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ASSOCIATION BETWEEN ARKANSAS CANNABIS PROGRAM IMPLEMENTATION AND
DRUG OVERDOSES

BY

Alex C. Hooper

A doctoral project submitted to the faculty of the Medical University of South Carolina
in partial fulfillment of the requirements for the degree
Doctor of Health Administration
in the College of Health Professions

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Abstract of Dissertation Presented to the
Medical University of South Carolina
In Partial Fulfillment of the Requirements for the
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Abstract

Overdose rates have been on the rise in the United States. In 2018 Arkansas launched its medical cannabis program. The effects of cannabis are still not widely known due to limited research and legislation. Utilizing state issued reports, we examined if a state medical cannabis program had any impact on overdose rates between 2018 and 2020. Data was examined from the Arkansas Prescription Drug Monitoring Program and the Arkansas Medical Marijuana program to determine if a pattern could be recognized on the impact of state medical cannabis programs. Data was examined at a county level to determine if any change had occurred between 2018 and 2020. While largely inconclusive there is some evidence to suggest the state's cannabis program could have a positive impact, but further and more detailed research is needed.

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1 CHAPTER I INTRODUCTION

1.1 Background and Need

The United States is having a major opioid epidemic. Drug overdose deaths increased by nearly 5% from 2018 to 2019 and have quadrupled since 1999. Over 70% of deaths in 2019 involved opioids. The availability of legal drugs that are non-addictive, such as cannabis has potential for moderating the effects of the opioid epidemic based on the assumption that legal cannabis may substitute for opioid use and lessen the risk of overdoses. Arkansas (AR) has implemented a cannabis programs, but its effects are not yet described.

1.2 Study Objective

The objective of this study is to describe the Arkansas cannabis program and examine the correlation between rate of cannabis use and opioid and other drug overdoses. We will use AR statistics for all drug overdoses by county and correlate these data trends with data on legal cannabis use. This will enable us to examine the trajectories of overdoses by county and identify overall trends as well as exemplary counties where legal cannabis use may be moderating overdoses. We will use data for two time periods (2018 and 2020) to assess if trends are changing over time.

1.3 Population

The population is residents of the state of Arkansas in 2018 through 2020. We will use published statistics on drug overdose deaths and the summed uptake of legal cannabis certifications in the state for the study.

CHAPTER II SCOPING LITERATURE REVIEW

Literature review was conducted using existing data from international, federal, state and independent studies conducted on the effects of opioids and cannabis. Studies focus on the impact of opioids on individuals and healthcare systems. Cannabis studies are examined for improvements to patient quality of life and reduction of opioid use. Time frame for most studies is 2016 to present with some studies utilized for historical data from 2000.

1.4 Rates of Overdoses

Drug overdose deaths in Arkansas from 2000-2016 show a sharp increase from 5.4 per 100,000 in 2000 to 14.0 per 100,000 in 2016. This was determined using counts based on death certificates (Arkansas Department of Health, 2017). Between 2010 and 2018 the number of opioid related deaths increased by 120% in the United States. Two-thirds of opioid related deaths included fentanyl in 2018. Fentanyl is approximately 50 to 100 times stronger than morphine. The COVID-19 pandemic and synthetic opioids further exacerbated overdose deaths (World Health Organization, 2021).

The COVID-19 pandemic had a significant impact on drug overdose deaths with an increase of 36% post-COVID emergence, with synthetic narcotics being a significant factor. Death certificates from January 2017 to December 2020 were used to determine counts (Mandana Rezaeiahari, 2022). Opioids are the top selling prescription drug in Arkansas with 2,750,385 prescriptions written and 139,917,568 pills sold in 2020. Benzodiazepines are the second highest with 1,480,396 prescriptions and 70,584,927 pills sold. Arkansas has almost double the CDC's determined nation average rate for opioid prescriptions dispensed (Arkansas Department of Health, 2020).

1.5 Outcomes and Impact of Overdoses on Patients

Ninety percent of patients continue to receive prescription opioids after a nonfatal

overdose. Almost half (46%) of nonfatal overdoses have a previous diagnosis of substance use disorder. Access to mental health can greatly benefit nonfatal overdose patients. Medication Assisted Treatment (MAT) can lower rates of illicit opioid use and can help substance recovery after a nonfatal overdose. Social support networks and culturally-specific supports are critical factors in preventing further opioid overdoses. Lack of stable housing and homelessness is a major risk factor (Minnesota Department of Health, 2022).

