International Journal of Drug Policy 119 (2023) 104155

Contents lists available at ScienceDirect

International Journal of Drug Policy

journal homepage: www.elsevier.com/locate/drugpo

Research Paper

Changes in arrests following decriminalization of low-level drug possession in Oregon and Washington

Corey S. Davis [a,b,1,*], Spruha Joshi [a,1], Bianca D. Rivera [a], Magdalena Cerdá [a]

[a] Department of Population Health, Grossman School of Medicine, New York University Langone, 180 Madison Ave, 4th Floor New York, NY 10016, United States
[b] Network for Public Health Law, 7101 York Avenue South, #270 Edina, MN 55435, United States

ARTICLE INFO

Keywords:
Overdose
Arrest
Drug policy
Decriminalization
Drug possession

ABSTRACT

Background: Despite evidence that the U.S. "War on Drugs" is associated with increases in drug-related harm and other negative outcomes, all U.S. states have long criminalized most drug possession. In early 2021, both Oregon and Washington became exceptions to this rule when they fully (Oregon) or partially (Washington) decriminalized possession of small amounts of all drugs.

Methods: We obtained arrest data for 2019 to 2021 for intervention states (Oregon and Washington) and control states (Colorado, Idaho, Montana, and Nevada). We calculated monthly rates for arrests overall and for violent crimes, drug possession, equipment possession, non-drug crimes, and a set of low-level crimes termed displaced arrests. Using an interrupted time series analysis, we examined changes in monthly arrest rates after the implementation of policy change in Oregon and Washington compared to control states.

Results: In Oregon, there were 3 fewer drug possession arrests per 100,000 in the month after the policy change; the rate decreased throughout the post-implementation period. In Washington, there were almost 5 fewer drug possession arrests per 100,000 in the month following policy change, and the rate remained stable thereafter. Both declines were significantly greater than in comparison states. There were also statistically significant reductions in arrests for possession of drug equipment in Washington and a significant increase in displaced arrests in Oregon. There were no significant changes in overall arrests, non-drug arrests or arrests for violent crime in either state, relative to controls.

Conclusion: This analysis demonstrates that it is possible for state drug decriminalization policies to dramatically reduce arrests for drug possession without increasing arrests for violent crimes, potentially reducing harm to people who use drugs and their communities. Additional research is needed to determine whether these legal reforms were associated with changes in overdose rates and other drug-related harms.

Background

The United States (U.S.) continues to experience an epidemic of drug-related harm. Nearly 107,000 people in the U.S. died of a drug overdose in 2021, the highest number ever recorded (National Center for Health Statistics, 2022). Rates of injection-related endocarditis and soft tissue infections are also at or near all-time highs (Barocas et al., 2021; Schranz, Fleischauer, Chu, Wu, & Rosen, 2018; Wurcel et al., 2016; Ciccarone, Unick, Cohen, Mars, & Rosenblum, 2016). Every U.S. state has adopted at least one policy intervention designed to reduce overdose and injection-related harm, including authorizing syringe services programs, decriminalizing drug checking equipment, and increasing access to the overdose reversal medication naloxone (Davis & Carr, 2022; Davis, Lieberman, & O'Kelley-Bangsberg, 2022; Fernandez-Vina, Prood, Herpolsheimer, Waimberg, & Burris, 2020; Smart, Pardo, & Davis, 2021; Townsend et al., 2022).

These changes, while important, exist against a backdrop of criminalization and stigmatization of people who use drugs (PWUD). Despite a global trend toward reducing or eliminating penalties associated with illicit drug use, until early 2021 every U.S. state criminalized the possession of illicit drugs other than cannabis (Laqueur, 2015; Rosmarin & Eastwood, 2012; Unlu, Tuukka, & Hakkarainen, 2020). Although the

* Corresponding author at: Department of Population Health, Grossman School of Medicine, New York University, 180 Madison Ave, 4th Floor, New York, NY 10016
E-mail address: cdavis@networkforphl.org (C.S. Davis).
[1] Co-first authors.

https://doi.org/10.1016/j.drugpo.2023.104155

Available online 9 August 2023
0955-3959/© 2023 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY-NC license (http://creativecommons.org/licenses/by-nc/4.0/).

overall number of arrests in the U.S. decreased by nearly 25% from 2009 to 2019, arrests for drug possession remained essentially stable, despite the legalization of recreational cannabis use in a growing number of states (Pew Charitable Trusts, 2022). Indeed, more arrests were made in 2019 for drug offenses than any other category of crime. Approximately 87% of all drug arrests in 2019 – more than 1.3 million – were for drug possession (Federal Bureau of Investigation, 2020).

Arrest, prosecution, and incarceration of PWUD increases health risks to those individuals and their communities (Bick, 2007; Brinkley-Rubinstein, 2013; Cohen, Vakharia, Netherland, & Frederique, 2022; Wildeman & Muller, 2012). Police stops, arrests, and incarceration are associated with lower levels of health and well-being across a wide variety of measures (Sundaresh et al., 2020). Simply having been arrested for a drug crime is a risk factor for overdose death, and that risk increases with the number of arrests an individual experiences (Krawczyk et al., 2020). Incarceration is associated with a large number of negative health impacts (Schnittker & John, 2007), and formerly incarcerated people are at extremely high risk for overdose (Beletsky et al., 2015; Binswanger, Blatchford, Mueller, & Stern, 2013; Binswanger et al., 2007). Criminalization also contributes to stigma against PWUD (Tsai et al., 2019).

