statement of Progress

We first continued gathering relevant literature and articles on the subject. Then, over the course of the summer, we began working with the FARS data. This data includes individual person records for all drivers, passengers, and pedestrians involved in a fatal crash. The person records include data on age, race, drug test results, alcohol test outcomes, and more.

We cleaned the FARS data and determined the fraction of individuals involved in a fatal crash that that take a blood or urine test in each state. We then calculated the fraction of tested individuals that tested positive for THC. We are currently focused mostly on drivers because drivers are more likely to be tested for drugs than passengers or pedestrians. In our first pass, we are considering states that have tested at least 40 percent of their drivers in 2017 - 2021 and the data in that state shows evidence of regular testing and reporting of THC. As we continue to expand our analysis, we may consider states with lower testing rates. Table 1 lists the driver testing rates and the rate at which individuals test positive for THC for each of the states we are currently analyzing. One of our next steps will be to confirm the testing regime in each state of interest. For example, we know that Washington state requires THC blood tests when specific criteria are met for accidents involving a traffic fatality and has done so since 2008.[2] Increasing our understanding of

[1] For example, see https://pubmed.ncbi.nlm.nih.gov/23449702/

[2] https://app.leg.wa.gov/rcw/default.aspx?cite=46.52.065

these states' testing regimes will also help inform whether a 40 percent testing rate is the right threshold for whether a state is included in our study.

3. Preliminary Data Summary

In addition to the data summarized for the states we are using in our analysis in Table 1, we provide some preliminary additional data and figures here for one of these states – Kentucky. Going forward, we will conduct this same analysis (and much more) for all states included in our sample. Figure 1 plots the frequency that drug tests are conducted and conditional on a drug test, the likelihood the test comes back positive for THC for Kentucky in years 2012 - 2021.[3] This figure highlights that Kentucky administers a blood and/or urine test to more than 50 percent of drivers involved in a fatal crash, and this rate has remained stable over our sample period. Roughly 14 percent of tested drivers test positive in the most recent five years of our sample and this has remained relatively stable over time; if anything, it has declined slightly since 2017.

The fraction that test positive for THC in Kentucky in our data set is higher than the fraction that report cannabis consumption in the BRFSS (this is true in other states as well). Going forward, we will seek to understand whether the prevalence is different because people are underreporting in the BRFSS or those that get into fatal car crashes engage in more risky behaviors and cannabis consumption is a complement to these. To begin, we have determined that drivers and passengers in our data have similar likelihoods of testing positive for THC in Kentucky. Those that are currently over the legal alcohol limit do test positive for THC about twice as often, though even those below the legal alcohol limit are still more likely to test positive for cannabis than the BRFSS data would suggest. In light of this evidence, we will consider whether it's more advisable for our primary measure of cannabis consumption to use daytime crashes (where alcohol is less likely to be relevant) or exclude those that test positive for alcohol from our primary measure.

4. Outcomes and Deliverables

As noted in Sections 2 and 3, we have now created our measure over time and made an initial selection of the states that we will focus further analysis on. Our next steps are to gather additional details on each of these states' testing regimes to confirm our expectations that these states are reasonable to utilize in our analysis. Then we will compare our measures to those found in the BRFSS. From there, we will write a descriptive paper that summarizes our findings about the prevalence of cannabis consumption, how it varies by demographics and risky behavior choices such as alcohol and hard drugs. Once this paper is completed, we will submit it for publication in a peer-reviewed journal.

We will then write an NSF grant (NSF Economic Program grant, PD 98-1320) that proposes to use our newly constructed measures to analyze shifts in cannabis consumption in response to recreational cannabis laws. Our measure is best suited to studying recreational cannabis laws as THC is the primary substance in recreational cannabis, but is often not the primary substance in medicinal cannabis (which is often low in THC and high in CBD).

[3] Kentucky was not generally testing for THC as part of their drug panel prior to 2012.