About 1 in 20 patients treated for a nonfatal overdose in ED's die within 1 year, most within 2 days. Two-thirds of those deaths were related to subsequent opioid related overdoses. Immediate substance use disorder treatment is necessary to reduce mortality rate of overdoses (National Institute on Drug Abuse, 2020).

1.6 Impact of Overdoses on Health Systems

Substance use disorder cost the US hospital system over \$13 billion in 2017. Preventive treatment and MAT's could help reduce cost significantly (Peterson, Mengyaho, & Likang, 2021). Estimated cost of opioid use disorder and fatal overdoses in 2017 is estimated to be \$1.02 trillion. Reduction in quality of life and value of life lost are the two primary drivers for the estimated cost of opioid use and overdoses (Luo, Mengayo, & Florence, 2017).

Total cost involving opioids in the US healthcare system is \$72.5 billion annually. Insurance companies prefer prescription of opioids rather than alternative pain relief alternatives. Interdisciplinary treatments have proven effective, but the number of insurance companies carrying these plans are minimal (Stocia, et al., 2019).

1.7 Medical Benefits to Cananbis

A questionnaire delivered to 100 patients with a response rate of 94% found an

improvement in chronic pain score with an average starting pain of 7.8 and reduction to 2.8 on a scale of zero to ten. Additional benefits included relief from stress, anxiety, insomnia and depression. Six percent of patients mentioned they no longer need or greatly reduced the need for other medications. Majority of patients (71%) reported no adverse side effects, but this survey did not account for long term effects of cannabis (Webb & Webb, 2014).

Cross sectional surveys show cannabis for therapeutic (CTP) purposes have a positive effect on individuals suffering from depression. There is no evidence to suggest CTP is effective on bipolar disorder. Individuals with a history of psychosis are cautioned when using strains of cannabis with THC which may exacerbate symptoms associated with psychosis (Walsh, et al., 2017).

Twenty eight studies were assessed (63 reports; 2454 participants) on the effects of cannabis on chronic pain. Various reports demonstrated evidence to support the use of cannabis for treatment of chronic pain. The source of pain, neuropathic or cancer pain, did not have an impact on the effectiveness of cannabis (Whiting, et al., 2015). There is moderate evidence to support the use of cannabis to reduce chronic pain. Multiple studies showed a reduction in pain when compared with placebos. However, a higher proportion of patients treated with cannabis reported adverse effects (European Monitoring Centre for Drug and Drug Addiction, 2018).

Cannabis has shown to be an effective treatment for peripheral neuropathy in small clinical studies. Concern is warranted over the safety of marijuana available commercially. Adverse side effects included throat irritation, headache, and dizziness. High doses run the risk of serious neuropsychiatric effects (Modesto-Lowe, Bojka, & Alvarado, 2018).

One study suggests that THC-dominant cannabis products reduced PTSD symptom severity over time. However, a study with greater attention to detail over control factors and

demographics is needed for further application of cannabis for PTSD (Bonn-Miller, et al., 2022).

Several reports suggest cannabis could be an effective treatment for arthritis with patients demonstrating reduced symptoms and improved sleep. Additional research is needed to determine long-term efficacy and adverse effects (Gonen & Amital, 2020). A study with 319 patients was used to examine a correlation between different parameters and percentage of improvement of either pain or quality of sleep. The disease of patients included fibromyalgia, mechanical back pain, physical injury, rheumatoid arthritis, diabetic neuropathy and different degenerative, inflammatory, neuropathic, or other entities. Results demonstrated a favorable effect on pain level and sleep quality across the board of resistant “chronic pain syndromes (Habib, Khazin, & Artul, 2021).”

Cannabis use was associated with improvements in pain, function, and quality of life with reductions in prescription drug use; 73% either ceased or decreased opioid consumption and 31% discontinued benzodiazepines. Benefits of cannabis consumption occur within 3 months and plateau (Gries, et al., 2022). Random effects modeling based on pooled data revealed that legalizing cannabis for medical use was associated with a statistically non-significant 8% reduction in opioid overdose mortality (95% confidence interval: -0.21 to 0.04 ; $p = 0.201$). Recreational cannabis legalization was associated with an additional 7% reduction in opioid overdose mortality in Colorado. Barriers to access of medical cannabis may be preventing further reduction in numbers. More studies are needed to determine if cannabis can reduce overdoses among prescription patients (Chihuri & Li, 2019).