Decriminalization of drug possession in Oregon and Washington

The U.S. Constitution grants states wide latitude to decide which activities are criminalized within their borders, permitting them to act as "laboratories of democracy" (Supreme Court of the United States). Two U.S. states exercised this authority in 2021 by fully (Oregon) or partially (Washington) decriminalizing the possession of small amounts of drugs under state law. Washington state also largely decriminalized the possession of drug paraphernalia. These modifications occurred by two quite different means.

In Oregon, state drug law was changed pursuant to a ballot initiative termed Measure 110. Such ballot initiatives, which are permitted in some U.S. states, permit voters to vote directly for or against a specific change to state law. Measure 110 revised the previous drug law in two main ways. First, the possession of small amounts of drugs was reclassified from a misdemeanor to a non-criminal "Class E" violation, which is punishable only by a fine that is waived if the cited individual completes a health assessment within 45 days. The measure also reduced possession of larger amounts of drugs from a felony to a misdemeanor and directed tens of millions of dollars every year into a fund earmarked for drug prevention, treatment, and recovery services. Measure 110 did not make any changes to the law related to paraphernalia possession, likely because the state was one of a small number that did not previously criminalize either the possession or free distribution of drug paraphernalia. Measure 110 was approved by nearly 60% of Oregon voters in November 2020, and its changes went into effect on February 1, 2021.

Around the same time, Washington law regarding drug possession also underwent a dramatic shift. On February 25, 2021, the Washington Supreme Court found the state's drug possession statute unconstitutional in a case called *State v. Blake*. As a result, the possession of small amounts of drugs in the state was immediately legalized. The Washington legislature soon passed a law re-criminalizing drug possession, which was subsequently signed by the state governor and went into effect on May 13, 2021 (Washington Legislature) The new law, however, differed significantly from the pre-*Blake* regime. Among other changes, it classified drug possession as a misdemeanor instead of a felony, required that law enforcement officers offer anyone who would be subject to arrest for possession of small amounts of drugs a referral to a health assessment and related services at least twice before arresting them, and encouraged prosecutors "to divert cases for assessment, treatment, or other services." (Washington Code) The law also required that police officers receive training on interacting with people with substance use disorders, greatly liberalized the law that criminalizes the possession and use of drug paraphernalia, and established a grant program to fund treatment navigator and related services (Washington Legislature).

Previous research from the U.S. has shown that the decriminalization or legalization of cannabis resulted in large reductions in cannabis-related arrests and incarceration (Plunk, Peglow, Harrell, & Grucza, 2019; Sheehan, Grucza, & Plunk, 2021). This study is the first, however, to examine the impacts of state-level decriminalization of possession of all drugs on arrest rates before and after the legal change. Our primary outcome was changes in arrest rates for drug possession and paraphernalia possession. Qualitative interviews with PWUD in Oregon revealed that many were concerned that officers might increase arrests of PWUD for other low-level crimes when deprived of the ability to arrest them for drug possession (Netherland et al., 2022). To test for such an effect, we also examined changes in arrests for curfew violations, loitering, vagrancy, trespassing, and disorderly conduct, which we refer to as potential displacement arrests. Because it is possible that the laws might be associated with changes in arrests for violent crime, either because the change led to an increase in such crimes or because it freed up officers to focus on arresting those committing them, we examined changes in arrest rates for violent crime as well. Finally, to test for a potential overall impact of the policy change, we also examined the impact of the laws on the overall arrest rate.

We utilized an interrupted time series analysis with Colorado, Idaho, Montana and Nevada serving as comparison states. We also describe sex- and race-specific rates of arrest before and after the legal changes in each state.

Methods

Data sources

The National Incident-Based Reporting System (NIBRS) is an incident-based crime reporting program that local, state, and federal law enforcement agencies use to submit information to the Federal Bureau of Investigation (FBI). For each incident, NIBRS captures information on offenses, victims, offenders, property, and persons arrested, as well as information about the incident itself (Federal Bureau of Investigation, 2019a). NIBRS improves on the previous system, the Summary Reporting System (SRS), in several ways. Of particular relevance to this research, SRS collected data on a total of 30 types of offenses, while NIBRS collects information on 62 offenses. SRS did not specifically collect data on drug equipment (paraphernalia) violations, while NIBRS does. Further, SRS only permitted law enforcement to report the most serious offense related to an incident, while NIBRS permits up to 10 offenses per incident to be reported (Congressional Research Service, 2022).

The FBI has made nationwide implementation of NIBRS a high priority. However, local law enforcement agencies have been relatively slow to move from SRS to NIBRS. For 2021, only 53% of law enforcement agencies reported full-year data in the NIBRS format (Congressional Research Service, 2022). Where possible, we utilized NIBRS data for this analysis. However, as detailed below, we used SRS data in a limited number of instances.