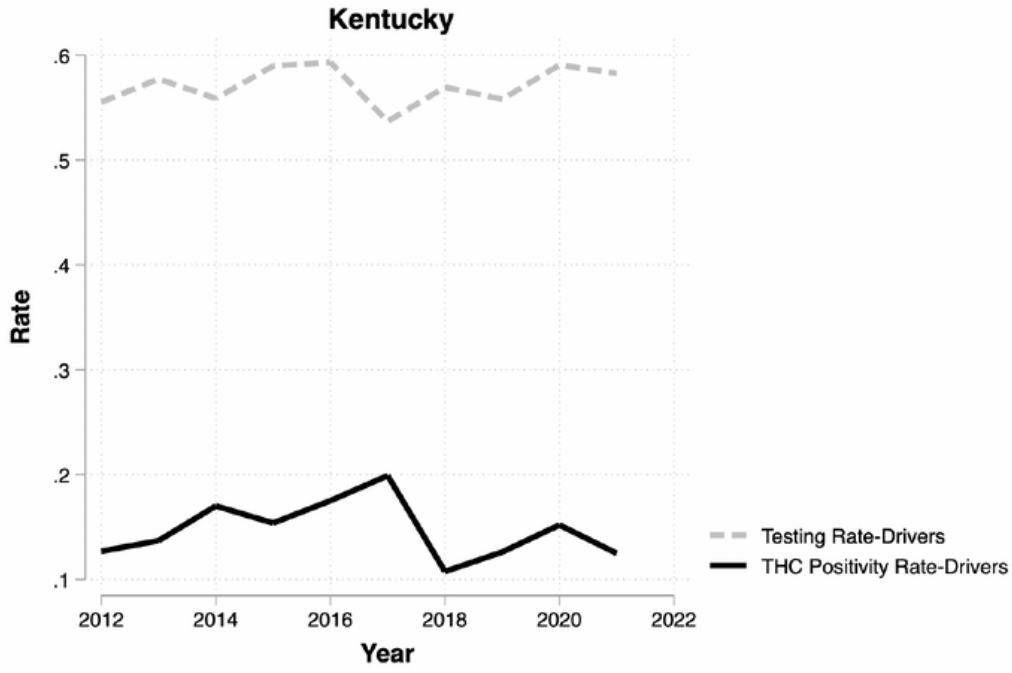
5. Tables and Figures

Table 1: State Fractions for 2017 - 2021

	State	Drivers Tested for Drugs(%)	Tested Drivers Positive for THC(%)
1	Montana	75.72	16.88
2	New Hampshire	68.12	18.55
3	Arkansas	67.04	17.98
4	Oklahoma	58.17	9.80
5	Louisiana	57.02	15.78
6	**Kentucky**	**56.75**	**14.20**
7	South Dakota	53.93	7.31
8	Utah	53.08	11.51
9	Vermont**	49.56	30.36
10	Connecticut	48.63	20.44
11	West Virginia	48.04	11.46
12	Hawaii	47.11	16.73
13	Pennsylvania	46.86	8.51
14	Colorado**	46.74	21.73
15	New Jersey**	46.45	17.05
16	Washington**	46.31	20.39
17	Idaho	45.79	14.85
18	Indiana	45.23	7.40
19	North Dakota	44.83	5.86
20	District of Columbia**	44.60	28.25
21	Alabama	43.94	14.48
22	Rhode Island	43.13	27.33
23	Ohio	42.70	19.92
24	Tennessee	40.94	16.11
25	Wisconsin	40.71	16.45

This table presents the percent of drivers in the FARS data (all drivers involved in a car crash with at least one fatality) that are administered a blood or urine drug test by state for all states who test at least 40 percent of drivers in the years 2017 - 2021. It also presents the fraction of drivers administered one of these tests that test positive for THC. ** indicates that recreational cannabis was legalized during the time period of valid data for that state (5 states).

Figure 1: Kentucky: Driver Test Rates and THC Rates over Time



This figure plots FARS data over time in Kentucky from 2012 - 2021. The gray dashed line marks the fraction of drivers that Kentucky has tested for drugs via blood or urine tests and the black line marks the fraction of individuals tested for drugs that test positive for THC.

University of Kentucky Cannabis Center
Pilot Grant – Progress Report

1) The title of the project: Impact of Cannabis Laws on Opioid and Benzodiazepine Prescriptions and Associated Health Outcomes in Older Adults

2) PI and Co-I names: Jayani Jayawardhana (PI), Daniela Moga (Co-I), Patricia Freeman (Co-I)

3) Brief description of the project (in 2-3 sentences): This study examines the effects of cannabis laws (medical and recreational) on co-prescriptions of opioid and benzodiazepine (i.e., at least one day of overlap between an opioid and a benzodiazepine prescription) and diagnoses of opioid use disorder (OUD), benzodiazepine use disorder (BUD), and cannabis use disorder (CUD) among older adults (≥65). The study utilizes patient-level Medicare claims data (i.e., The Medicare Provider Analysis and Review (MEDPAR) and Prescription Drug Event (PDE) files for 2012-2016) and state-level socio-economic and policy variables to achieve these aims.

4) A brief statement of progress (regulatory approvals completed, survey designed, etc.)

We have requested to purchase Medicare claims data from 2017-2020 from Centers for Medicare and Medicaid Services (CMS). While we are awaiting the approval of our data request from CMS, we are analyzing the Medicare claims data we currently have access to (2012-2016) and have made good progress with this data.

In our analysis of the Medicare claims data, we have come to realized that Part-D coverage of prescription drugs did not include benzodiazepines prior to 2013. Therefore, we will focus our analysis from 2013 onwards. However, in our initial trend analysis, we included 2012 data, and you will notice that numbers for 2012 tend to be much smaller compared to other years, especially for co-prescription data.

5) A summary of any preliminary data you have so far if applicable (basic descriptive data is fine)

- Figure 1 presents percent of Medicare enrollees (in Part D) with co-prescriptions of opioids and benzodiazepines in the US and in KY by quarter and cannabis legalization (medical and recreational) status. The trends overtime tend to be pretty stable. The lowest percent of enrollees with co-prescriptions are in the states where recreational cannabis is legalized, next in states where medical cannabis is legalized, and then in states where recreational cannabis is not legal. Across the US, percent of enrollees with co-prescriptions are highest among states where medical cannabis is not legal. However, percent of enrollees with co-prescriptions are highest in KY compared to states where medical and recreational cannabis are legalized versus not legalized.

- Figure 2 presents Medicare enrollees (in Part D) with opioid use disorder (OUD) per 100,000 eligible beneficiaries (i.e., those received at least one opioid or benzodiazepine prescription, has part D coverage for the entire period, and 65 or older) in the US and in KY by quarter and cannabis legalization (medical and recreational) status. The rates of OUD trends seem to be increasing across all categories overtime, with recreational cannabis legalized (RCL) states having the highest OUD rates across all time points. Medical cannabis legalized (MCL) states have the second highest OUD rates. OUD rates across states where medical and recreational cannabis are not legalized tend to follow a similar trend overtime, though starting around 3rd quarter of 2015 OUD rates tend to be higher among states where recreational cannabis is not legalized compared with states where medical cannabis is not legalized. Interestingly, OUD

rate in KY was lower at the beginning of the period but starting around 3rd quarter of 2015 OUD rates in KY increased - more than tripling by 4th quarter of 2016.

- Figure 3 presents Medicare enrollees (in Part D) with benzodiazepine use disorder (BUD) per 100,000 eligible beneficiaries in the US and in KY by quarter and cannabis legalization (medical and recreational) status. Please note that BUD rates are zero for some quarters in KY and among states that have legalized recreational cannabis, which makes the trend lines look a bit cyclical. However, the rates of BUD trends seem to be increasing across all categories overtime in general. The BUD rates experienced an increasing trend starting around quarter 3 of 2015. Interestingly, BUD rate in KY was mostly zero at the beginning of the period but starting around 3rd quarter of 2015 BUD rates in KY drastically increased.

- Figure 4 presents Medicare enrollees (in Part D) with cannabis use disorder (CUD) per 100,000 eligible beneficiaries in the US by quarter and cannabis legalization (medical and recreational) status. Since CUD was zero for almost all quarters in KY, we didn't include that graph in Figure 4. The rates of CUD start increasing around 2014, especially among RCL states and MCL states, which is not surprising since more people are likely to start using cannabis in those states with increased availability of cannabis. The Figure 4 also shows that CUD rates have increased over time among states that have not legalized recreational and medical cannabis, though these increases are at much lower level especially comparing to the increase in CUD rate among RCL states.