Cannabis for therapeutic purposes (CTP) has 3 primary opportunities to reduce opioid use disorder and morbidity and mortality: 1) prior to opioid introduction in the treatment of chronic pain; 2) as an opioid reduction strategy for those already using opioids; and 3) as an adjunct

therapy to methadone or Suboxone treatment in order to increase treatment success rates (Lucas, 2017).

1.8 Arkansas Medical Marijuana Program

The Arkansas Medical Marijuana program was passed into law on November 8, 2016, by majority of Arkansas voters on Issue 6, the Arkansas Medical Marijuana Amendment or Amendment 98, to legalize the use of cannabis for medical use. The amendment requires individuals to be certified by a physician for one or more of the 18 qualifying conditions to have access to legal medical cannabis (State of Arkansas, 2016).

The Arkansas Department of Health manages patient registration and card issuance under the authority of Amendment 98 and began issuing cards in 2018 with the first licensed sale in May 2019. The first year of the program saw 5,459 cards issued. As of January 2023, there are currently 89,780 active card holders (Arkansas Department of Health, 2023).

Amendment 98 originally called for 32 licensed dispensaries and 5 cultivators. The number was later expanded to 38 licensed dispensaries and 8 cultivators. Dispensaries are divided among eight zones across the state. The Arkansas Department of Finance and Administration (DFA) reported sales reached \$31 million in 2019 and increased to \$273.6 million by 2022.

CHAPTER III METHODOLOGY

1.9 Research Design or Method

Quantitative design using data from public reports published by the Arkansas Department of Health Prescription Drug Monitoring Program and the Medical Marijuana Program containing county level data for the range of cannabis cards and the range of overdose deaths. Data from these maps were compared between 2018 and 2020.

1.10 Data set consist of two reports: 1) Arkansas Prescription Drug Monitoring Program Annual Report and 2) Arkansas Medical Marijuana Annual Report Data

Collection/Procedure

Data was collected from published state reports by the Arkansas Prescription Drug Monitoring Program and the Arkansas Medical Marijuana Program. Rates for counties were assessed using the upper value of range levels provided in heat maps. Each county was assigned a row and values were inputted into excel. The patient cards were converted to 100,000 per county ($\text{Year Data}/\text{Population} \times 100,000$) to match overdose rates. Data from 2020 was subtracted from 2018 data to determine a change rate, then converted to percentage. Filters were applied to be able to view multiple aspects of data such as counties with lowest overdose rates or highest medical cannabis card issuance. Comparisons could then be made to determine the impact of medical cannabis on overdose rates.

1.11 Independent and Dependent Variables

State medical cannabis cards are our independent variable with overdose rates being our dependent variable.

1.12 Data Analysis

County cannabis cards and number of overdose rates were compared from 2018 and 2020. Observations were made to determine if any patterns emerged from reviewing data.

1.13 Protection of Human Subjects

No human subjects or protected information was used to conduct this study.