States geographically close to our control states were selected as 'location-based' controls (Lopez Bernal, Cummins, & Gasparrini, 2018). We attempted to obtain data from the eleven contiguous states in the United States Census Bureau's Western Region. However, due to the ongoing switch to the NIBRS reporting system, reliable data were not available from five of those eleven states (Arizona, California, New Mexico, Utah, and Wyoming). We therefore obtained state-level arrest data for the period January 1, 2019 through December 31, 2021 from law enforcement agencies in Oregon, Washington, Colorado, Idaho, Montana and Nevada. Due to the way the data are reported, these data only include the most serious offense arising from an arrest encounter.

Primary outcomes in Oregon and Washington

Our primary outcome of interest in Oregon was arrests for drug possession. Arrests were deemed to be for drug possession if they were coded with NIBRS code 35A (Drug Narcotic Violations) with criminal activity data reflecting "Possessing/Concealing." Some Oregon arrests were coded using ONIBRS, a richer data source used in Oregon (Oregon National Incident-Based Reporting System, 2022). For these data, "possess for sale" and "possess for use" measures were combined as a single drug possession measure. We calculated monthly rates overall, by sex (male/female) and by white, Black, and American Indian/Alaska Native. Because the possession of drug paraphernalia was not criminalized in Oregon either before or after the policy change, we did not examine paraphernalia arrests in Oregon.

Primary outcomes in Washington included arrest for possession of drugs and possession of drug paraphernalia, defined as NIBRS arrest offense codes 35A (Drug Narcotic Violations) and 35B (Drug Equipment Violations), respectively, with criminal activity data reflecting "Possessing/Concealing". As with Oregon, we calculated monthly rates overall, by sex (male/female) and by white, Black, and American Indian/Alaska Native.

Primary outcomes in comparison states

Primary outcomes in Colorado included arrest for possession of drugs and possession of drug paraphernalia, defined in the same manner as Washington. The primary outcome in Nevada was arrest for possession of drugs, defined in the same manner as Washington for arrests coded using the NIBRS system. Law enforcement agencies in Nevada began to transition to NIBRS in November 2019, and continued throughout the study period. For each Nevada agency, we converted arrests prior to the NIBRS transition from the SRS system to NIBRS coding. A list of Nevada agencies and their respective NIBRS start date are in Supplemental Table 3. For arrests in Nevada coded using the older SRS system, we used the SRS offense equivalent "185: Drug Violations – Possession". There was no SRS offense specifically for drug equipment possession, and therefore this outcome was not measured in Nevada. Primary outcomes in Montana included arrest for possession of drugs and possession of drug paraphernalia, defined in the same manner as Washington.

Secondary outcomes

Secondary outcomes included arrests for all offenses as well as measures of non-drug related arrests, arrests for violent crimes, and displaced arrests. Non-drug related arrests included all arrests except NIBRS offense codes 35A and 35B, or their SRS equivalent in Nevada. For Oregon, some offense codes were removed to ensure comparability across data sources. These codes are specific to ONIBRS and include certain traffic violations, violations of certain fish and game laws, marine violations, and minors in possession of tobacco.

Arrests for violent crimes included all "Part 1 crimes" as defined by the Federal Bureau of Investigation's Uniform Crime Reporting (UCR) Program (criminal homicide, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson) (Federal Bureau of Investigation 2019b). To measure a potential displacement effect whereby law enforcement officers might substitute arrests for other crimes in lieu of arrests for drug or paraphernalia possession, we aggregated arrests for curfew violations, loitering, vagrancy, trespassing, and disorderly conduct to create a measure of displaced arrests for each state.

Idaho arrests were only used for the secondary analyses as the format of the data from Idaho did not permit us to determine the most serious offense related to an arrest and were therefore not comparable with data from the other states. For all outcomes, we calculated rates per 100,000 using American Community Survey 5-year population estimates for 2019 and 2020. Rates for 2021 were created using 2020 estimates (U.S. Census Bureau, 2021). Supplemental Table 4 summarizes all outcomes by state and data source.

Exposures

Our primary exposure in Oregon was the implementation of Measure 110, which went into effect on February 1, 2021; hence, the post-law period for Oregon is February through December 2021. Our primary exposures for Washington were the decision in *State v. Blake*, which occurred on February 25, 2021, and the May 13, 2021 law that re-criminalized drug possession but required that law enforcement officers refer individuals to services twice before arresting them for drug possession and eliminated many types of devices as "drug paraphernalia" under state law. We therefore used a post-intervention period starting in March 2021 for drug possession and May 2021 for drug paraphernalia (also termed drug equipment) in Washington. Both periods ended in December 2021.

Statistical analysis

We utilized an interrupted time-series (ITS) design to examine the change in monthly arrest rates before and following the implementation of these legal changes. ITS can model diverse types of serial autocorrelation and provides flexibility in estimating the magnitude and nature of intervention effects using multiple transfer functions. This quasi-experimental design controls for secular trends and tests whether an intervention was associated with a change in the intercept and the slope (Linden, 2015). For the Oregon analysis we also controlled for the election in November 2020, when voters adopted ballot initiative Measure 110. For the Washington analyses, we controlled for the enactment of the new drug law in May 2021 in all but one model (drug paraphernalia arrests).