- Figure 5 presents Kentucky Medicare enrollees (in Part D) with co-prescriptions of opioids and benzodiazepines by demographic characteristics (age, sex, and race) and year. Percent of co-prescriptions tend to be higher among the 75+ age group compared with 65-74 age group, among females compared with males, and among White enrollees compared with African American enrollees across all years. However, Hispanic and other-race enrollees experience higher percent of co-prescriptions in 2013 and 2015 compared with White enrollees.

- Figure 6 presents Kentucky Medicare enrollees (in Part D) with OUD per 100,000 eligible beneficiaries by demographic characteristics (age, sex) and year. The OUD rates in KY seem to be higher in 2015 and 2016 across all age groups and sexes with females experiencing higher OUD rates than males in 2015 and 2016, and younger age cohort (65-74) experiencing higher OUD rate than older age (75+) cohort.

6) What the project will determine and what deliverables can be expected (if any):

Results from the proposed study will provide evidence regarding the varying effects of different types of cannabis laws (CLs) on co-prescriptions of opioids and benzodiazepines, OUD, BUD, and CUD among older adults, along with information on which sub-populations (i.e., male/female, 65-74/75-84/above 85, Hispanic/non-Hispanic (NH) White/NH-Black/NH-Other race) are preferentially affected by different types of CLs. Study results will inform clinicians and policy makers on the effectiveness of different types of CLs in reducing adverse health outcomes associated with prescription opioids and benzodiazepines among the largest group of consumers of prescription drugs in the US – older adults aged 65 and above, and their sub-population categories.

Deliverables of the project will be two manuscripts (targeting academic journals) and a White paper (policy brief) explaining the findings and the policy implications of the study findings.

Figures

Figure 1: Percent of Medicare enrollees (in Part D) with co-prescriptions of opioids and benzodiazepines in the US and KY by quarter and cannabis legalization (medical and recreational) status

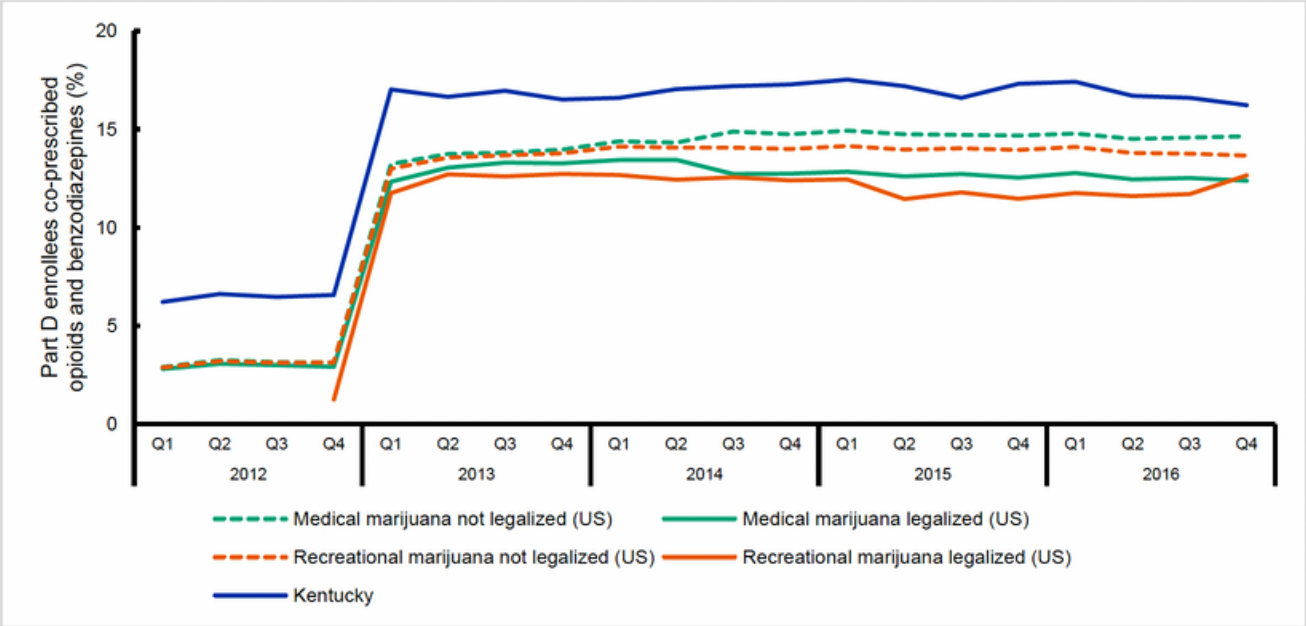
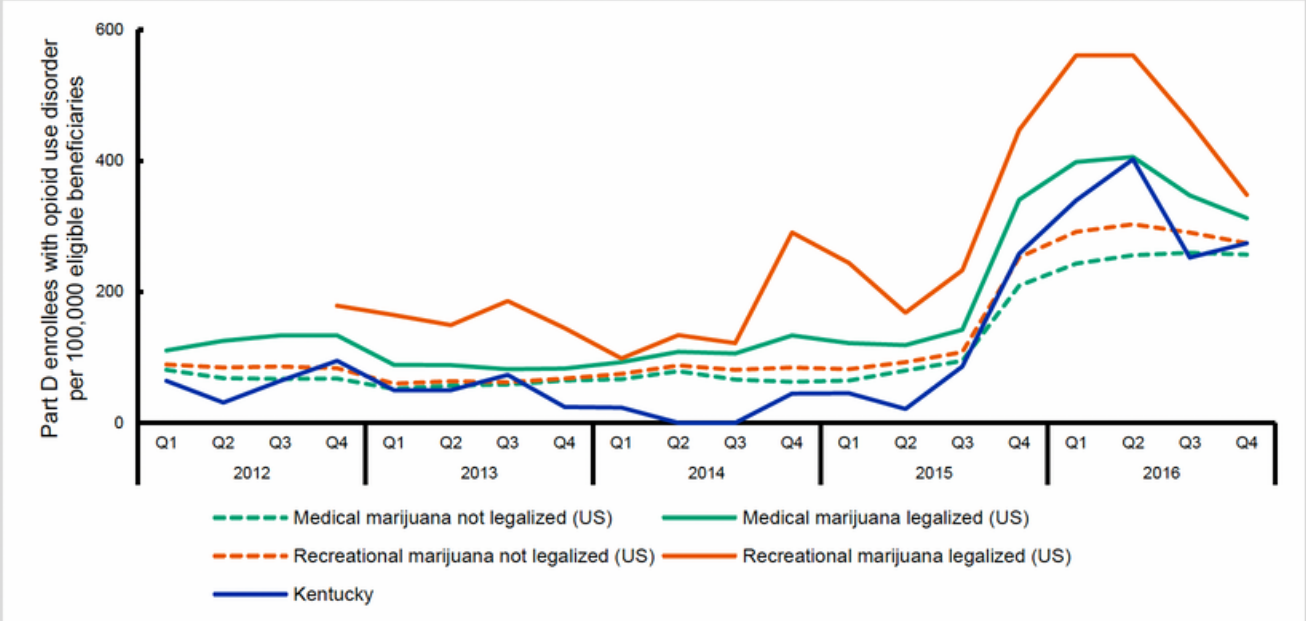
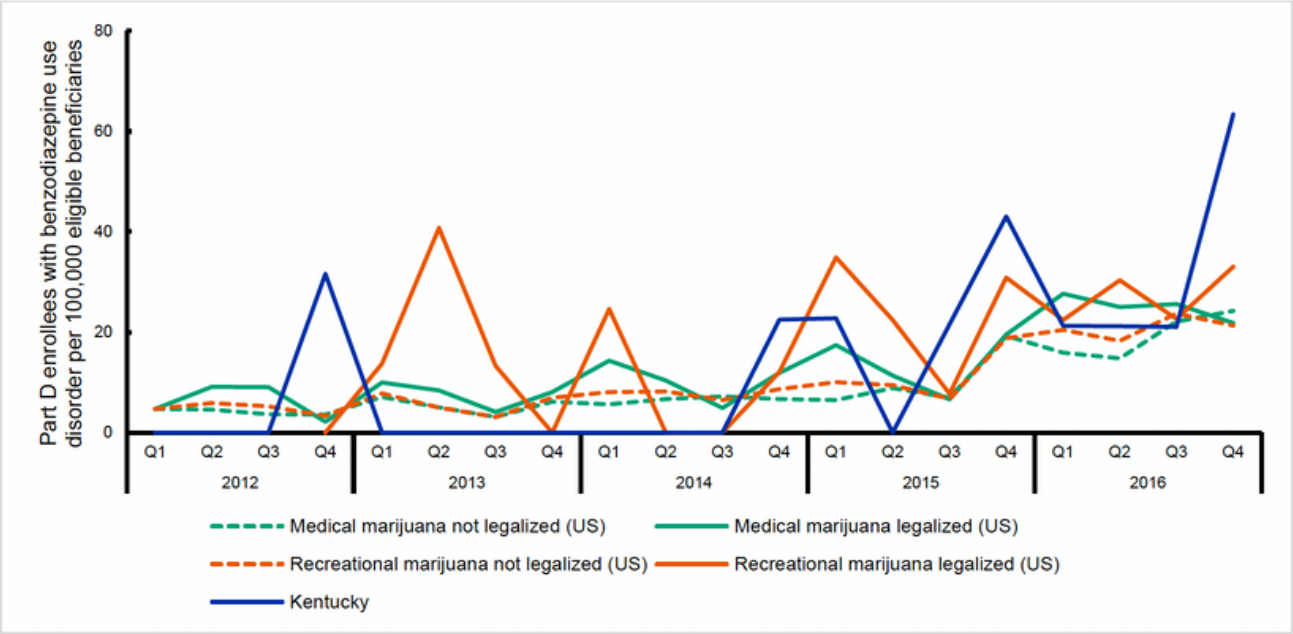