CHAPTER IV RESULTS

1.14 Results/Findings

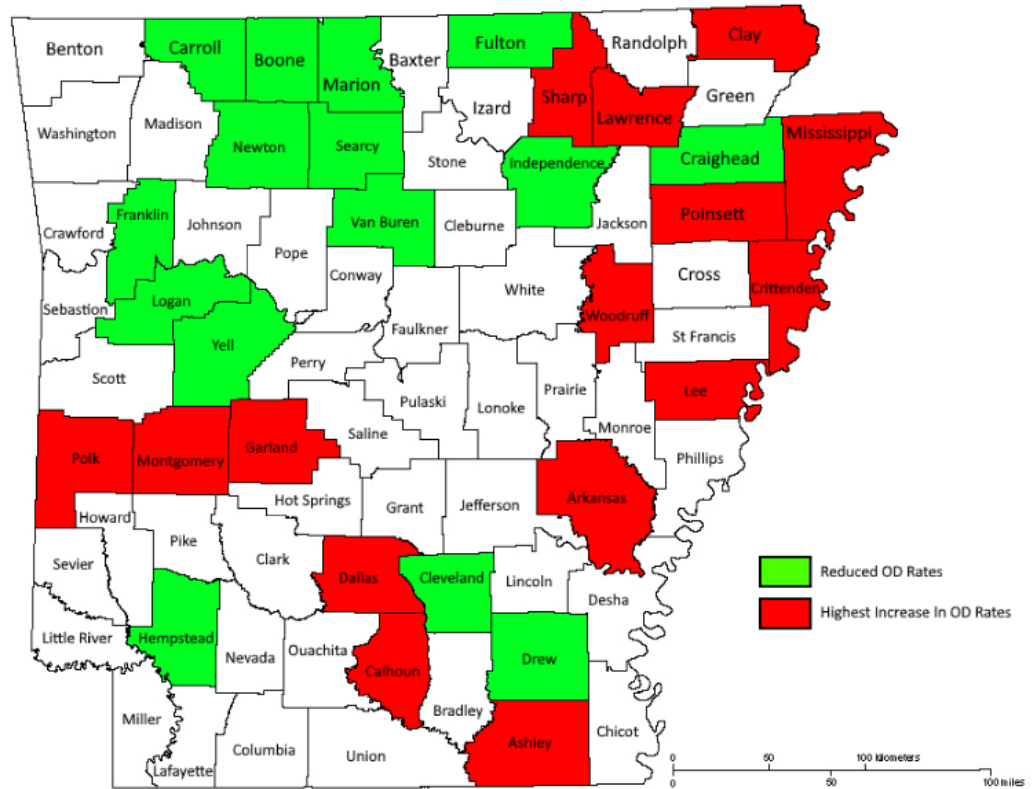
Overdose and medical card changes were examined and compared by county to search for patterns demonstrating an increase or decrease in overdose rates. No pattern emerged showing medical cannabis has significantly reduced or increased opioid overdose rates in the state of Arkansas. In examining the counties with highest reduced overdose rate and highest increased, it was found that the average medical cannabis card issuance was higher in counties with reduced overdose rates. (Table 1).

Table 1 – Top Five Reduced Overdose Rates vs Highest Increase Overdose Rates

	Population	OD per 100000		MMJ per 100000		Change Per 100000		% Change	
Lowest Overdose Change	2020	2018	2020	2018	2020	OD	MMJ	OD	MMJ
Newton County	7225	20	11	623	3460	-9	2837	-45%	456%
Marion County	16826	20	11	874	4154	-9	3281	-45%	376%
Van Buren County	15796	15	11	285	4425	-4	4140	-27%	1453%
Yell County	20263	15	11	222	3450	-4	3228	-27%	1453%
Craighead County	111231	15	11	304	1977	-4	1673	-27%	551%
Average	34268	17	11	461	3493	-6	3032	-34%	858%
Highest Overdose Change	2020	2018	2020	2018	2020	OD	MMJ	OD	MMJ
Lee County	8600	5	42	523	2907	37	2384	740%	456%
Dallas County	6482	5	41	694	3857	36	3163	720%	456%
Montgomery County	8484	10	41	530	2947	31	2416	310%	456%
Calhoun County	4739	15	42	950	5275	27	4326	180%	456%
Lawrence County	16216	15	42	278	1542	27	1264	180%	456%
Average	8904	10	42	595	3306	32	2711	426%	456%

A significant number of counties, 12 of the 15 with reduced overdose rates, resided in the northern geographical region of the state.

Map of Highest Increase Overdose Rates vs Reduced Overdose Rates between 2018 and 2020 in Arkansas by County



CHAPTER V DISCUSSION

1.15 Discussion of Results

While no pattern emerged showing medical cannabis has reduced overdose rates, there is evidence to suggest it may slow the rate of increase. Garland county, with a population of over 100,000, shows being among the highest overdose rates of 42 per 100,000 in Arkansas, but its growth in those overdose rate change was significantly lower at 17 per 100,000 when compared to the increase of overdose rates in Lee county, with a population of 8,600 with the same overdose rates of 42 per 100,000 and a rate change of 37 per 100,000. Garland county cannabis card change was 5,352 per 100,000 while Lee county was only 2,384 per 100,000.

While examining the counties with the highest reduced overdose rate and the highest increase in overdose rates, it was noted that the amount of medical cannabis card rate issuance was, on average, higher than that of counties with increased overdose rates, but population density of counties may suggest easier access to dispensaries than more rural counties.

It is possible that cost of physician written certifications, geographical location of dispensaries and price of medical cannabis may be impacting the effectiveness of the state's medical cannabis program. It is also possible that COVID 19 maybe have significantly impacted overdose rates in 2020.

1.16 Limitations

One limitation of this study is the broad view of data used. Public reports issued by the Department are in heat format, so precise numbers were not available making data review less accurate.