To reduce potential confounding, we included controls in the ITS models where appropriate. Using a control donor pool of Colorado, Idaho, Montana, and Nevada, we assessed if these states were comparable to the treatment group (Oregon or Washington) on observed pre-intervention arrest rates. We used an iterative process to determine if these states were an appropriate control using methods described by Linden et al (Supplemental Table 1.) (Linden, 2015). Briefly, the key assumption is that the change in the level or the trend in the outcome variable of interest is the same for both the treated group (Oregon and Washington) and for the controls during the preintervention period. To determine what combination of states were appropriate controls for each outcome, we used an iterative process in which each non-treated state and combinations of states were compared with the treatment group. If the p-values were greater than 0.05 on both level and slope they were deemed to be appropriate controls and were included in the final models. In Oregon the following states were appropriate controls for each outcome: 1) Drug Possession (Colorado, Montana, and Nevada); 2) All Arrests (Colorado, Idaho, Montana, and Nevada); 3) Non-drug arrests (Colorado, Idaho, Montana, and Nevada); 4) Violent Arrests (Colorado, Idaho, Montana, and Nevada); and 5) Displaced Arrests (No appropriate controls). In Washington, the following states were appropriate controls for each outcome: 1) Drug Possession (No appropriate controls); 2) Equipment Possession (No appropriate controls) 3) All Arrests (Colorado, Idaho, Montana, and Nevada); 4) Non-drug arrests (Colorado, Idaho, Montana, and Nevada); 5) Violent Arrests (Colorado, Idaho, Montana, and Nevada); and 6) Displaced Arrests (Colorado, Montana, and Idaho).

We used Prais–Winsten regression with the Cochrane–Orcutt transformation and robust standard errors (SE) to adjust for first-order serial autocorrelation or Newey–West standard errors where appropriate. We examined the Durbin-Watson statistic to ensure that our models adequately corrected for first-order autocorrelation. Values of the Durbin-Watson statistic close to 2.0 indicated the absence of serial autocorrelation. Given sparse data, ITS analysis by subgroups of race

and sex was not conducted. All ITS analyses were performed with Stata version 17 using the 'itsa' command. Hypothesis tests were two-sided with an a priori alpha level of 5%. Descriptive differences were obtained using the 'summarize' command, with no significance testing.

Results

Oregon

Monthly averages

Observed differences in arrest rates pre- and post- Measure 110 by race and sex are presented in Table 1. The numbers presented in this table represent the average crime rate across 25 months in the pre-period and 11 months in the post-period. There were an average of 23.5 (Standard Deviation (SD=6.6) monthly drug possession arrests per

Table 1
Average monthly arrests per 100,000 before and after Oregon M110 in Oregon, Colorado, Idaho, Montana, and Nevada, by race and sex.