Figure 2: Medicare enrollees (in Part D) with opioid use disorder (OUD) per 100,000 eligible beneficiaries in the US and in KY by quarter and cannabis legalization (medical and recreational) status.



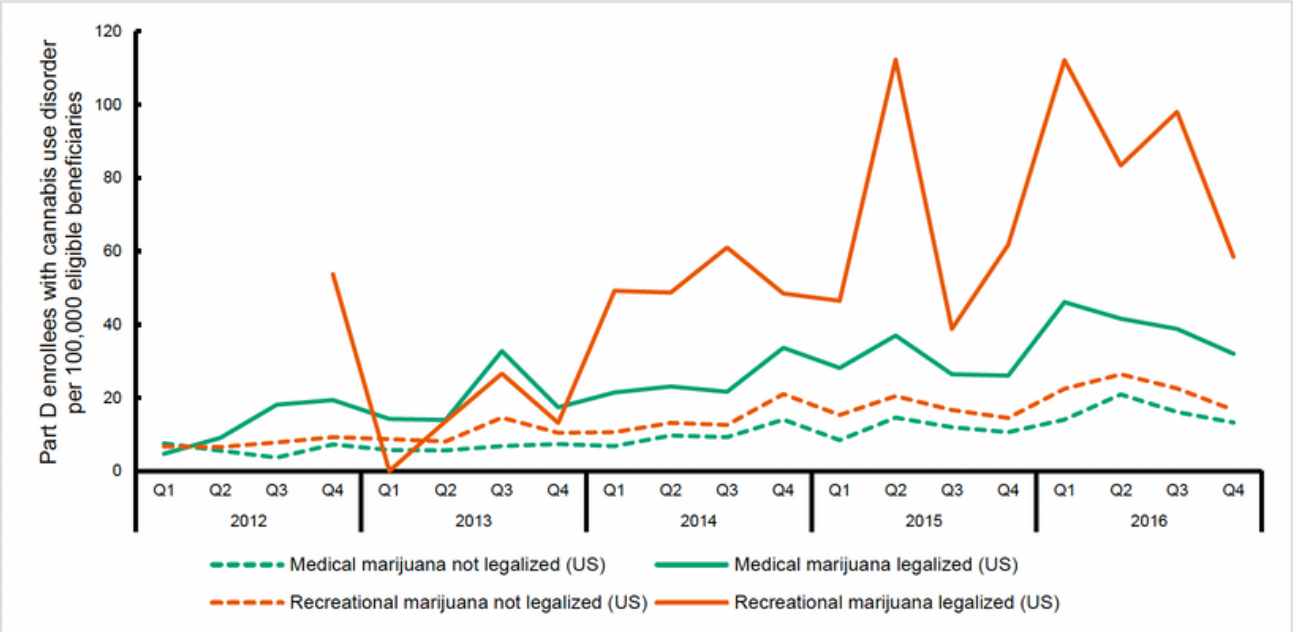
Note: Eligible beneficiaries include those who have received at least one opioid or benzodiazepine prescription, has part D coverage for the entire period, and 65 or older.