The state's medical program is also still new and has grown significantly since 2020. The state has also passed legislation to allow for telehealth acquisition of physician written certifications allowing easier access.

1.17 Future Research

A more precise examination of overdose rates and medical cards would be beneficial to determine if the state's program is impacting overdoses. An examination of data from 2022 and onward may help remove any impact COVID-19 restrictions may have placed on cannabis and healthcare providers.

A close examination at county level activities could also benefit the study as Lee county's population is significantly lower than many, but maintains a very high overdose rate. The concentration of reduced overdose rates in the northern part of the state may also reveal further insight as to why this counties saw reduced overdose rates while others saw an increase. Geographical location of the state's dispensaries should be considered when determining access to medical cannabis and its impact.

Cost of licensure to patients should be examined to determine if reduction in cost could reduce or eliminate barriers while maintaining viability of the state program.

1.18 Conclusions

No significant conclusion could be determined for the impact of Arkansas's medical cannabis program. There is evidence to suggest it may be beginning to have an impact, but more time is needed for the program's impact to be seen. Future researchers may wish to consider barriers to the state's cannabis program that include rural populations, legislation and rules that create barriers for industry providers, healthcare providers and patients.

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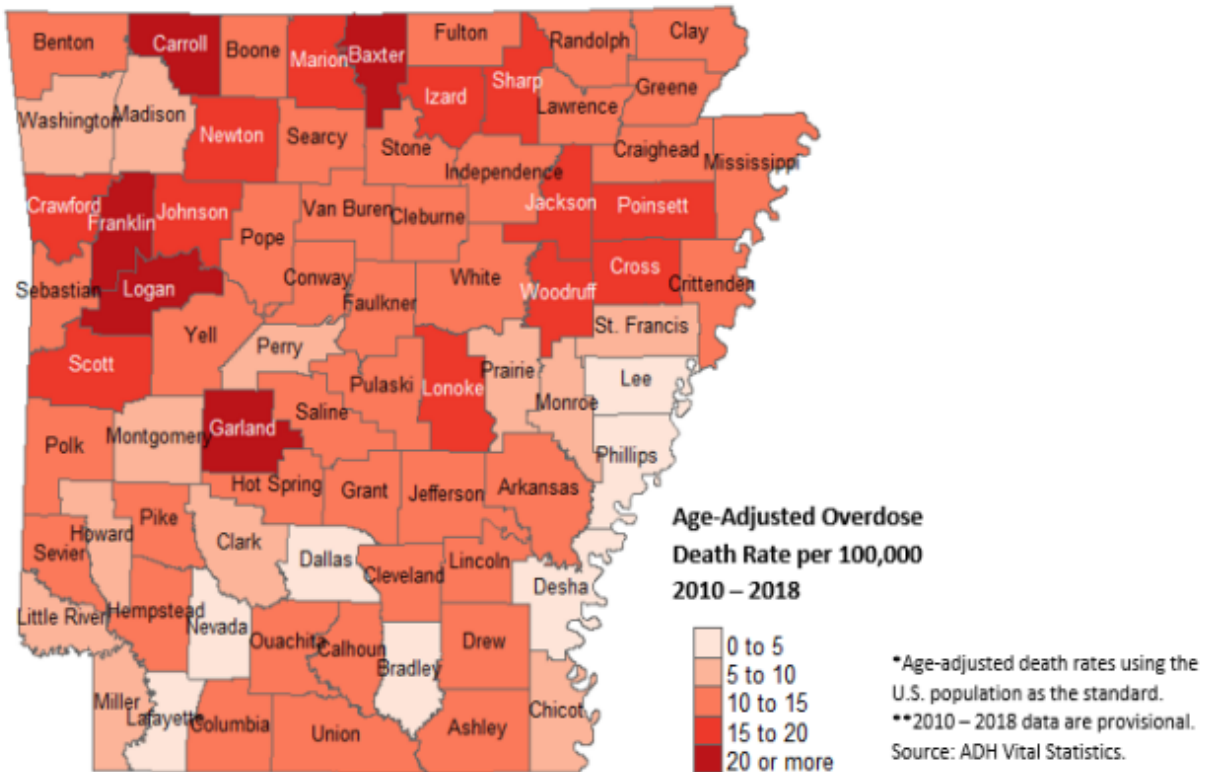
Appendices

Appendix 1 – Overdose Death Rates and Medical Cannabis Card Issuance Rates 2018 and 2020

Overdose Death Rates

According to the Arkansas Department of Health Vital Statistics Section, provisional data based on death certificates indicate that 426 Arkansas residents died from a drug overdose in 2018. This number is an increase from the 417 overdose deaths in 2017. The overdose death rates vary by county, with some of the higher ranking counties found in north central, central and south east Arkansas. The county with the highest overdose death rate is Garland County (Figure 9). Counties are determined by the individual’s address of residence.