	Total		White		Black		American Indian/ Alaska Native		Male		Female	
	Pre-M110 M(SD)	Post-M110 M(SD)	Pre-M110 M(SD)	Post-M110 M(SD)	Pre-M110 M(SD)	Post-M110 M(SD)	Pre-M110 M(SD)	Post-M110 M(SD)	Pre-M110 M(SD)	Post-M110 M(SD)	Pre-M110 M(SD)	Post-M110 M(SD)
Drug Possession Arrests												
Oregon	23.5 (6.6)	7.6 (1.7)	24.1 (6.5)	7.8 (1.8)	55.3 (21.3)	12.5 (3.6)	25.2 (10.1)	12.5 (6.9)	34.5 (9.1)	11.4 (2.5)	12.7 (4.2)	3.8 (1.0)
Colorado	22.7 (6.1)	19.4 (1.6)	24.4 (6.1)	21.4 (1.6)	58.5 (19.7)	42.9 (5.0)	15.5 (5.9)	18.1 (4.6)	34.7 (8.7)	29.7 (2.5)	15.6 (4.6)	12.8 (0.8)
Idaho	–	–	–	–	–	–	–	–	–	–	–	–
Montana	14.8 (2.8)	10.2 (1.5)	13.2 (2.6)	8.1 (1.2)	93.9 (66.4)	57.9 (38.8)	44.5 (10.5)	50.5 (16.6)	19.9 (4.0)	13.2 (2.3)	9.6 (2.4)	7.2 (1.1)
Nevada	24.1 (4.9)	18.2 (2.9)	26.0 (4.6)	19.8 (3.0)	70.3 (17.1)	52.4 (11.2)	16.9 (8.7)	17.6 (5.3)	37.0 (7.2)	27.9 (4.9)	11.0 (2.8)	8.3 (1.2)
All Arrests												
Oregon	281.5 (48.4)	216.3 (12.3)	280.8 (46.1)	218.0 (12.4)	1089.5 (233.9)	826.6 (48.55)	379.4 (65.2)	297.9 (47.4)	422.3 (67.1)	333.0 (17.7)	143.2 (30.5)	101.5 (7.6)
Colorado	528.0 (58.1)	588.0 (36.0)	279.0 (17.3)	281.7 (15.6)	1104.9 (95.7)	1082.0 (85.4)	234.6 (32.0)	276.6 (35.5)	448.1 (28.2)	465.7 (27.0)	180.9 (15.7)	169.1 (8.7)
Idaho	252.8 (36.4)	239.3 (18.0)	239.8 (32.6)	230.7 (18.1)	1121.6 (197.5)	1146.6 (149.1)	509.6 (85.6)	585.8 (126.6)	356.6 (49.8)	339.9 (26.9)	148.4 (23.5)	138.2 (9.7)
Montana	118.7 (9.6)	118.5 (10.2)	98.2 (8.2)	89.3 (6.6)	854.0 (216.2)	607.9 (137.2)	465.9 (72.7)	635.7 (75.4)	159.6 (12.8)	159.6 (15.7)	77.3 (6.9)	76.4 (5.5)
Nevada	350.9 (68.1)	285.1 (18.5)	353.2 (65.2)	289.6 (16.8)	1179.3 (228.0)	950.7 (83.6)	327.5 (81.9)	304.2 (39.1)	501.8 (90.0)	412.7 (27.9)	198.9 (46.5)	156.5 (9.9)
Non-Drug Arrests												
Oregon	253.2 (41.2)	206.7 (12.0)	251.6 (38.9)	208.1 (12.0)	1021.0 (210.8)	808.4 (46.3)	350.1 (62.0)	282.2 (44.5)	380.6 (57.1)	318.6 (17.3)	127.9 (25.9)	96.8 (7.5)
Colorado	486.4 (62.7)	552.1 (35.0)	234.6 (13.0)	242.2 (14.6)	999.2 (89.1)	1001.9 (82.5)	207.9 (33.0)	246.5 (33.5)	385.1 (25.8)	411.0 (26.1)	152.1 (9.4)	145.1 (8.36)
Idaho	190.7 (30.0)	177.7 (11.7)	182.9 (26.8)	173.6 (11.6)	862.6 (159.7)	860.5 (130.0)	430.7 (81.2)	478.4 (87.8)	271.6 (41.2)	255.6 (18.7)	109.2 (19.2)	99.3 (5.76)
Montana	93.8 (7.9)	101.2 (8.4)	76.4 (6.3)	76.6 (5.8)	697.6 (172.4)	522.7 (123.0)	382.1 (61.4)	535.3 (56.0)	126.0 (10.5)	137.4 (13.1)	61.2 (6.0)	64.1 (4.9)
Nevada	316.1 (66.5)	246.2 (13.5)	316.1 (64.6)	247.0 (12.9)	1075.7 (219.6)	840.3 (60.9)	304.3 (76.7)	268.8 (37.1)	448.2 (87.9)	353.1 (19.9)	183.2 (45.4)	138.6 (8.0)
Violent Arrests												
Oregon	50.6 (6.1)	40.8 (2.7)	50.0 (5.6)	40.5 (2.7)	236.3 (40.8)	207.1 (23.4)	73.5 (18.3)	66.1 (18.4)	72.9 (6.7)	62.0 (3.3)	28.8 (6.0)	20.1 (2.3)
Colorado	281.7 (32.1)	320.6 (17.2)	115.8 (6.8)	118.0 (6.1)	501.1 (54.8)	503.7 (47.8)	95.5 (17.9)	98.1 (17.9)	195.8 (15.8)	210.2 (12.7)	73.9 (5.0)	68.1 (4.0)
Idaho	30.1 (3.9)	24.0 (1.1)	29.5 (3.1)	24.2 (1.2)	146.5 (47.9)	137.9 (52.7)	66.0 (24.3)	56.5 (22.1)	41.7 (4.7)	34.6 (2.0)	18.5 (3.6)	13.4 (1.4)
Montana	44.7 (4.3)	43.2 (3.6)	35.8 (3.8)	33.9 (2.8)	326.2 (92.3)	235.0 (82.2)	193.5 (24.0)	212.1 (22.7)	57.3 (5.8)	56.9 (6.7)	32.0 (4.3)	29.1 (2.8)
Nevada	44.5 (7.9)	36.8 (2.0)	43.0 (8.1)	34.1 (2.6)	164.4 (24.9)	151.5 (9.9)	38.1 (12.8)	28.9 (11.6)	63.8 (8.8)	56.8 (3.4)	24.9 (7.3)	16.7 (1.1)
Displaced Arrests												
Oregon	74.2 (11.0)	660.5 (3.8)	74.6 (10.8)	61.3 (3.5)	214.9 (39.5)	150.8 (25.6)	110.6 (28.9)	86.8 (16.2)	111.9 (16.3)	92.1 (5.8)	37.1 (6.2)	29.4 (2.1)
Colorado	53.6 (8.4)	47.1 (3.8)	55.9 (8.1)	50.7 (4.2)	146.6 (29.7)	110.2 (6.4)	72.9 (16.8)	78.4 (21.0)	79.1 (12.0)	69.6 (6.0)	27.8 (4.9)	24.2 (1.8)
Idaho	4.0 (0.8)	2.7 (0.3)	3.4 (0.8)	2.1 (0.3)	14.3 (12.7)	6.3 (6.8)	6.4 (4.4)	3.2 (5.5)	6.0 (1.5)	3.9 (0.6)	2.0 (0.5)	1.4 (0.3)
Montana	1.4 (0.5)	3.6 (0.7)	1.06 (0.5)	0.8 (0.3)	6.7 (13.1)	8.5 (12.9)	6.9 (8.4)	49.2 (10.3)	1.7 (0.6)	4.4 (1.0)	1.1 (0.6)	2.8 (0.6)
Nevada	–	–	–	–	–	–	–	–	–	–	–	–

Note: Oregon Measure 110 became effective on February 1, 2021. Pre-M110 is a period from January 2019 through January 2021.