Figure 3: Medicare enrollees (in Part D) with benzodiazepine use disorder (BUD) per 100,000 eligible beneficiaries in the US and KY by quarter and cannabis legalization (medical and recreational) status



Note: Eligible beneficiaries include those who have received at least one opioid or benzodiazepine prescription, has part D coverage for the entire period, and 65 or older.

Figure 4: Medicare enrollees (in Part D) with cannabis use disorder (CUD) per 100,000 eligible beneficiaries by quarter and cannabis legalization (medical and recreational) status



Note: Eligible beneficiaries include those who have received at least one opioid or benzodiazepine prescription, has part D coverage for the entire period, and 65 or older.

Figure 5: Percent of Kentucky Medicare enrollees (in Part D) with co-prescriptions of opioids and benzodiazepines by demographic characteristics (age, sex, and race) and year

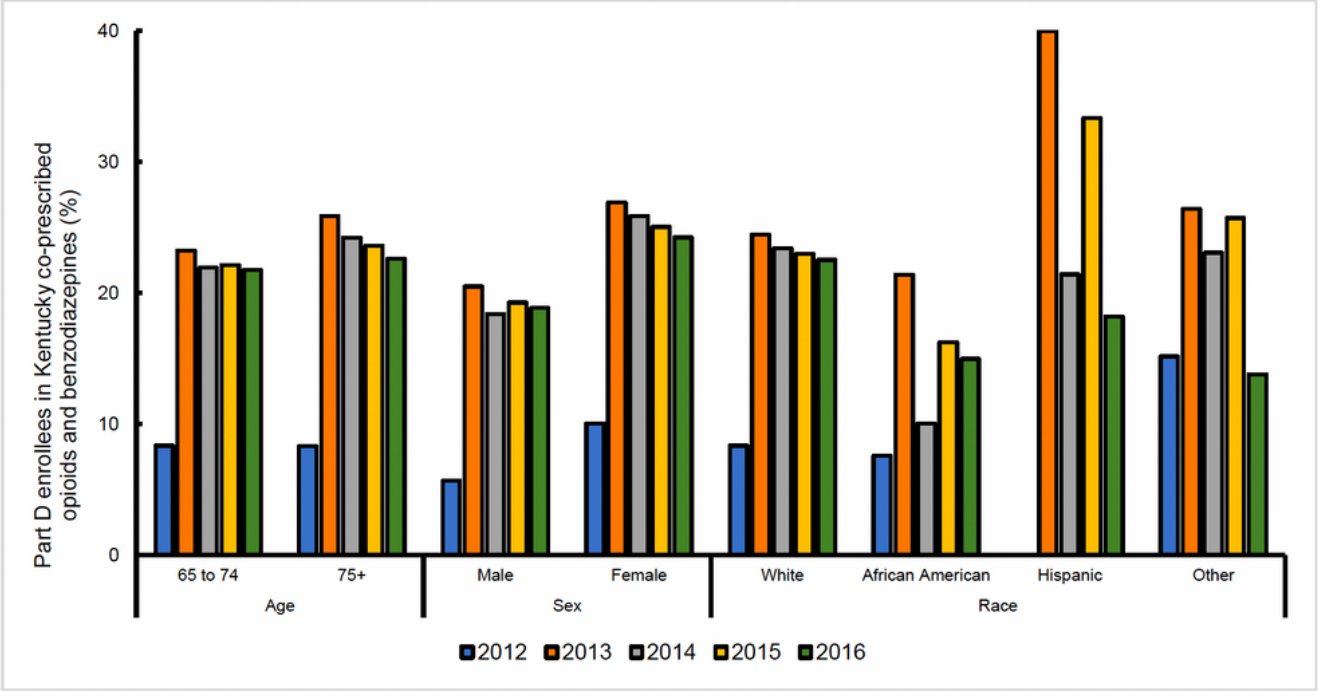
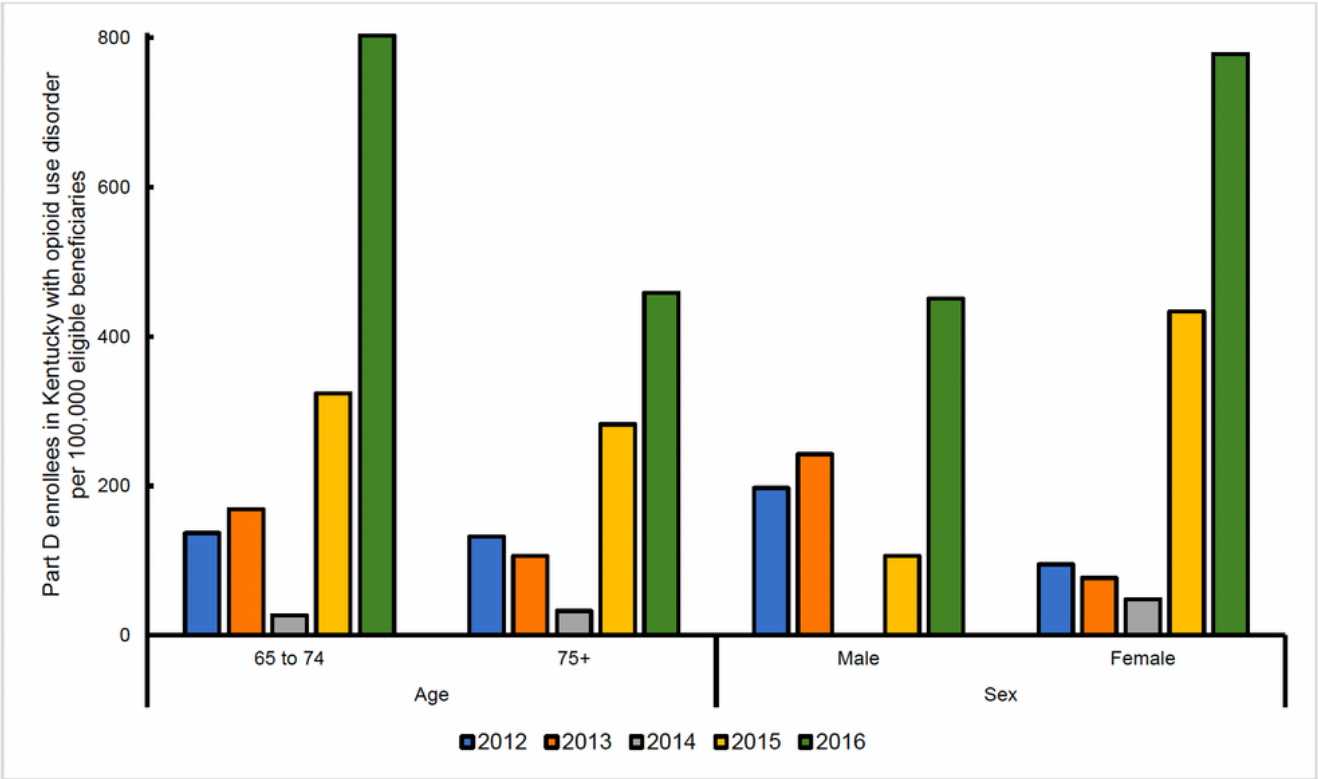