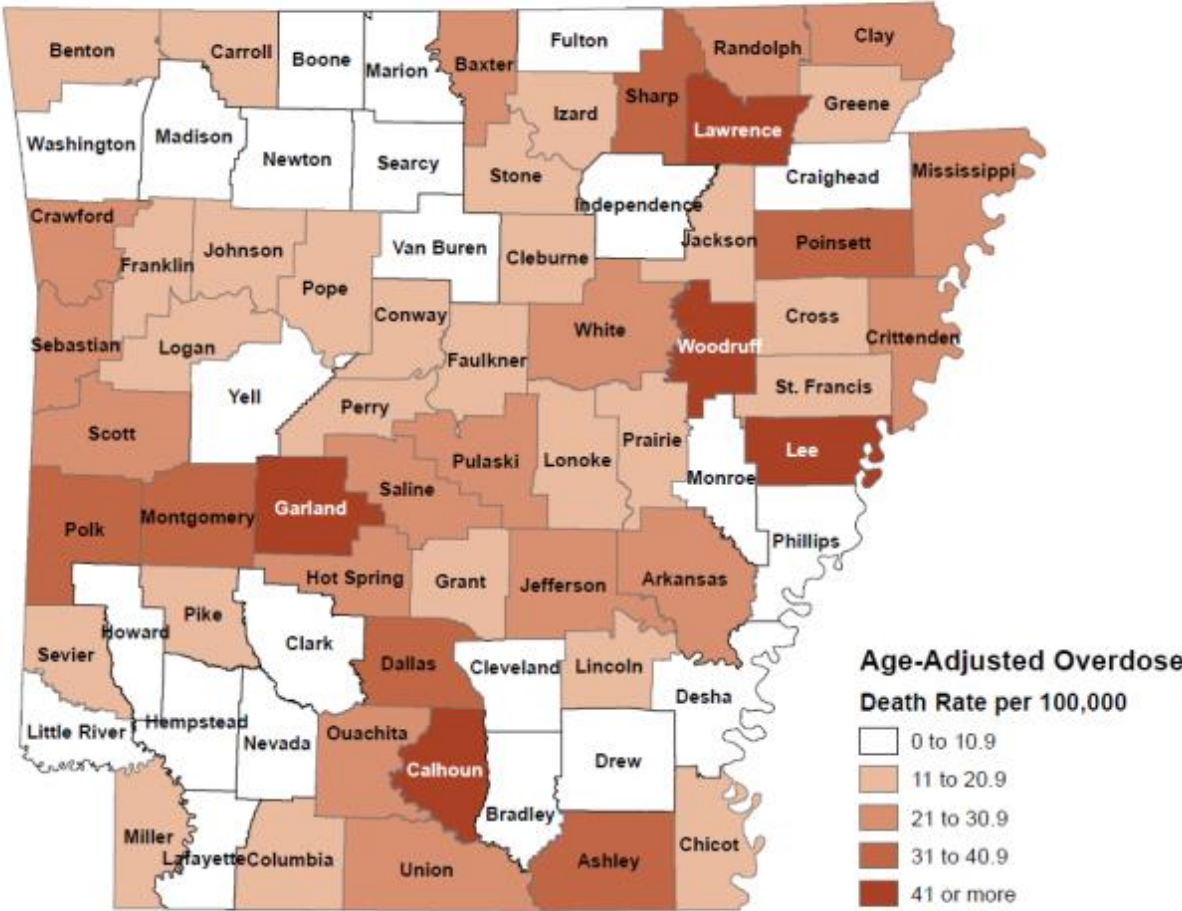
Figure 9: Overdose Death Rates per 100,000 People per County Based on the Individual’s Address-- Arkansas, 2018