100,000 prior to Measure 110, compared to 7.6 (SD=1.7) in the post-implementation period, a decrease of approximately 68 percent. The rate of drug possession arrests among Black individuals decreased from 55.3 (21.3) in the pre-intervention period to 12.5 (3.6) post-implementation. Prior to Measure 110, the arrest rates among white and American Indian/Alaska Native individuals were similar, 24.1 (6.5) and 25.2 (10.1), respectively. Following implementation of Measure 110, the white arrest rate declined to an average of 7.2 (1.8) arrests per 100,000 compared to a post implementation arrest rate of 12.5 (6.9) for American Indian/Alaska Native individuals.

Interrupted time series analysis

Results from the ITS analysis are presented in Table 3 and Fig. 1. Prior to Measure 110, drug possession arrests in Oregon were decreasing monthly at a rate of 0.78 arrests per 100,000 (95% CI = −0.97, −0.59). In the first month after Measure 110, there was a decrease in the monthly rate of 2.78 per 100,000 (95% CI = -3.68, -1.88). Following this initial decrease, drug possession arrests continued to slightly decrease monthly at a rate of 0.41 arrests per 100,00 (95% CI = −0.48, −0.33), resulting in 0.38 per 100,000 (95% CI = 0.16, 0.59 change in slope from pre- to post-Measure 110. The drug possession arrest rate decreased throughout the study period. Compared to control states, the monthly rate of drug possession arrests in Oregon following the implementation of Measure 110 was 6.75 (95% CI = −12.27, -1.22) arrests per 100,000 lower.

The monthly trend of all arrests was declining before Measure 110 at a rate of 5.53 arrests per 100,000 (95% CI = −6.76, −4.30). In the first month following the law change, the total arrest monthly rate increased by 14.20 per 100,000 (95% CI = 6.47, 21.93). However, this initial increase was followed by a stable monthly arrest rate slope for the rest of the study period of 0.26 arrests per 100,000 (95% CI = −0.96,1.48), resulting in 5.79 per 100,000 (95% CI = 4.06, 7.53) change in slope of the monthly arrest rate from pre- to post-Measure 110. Unlike for drug possession arrests, there was no statistically significant difference in either immediate or sustained slope change of the total monthly arrest rate compared to the control states, suggesting no differences in the total arrest rate patterns between the two groups.

The monthly trend of all non-drug arrests was declining before Measure 110 at a rate of 4.65 arrests per 100,000 (95% CI = −5.74, −3.56)). In the first month following the law change, the non-drug arrest monthly rate increased by 18.03 per 100,000 (95% CI = 10.65, 25.42). However, this initial increase was followed by a stable monthly arrest rate for the rest of the study period, changing at a rate of 0.79 arrests per 100,000 (95% CI = −0.42, 1.99), resulting in 5.44 per 100,000 (95% CI = 3.82, 7.06) change in slope from pre- to post-Measure 110. Similar to the trends in all arrests, there was no statistically significant difference in either immediate or sustained change of the monthly non-drug arrest rate in Oregon, compared to the control states, suggesting no differences in the arrest patterns for these crimes.

Similarly, for violent arrests, the monthly trend of arrests was declining prior to Measure 110 (−0.66 (95% CI = −0.83, −0.49)). In the first month of Measure 110, there was a decrease of the arrest rate of 2.27 per 100,000 (95% CI = −3.18, −1.36). After this initial decrease, violent arrests slightly increased monthly at a rate of 0.61 per 100,000 (95% CI = 0.48, 0.74), resulting in 1.26 per 100,000 (95% CI = 1.05, 1.48) change in slope from pre- to post-Measure 110. Unlike for drug possession arrests, there was no statistically significant difference in either immediate or sustained change of the monthly arrest rate compared to the control states, suggesting no differences in the arrest rate patterns between the two groups.

There were no suitable controls for displaced arrests; hence, results of a single-group ITS are presented instead of ITS with a comparison group. Prior to Measure 110, the monthly trend of these arrests was decreasing, −0.90 (95% CI = −1.43, −0.37). In the first month of Measure 110, the rate of displaced arrests increased by 6.13 (95% CI = 1.22, 11.04) and then remained stable changing at a rate of 0.12 per