Figure 6: Kentucky Medicare enrollees (in Part D) with opioid use disorder (OUD) per 100,000 eligible beneficiaries by demographic characteristics (age, sex) and year



Note: Eligible beneficiaries include those who have received at least one opioid or benzodiazepine prescription, has part D coverage for the entire period, and 65 or older.

Perinatal Cannabis: Perceptions, Use Patterns, and Policy Implications
Progress Report
April 2023 – August 2023

PI: Kristin Ashford

Project Description: The Perinatal Research and Wellness Team will examine perinatal cannabis use patterns (dose, frequency, and route of administration) and dependency in Kentucky by analyzing UKHC de-identified patient data over a 5-year period. We will also enroll patients at UKHC clinics and invite them to complete an online survey and participate in a virtual focus group to explore perceptions, motivations, and hesitations for perinatal cannabis use in Kentucky.

Project Activities to Prepare for Launch

IRB

We drafted our IRB application in April 2023 and submitted it to the UK Office of Research Integrity for review in early May. After receiving reviewer comments, we made a series of modifications to the application and received IRB approval in mid-June. Once we received the IRB approval letter, we applied for a ProCard to purchase participant gift card incentives. UK Procurement approved our ProCard application, and we received the ProCard in July.

Before launching data collection, we submitted additional IRB modifications to revise the list of variables to be included in the 5-year retrospective chart review. We also created a recruiting flyer and received approval from UK Public Relations before submitting a modification to IRB to include the flyer in our recruiting methods.

Survey Development and Testing

We developed the survey instrument in the REDCap platform and tested it thoroughly prior to launch. Our rigorous testing plan included asking individuals outside of our research team to take the survey and provide feedback. This feedback was very insightful as we discovered areas of the survey that may be difficult for respondents to understand. Based on the feedback we received, we updated some of the survey items and response choices to enhance the end-user survey experience. Once we finished the survey review process, we submitted a modification to IRB to revise the approved survey instrument.

We developed an internal protocol to define all processes for recruiting, screening, and consenting participants, distributing the survey, sending gift card incentives, and recruiting participants for focus groups. The protocol includes guidance on systematic documentation to ensure we gather essential data to keep us informed on barriers to research participation.

Clinic Coordination at Recruiting Sites

The nurse recruiter on our research team worked with four UK OB-GYN clinics to coordinate recruiting at each site. She provided each recruiting location with flyers and posted flyers on the bulletin boards and in other patient areas. Each week, the nurse recruiter will be in contact with clinic staff to determine the optimal time to be in the clinic (i.e., when new OB-GYN patients are scheduled for appointments).

Five-year Retrospective Chart Review

We met with the CCTS data team in early May to discuss our request for de-identified UKHC perinatal data. We shared a list of variables for the data query which include demographics, drug use, prenatal statistics, and birth outcomes. This data collection is part of our study aim to describe perinatal cannabis use patterns (dose, frequency, and route of administration) and dependency in Kentucky. The initial list of variables has been modified so that we have a comprehensive dataset. We anticipate that the dataset will be available in about a month. We have prepared a codebook template for the anticipated dataset to guide data cleaning, visualization, and analysis, as well as future data sharing.

Recruiting

We launched recruiting efforts in late July. As of August 10th, we have enrolled four participants. The sample is low, so we will describe our sample and provide some anecdotal observations since we do not have enough data for analysis.

Demographic Characteristics and Tobacco and Cannabis Use

The average age of participants is 27 (range: 23-38). The reported household income is low (<$20,000 annually) and no participants have a college degree. The sample is mostly white with one participant reporting more than one race. We anticipate a more diverse sample as we recruit more participants. All participants use one or more forms of tobacco products, but one participant is currently abstaining from smoking in the last 30 days citing concerns about effects on baby/pregnancy.

On average, participants initiated cannabis use at 14 years of age (range: 12-16). One participant has not used cannabis in the past 30 days citing concerns about effects on baby/pregnancy and potential issues with legality of cannabis where they live. Two participants currently use cannabis frequently (every other day or every day) and one participant reports using cannabis twice. Three months before the current pregnancy, all participants reported using cannabis almost every day, anywhere between 1 to 4 times per day.

Population-based Analysis of Cannabis Use among Cancer Patients & Survivors in Kentucky
UK Cannabis Center Pilot Grant

W. Jay Christian, PhD, MPH (PI)
Jessica Burris, PhD (Co-I)
Aradhana Kaushal, MD (Co-I)
Shyanika Rose, PhD (Co-I)

This study will examine cannabis use among Kentuckians who are being treated for cancer, or who were recently treated for cancer. These patients and survivors will answer a survey to determine how often they are using cannabis, which types of products they are using, and where they obtain it, including both during and after treatment. Up to 500 participants will be selected from the approximately 55,000 Kentuckians diagnosed with cancer over the past two years.