Overdose Death Rates

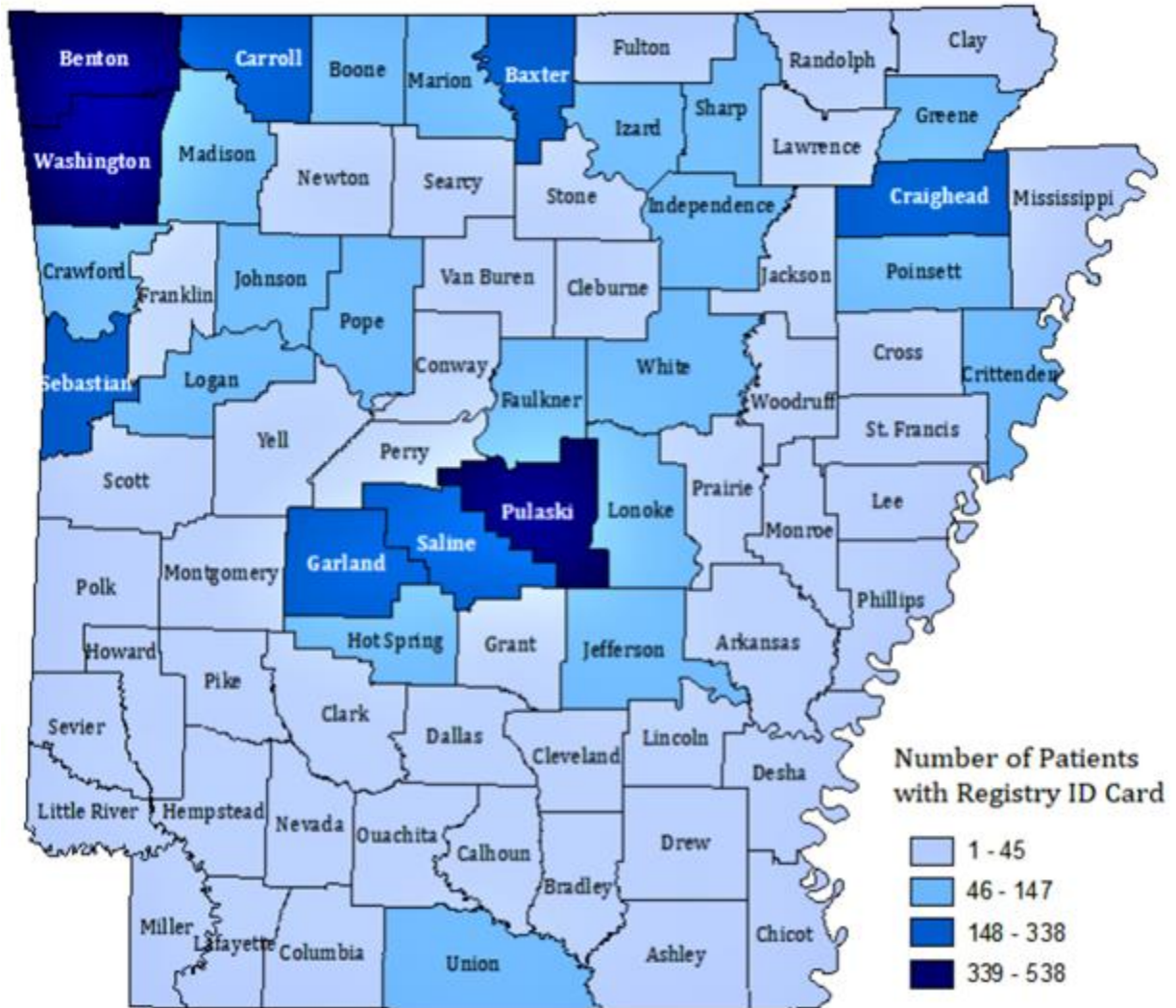
According to the Arkansas Department of Health Vital Statistics Section, provisional data based on death certificates indicate that 547 Arkansas residents died from a drug overdose in 2020. This number is an increase from the 426 overdose deaths in 2018 and 352 overdose deaths in 2019. The overdose death rates vary by county, with some of the higher-ranking counties found in central, northeast, southeast and southwest Arkansas (Figure 7). Counties are determined by the individual’s address of residence.