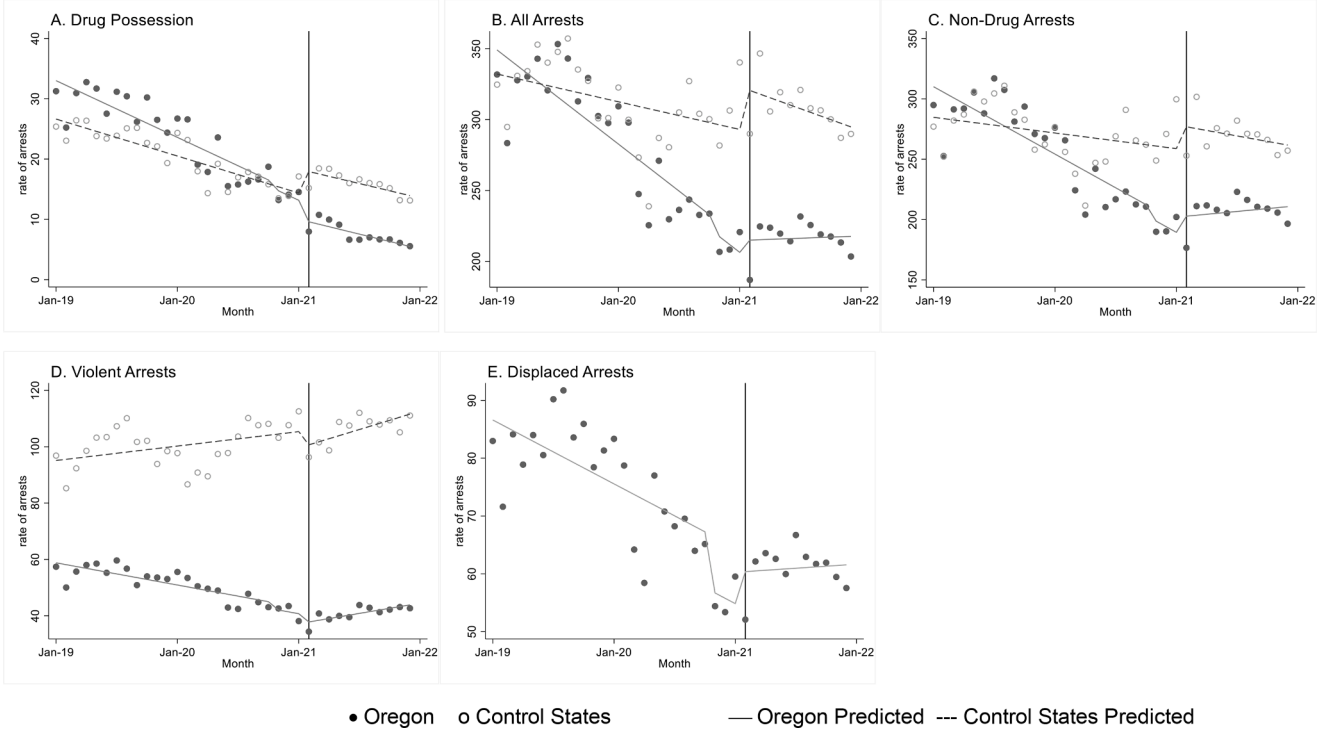

Fig. 1. Monthly rates of selected arrests per 100,000, before and after Oregon M110, 2019–2021.
Note: Oregon Measure 110 became effective on February 1, 2021.
[A] Control states include Colorado, Montana, and Nevada .
[B,C,D] Control states include Colorado, Idaho, Montana, and Nevada .
[E] No appropriate control, final analysis as single interrupted time series .

100,000 (95% CI = −0.64,0.88), resulting in 1.02 per 100,000 (95% CI = 0.05, 1.99) change in slope from pre- to post-Measure 110.

Washington

Monthly averages

Descriptive information on arrest rates and rates stratified by race and sex in Washington are presented in Table 2. The numbers presented in this table represent the average crime rate across 26 months in the pre-period and 10 months in the post-period for all outcomes besides drug equipment. For drug equipment, the pre-period was 26 months and the post -period 8 months. Briefly, there were an average of 9.2 (SD=2.3) monthly drug possession arrests per 100,000 prior to the *Blake* decision and 0.8 (0.3) after, a 91% decrease. Prior to the *Blake* decision, the average monthly arrest rate among Black and American Indian/Alaska Native individuals was similar, 25.7(10.3) and 27.3(7.8), respectively. Following the decision, the average monthly arrest rate among Black individuals decreased to 1.8 (1.1), while that for American Indian/Alaska Native individuals fell to 5.4 (3.0). The average monthly arrest rate for White individuals decreased from 9.9 (2.3) to 0.8 (0.4).

Drug equipment arrests fell from an average of 4.0 (0.9) monthly arrests per 100,000 before the May legislative change to 0.4 (0.4) after, a 90% decline. The arrest rate for Black individuals dropped from 9.3 (2.3) to 1.0 (0.1), while the American Indian/Alaska Native arrest rate dropped from 13.9 (6.2) to 4.9 (2.7). The monthly average arrest rate for whites fell from 4.3 (0.9) to 0.3 (0.4). The average monthly arrest rate was higher for males compared to females prior to and following the legislative change.

Interrupted time series analysis

Full results of the ITS results for all outcomes are presented in Table 4 and Fig. 2. For both drug possession and drug equipment arrests we present results from a single ITS, as Nevada, Idaho, and Colorado were not found to be suitable comparison states. Prior to the *Blake* decision, drug possession arrests were decreasing monthly at a rate of 0.24 arrests per 100,000 (95% CI = −0.34, −0.14). In the first month of the *Blake* decision, there was a decrease in the monthly rate of 4.68 per 100,000 (95% CI = −5.84, −3.53). Following this initial decrease, the monthly drug possession arrest rate remained stable, changing at a rate of 0.04 arrests per 100,000 (95% CI = −0.11, 0.04), resulting in 0.20 per 100,000 (95% CI = 0.05, 0.35) change in slope from pre- to post-*Blake* decision. Prior to the May legislative change, equipment-related arrests were slightly decreasing monthly at a rate of 0.04 arrests per 100,000 (95% CI = −0.08, −0.01). There was a decrease in the arrest rate of -1.79 per 100,000 (95% CI = −2.14, −1.43) in the first month post-legislative change. The rate of arrests continued to decrease slightly for the remaining study period, changing at a rate of −0.09 per 100,000 (95% CI = −0.17, −0.01), resulting in a non-statistically significant change in slope from pre- to post-*Blake* decision.