IRB Review & Approval

The Medical Institutional Review Board (IRB) of the University of Kentucky approved this study on 6/26/2023. While recruitment activities can begin at any time, the study team is still busy developing the REDCap online survey and planning for sampling and recruitment. Furthermore, minor changes to the survey and recruitment materials will necessitate a final IRB review. After obtaining this second and final IRB approval, we will also apply for a Certificate of Confidentiality from the National Institutes of Health (NIH) to protect study participants' responses from law enforcement. Still, the study team expects these tasks will be completed within a few weeks, barring any disruption, leading to a projected start date for recruitment of early- to mid-September.

Administrative & Personnel

Since IRB approval, the co-investigators, as well as paid staff at the Kentucky Cancer Registry (KCR) and Markey Cancer Center's Patient-Oriented and Population Sciences Shared Resource Facility (POP Sciences SRF), have begun to draw salaries and are working toward recruitment and survey implementation. The doctoral student assigned to the study, Sydney Shafer, is pursuing a PhD in combined Epidemiology/Biostatistics program; she will join the team under Dr. Christian's (PI) guidance very soon as the Fall 2023 semester begins.

Sampling Design & Recruitment Strategy

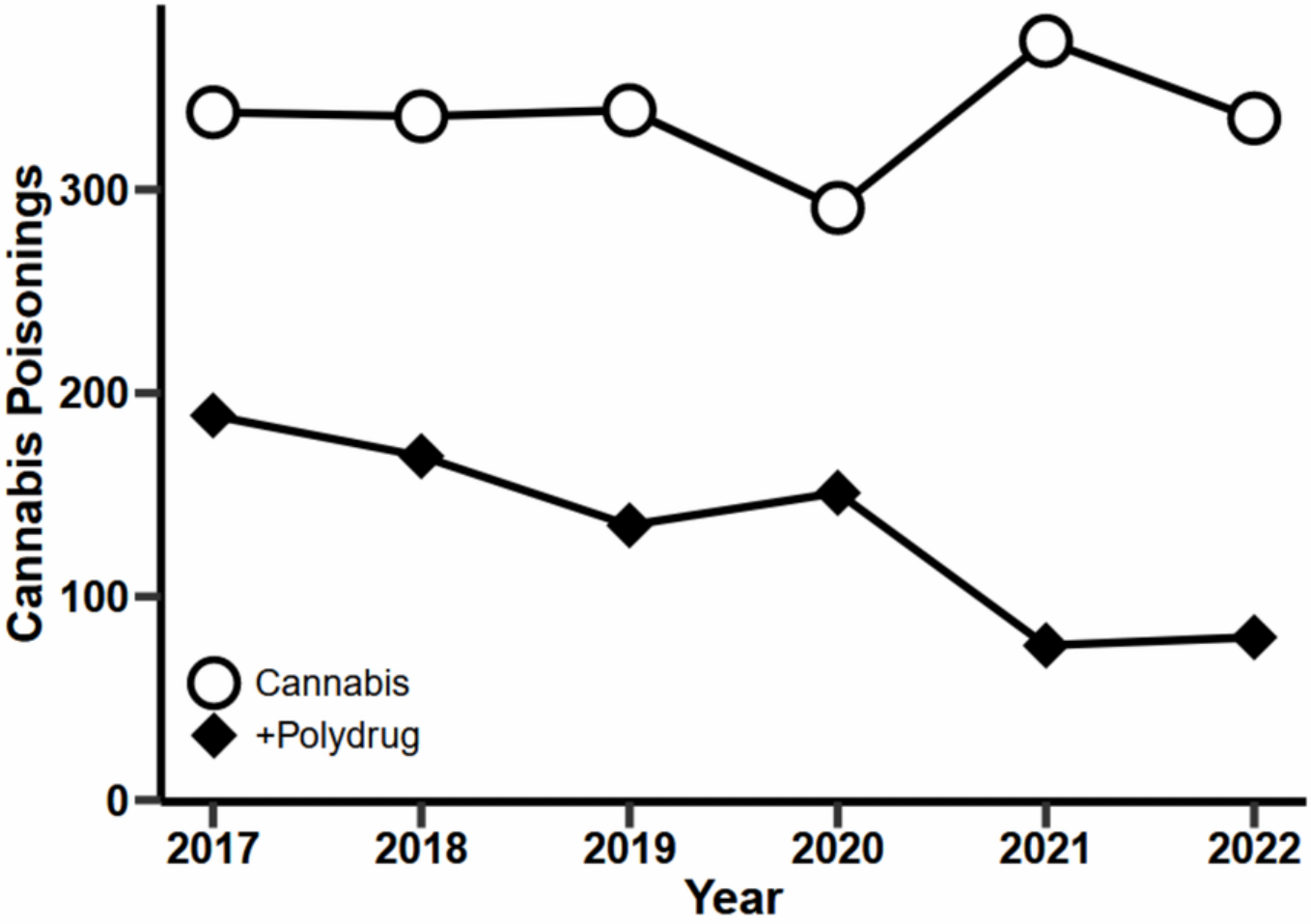
Drs. Christian (PI) and Huang (co-I; biostatistician) have discussed a slight alteration to the sampling design. While the initial proposal called for a random sample of individuals diagnosed with cancer in the previous two years (except the last six months), this could lead to a small number of participants who have used, or are using, cannabis, which could limit the number of responses to more detailed questions about how it is used and procured. For this reason, we will oversample among population sub-groups known to be more likely to use cannabis during cancer, according to previous research, including African-American Kentuckians, and those under 65—or, perhaps under 45—years old at diagnosis. This means we will invite a greater proportion of individuals who are in these groups to participate than are in the population. While this will not yield a random sample, we will use sampling weights and/or other statistical procedures to ensure the results are still population-based, as is commonly done for data gathered in large public health surveillance surveys.