Figure 7: Age-Adjusted Overdose Death Rates per 100,000 People per County Based on the Individual’s Address-Arkansas, 2020*



Source: Vital Statistics, ADH
*2020 data are provisional

A. 4: Number of Patients with Medical Marijuana Registry ID Card by County, Arkansas, FY 2018



Appendix 2 – County Data

	Population	OD per 100000		MMJ per 100000		Change Rate Per 100000	
	2020	2018	2020	2018	2020	OD	MMJ
Arkansas County	17149	15	31	262	1458	16	1195
Ashley County	19062	15	41	236	1312	26	1075
Baxter County	41627	25	31	812	1679	6	867
Benton County	284333	15	21	189	2005	6	1815
Boone County	37373	15	11	393	1870	-4	1477
Bradley County	10545	5	11	427	2371	6	1944
Calhoun County	4739	15	42	950	5275	27	4326
Carroll County	28260	25	21	1196	2473	-4	1277
Chicot County	10208	10	21	441	2449	11	2008
Clark County	21446	10	11	210	1166	1	956
Clay County	14552	15	31	309	1718	16	1409
Cleburne County	24711	15	21	182	1012	6	830
Cleveland County	7550	15	11	596	3311	-4	2715
Columbia County	22801	15	21	197	1096	6	899
Conway County	20715	15	21	217	3374	6	3157
Craighead County	111231	15	11	304	1977	-4	1673
Crawford County	60133	20	31	244	2160	11	1916
Crittenden County	48163	15	31	305	1451	16	1146
Cross County	16833	20	21	267	1485	1	1218
Dallas County	6482	5	41	694	3857	36	3163
Desha County	11395	5	11	395	2194	6	1799
Drew County	17350	15	11	259	1441	-4	1182
Faulkner County	123498	15	21	119	1781	6	1662
Franklin County	17097	25	21	263	1462	-4	1199
Fulton County	12075	15	11	373	2070	-4	1698
Garland County	100180	25	42	337	5690	17	5352
Grant County	17958	15	21	251	3892	6	3642
Greene County	45736	15	21	321	1528	6	1207
Hempstead County	20065	15	11	224	1246	-4	1022
Hot Spring County	33040	15	31	445	2116	16	1671
Howard County	12785	10	11	352	1955	1	1603
Independence County	37938	15	11	387	1842	-4	1455
Izard County	13577	20	21	1083	1841	1	759
Jackson County	16755	20	21	269	1492	1	1224
Jefferson County	67260	15	31	219	1039	16	821
Johnson County	25749	20	21	571	2715	1	2144

Lafayette County	6308	5	11	713	3963	6	3250
Lawrence County	16216	15	42	278	1542	27	1264
Lee County	8600	5	42	523	2907	37	2384
Lincoln County	12941	15	21	348	1932	6	1584
Little River County	12026	10	11	374	2079	1	1705
Logan County	21131	25	21	696	3308	-4	2612
Lonoke County	74015	20	21	199	1755	1	1556
Madison County	16521	10	11	890	4231	1	3341
Marion County	16826	20	11	874	4154	-9	3281
Miller County	42600	10	21	106	1641	11	1535
Mississippi County	40685	15	31	111	614	16	504
Monroe County	6799	10	11	662	3677	1	3015
Montgomery County	8484	10	41	530	2947	31	2416
Nevada County	8310	5	11	542	3008	6	2467
Newton County	7225	20	11	623	3460	-9	2837
Ouachita County	22650	15	31	199	1104	16	905
Perry County	10019	10	21	449	2495	11	2046
Phillips County	16568	5	11	272	1509	6	1237
Pike County	10171	15	21	442	2458	6	2016
Poinsett County	22965	20	41	640	3044	21	2404
Polk County	19221	15	41	234	3637	26	3403
Pope County	63381	15	21	232	2050	6	1818
Prairie County	8282	10	21	543	3019	11	2475
Pulaski County	399125	15	31	135	1428	16	1293
Randolph County	18571	15	31	242	1346	16	1104
Saline County	123416	15	31	274	1782	16	1508
Scott County	9836	20	31	458	2542	11	2084
Searcy County	7828	15	11	575	3194	-4	2619
Sebastian County	127799	15	31	264	1721	16	1456
Sevier County	15839	15	21	284	1578	6	1294
Sharp County	17271	20	41	851	1448	21	596
St. Francis County	23090	10	21	195	1083	11	888
Stone County	12359	15	21	364	5656	6	5292
Union County	39054	15	31	376	1790	16	1413
Van Buren County	15796	15	11	285	4425	-4	4140
Washington County	245871	10	11	219	2318	1	2099
White County	76822	15	31	191	1691	16	1500
Woodruff County	6269	20	42	718	3988	22	3270
Yell County	20263	15	11	222	3450	-4	3228