Survey Design & Implementation

Currently, a paper version of the survey is approved by the IRB for use in this study. As mentioned above, however, staff at the POP Sciences SRF are creating a REDCap survey so participants can complete the research activities online. The SRF will also create a small separate questionnaire to gather necessary information for Amazon gift card disbursal. It will become available for participants after completion of the main survey, and data will be sent to an administrative associate in Dr. Christian's department for fulfillment.

RADOR-KY & UK CANNABIS CENTER PROJECT

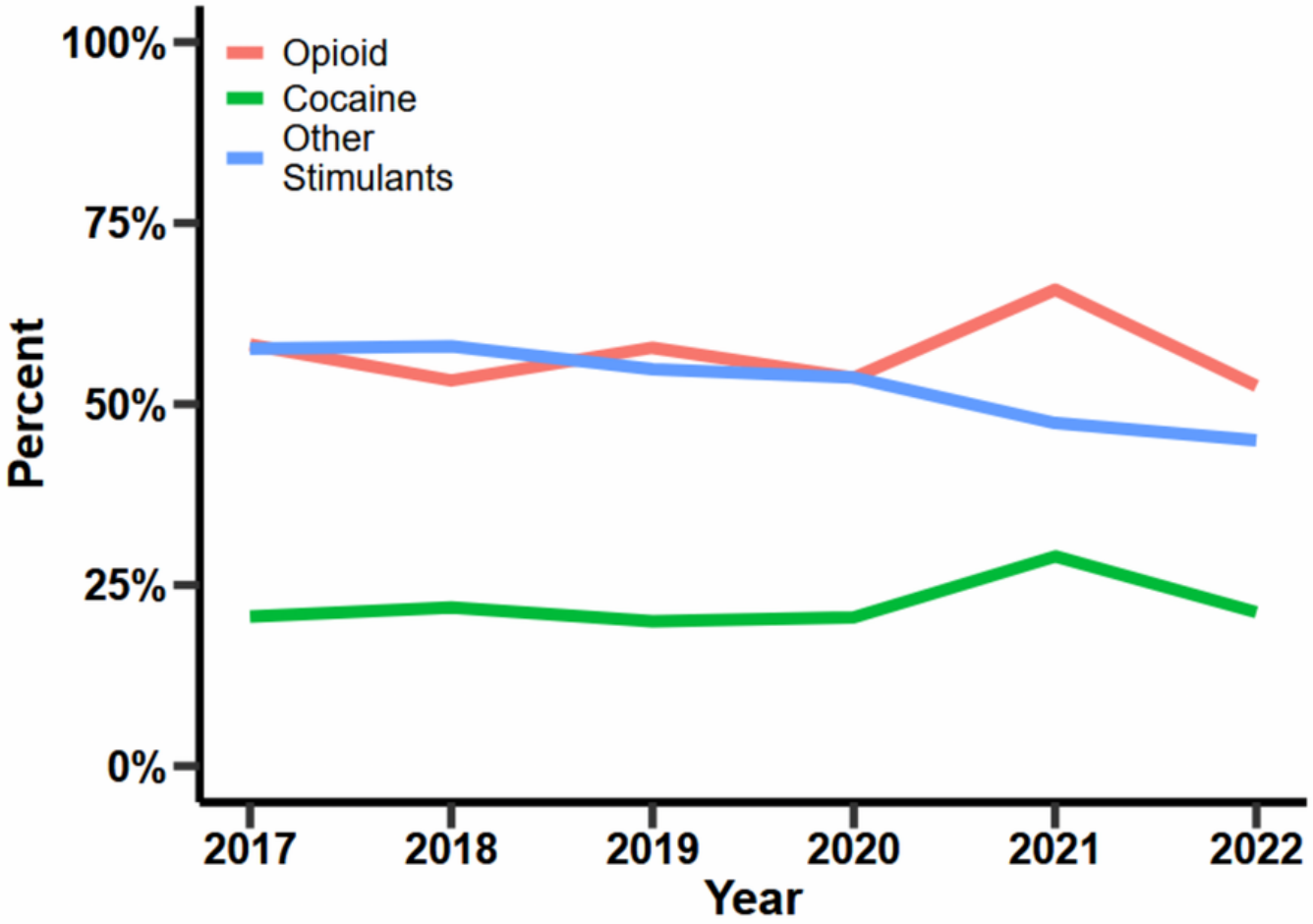
Figure 1. Number of Cannabis Poisonings by Discharge Year: Kentucky Residents, 2017-2022



Notes: Cannabis poisonings were identified as initial encounters of medical care for poisoning by or adverse effect of cannabis captured from outpatient emergency department or inpatient acute care facility administrative billing data within the state of Kentucky using ICD-10-CM codes T40.7X[1-5]A & T40.71[1-5]A. +Polydrug cannabis poisonings are defined as cannabis poisoning encounters with concurrent poisoning of commonly misused drugs grouped by the following IDC-10-CM codes: opioids (T40.[0-4,6], cocaine (T40.5), stimulants other than cocaine (T43.6[0,2,9]), hallucinogens, antipsychotics, and neuroleptics ([T40.[89],T43.[345]), or ethanol (T51.0). Poisonings that involve cannabis in combination with drugs other than those previously mentioned would be missed in the +polydrug group.

Across all years, 28.7% inpatient, 39.3% female

Figure 2. Percentage of Cannabis Poisonings (Emergency Department Visits and Hospitalizations) with Concurrent Involvement of Opioids, Cocaine, or Other Stimulants, by Discharge Year, Kentucky, 2017-2022



Notes: Lines represent the percent of common referent drug categories occurring in +Polydrug Cannabis poisonings. Cannabis poisonings are defined as initial encounters from outpatient emergency department and inpatient acute care facility administrative billing data within the state of Kentucky using ICD-10-CM discharge diagnosis codes T40.7X[1-5]A or T40.71[1-5]A. +Polydrug cannabis poisonings are defined as the concurrent involvement of commonly misused drugs captured by discharge diagnoses grouped by the following IDC-10-CM codes: opioids (T40.[0-4,6], cocaine (T40.5), stimulants other than cocaine (T43.6[0,2,9]). +Polydrug poisonings may involve other drugs in addition to those previously mentioned. The groups are not mutually exclusive; a cannabis poisoning with concurrent involvement of an opioid and cocaine will be counted under each drug group.