For all other outcomes (all arrests, non-drug arrests, violent arrests, and displaced arrests), we present ITS results with a comparison group. The monthly rates of total arrests, non-drug arrests, violent arrests and displaced arrests were decreasing in Washington prior to the *Blake* decision. In the first month following the *Blake* decision, there was an increase in the arrest rate for all arrests (9.13 (95% CI = 2.83,15.43), non-drug arrests (15.27 (95% CI = 9.78, 20.76), and displaced arrests (5.85 (95% CI = 3.14,8.57), but not for violent arrests. For all arrests (−1.23 (95% CI = −1.93, −0.53)), and displaced arrests (−0.62 (95% CI = −1.00, −0.24)), this initial increase was followed by a slight decrease in the arrest rate for the remaining study period. For all arrests (2.04 (95% CI = 1.18, 2.89)), non-drug arrests (1.80 (95% CI = 1.04, 2.57)), and violent arrests (0.68 (95% CI = 0.51, 0.84)) there was a statistically significant change in the slope from pre- to post-*Blake* decision, but not for displaced arrests. However, compared to controls, there was no statistically significant difference in either the month following implementation or in the slope of the arrest rates for any of the outcomes, suggesting no differences in the arrest rate patterns between the two groups.

Discussion

This study evaluated changes to laws that, while novel in the U.S., follow in the footsteps of a variety of full and partial decriminalization regimes implemented across the globe (Ferri, Davoli, & Perucci, 2011; Kilmer et al., 2018; Rosmarin & Eastwood, 2012). Even though the legal changes were initiated and operationalized in different ways and the pre-intervention rates of drug possession arrests were much lower in Washington than Oregon and the control states, we observed significant reductions in arrests for drug possession after these changes in both states, and for the possession of drug equipment in Washington.

In Oregon, there were approximately 3 fewer arrests per 100,000 for drug possession in the month after Measure 110 was implemented, relative to the pre-change period, and the rate continued to decrease throughout the study period. This decline was significantly greater than in the comparison states. In Washington, there were almost 5 fewer drug possession arrests per 100,000 in the month following the *Blake* decision, relative to the pre-policy period, and the rate remained stable thereafter. We also observed statistically significant reductions of arrests for possession of drug equipment in Washington. We did not observe significant changes in any other types of arrests examined in either state, relative to controls.

Taken together, these results suggest that shifting from an approach that prioritizes arresting individuals for possession of small amounts of drugs to one that replaces criminal arrests with non-criminal citations (Oregon) or requires prioritization of health-focused responses (Washington) significantly reduced drug possession arrests and did not increase arrests for crime overall or for violent crimes. As interactions with law enforcement officers, particularly those that result in arrests, increase health and other harms for people who use drugs, these changes may reduce both expenditures on arrest and incarceration and societal harms, such as diminished employment prospects for individuals convicted of drug crimes (Binswanger et al., 2007; Maier, Mannes, & Koppenhofer, 2017; O'Connor, Sears, & Fulton-Kehoe, 2022).

While Measure 110 was associated with significant increases in displaced arrests in Oregon, the monthly rate of these arrests post-Measure 110 appeared to return to the trend prior to the November 2020 election and the absence of a control group did not allow us to discern whether this increase was different from what would have occurred in the absence of the Measure. Nevertheless, as arrest for such crimes may be a risk factor for overdose, (Bohnert et al., 2011). it is important that this potential displacement effect be tracked in the future to ensure that PWUD are not targeted for arrest for minor crimes in the context of drug possession decriminalization.

Nationwide, Black adults made up 27% of those arrested for drug offenses in 2019, despite comprising only approximately 12% of the U.S. population (Pew Charitable Trusts, 2022). The Oregon Criminal Justice Commission estimated that Measure 110 would "likely lead to significant reductions in racial/ethnic disparities in both convictions and arrests." (Oregon Criminal Justice Commission, 2020). Our analysis supports this prediction; arrest rates for Black individuals in Oregon declined by a greater amount than those for white individuals (77% and 67% respectively) after Measure 110. However, Black individuals are still arrested for drug possession at more than twice the rates as white individuals, and American Indian/Alaska native individuals at nearly four times the rate of white individuals. Arrest rates for non-white groups in Washington also remained higher than those of white individuals. These results are similar to those following cannabis legalization in Washington, where disparities in arrests between white and Black individuals arrested remained even after decriminalization measures (Firth, Maher, Dilley, Darnell, & Lovrich, 2019; Sheehan et al., 2021). Further efforts are needed to address these ongoing disparities.

Table 2
Average monthly arrests per 100,000 before and after the *Blake* Decision in Washington, Colorado, Idaho, Montana, and Nevada, by race and sex

	Total		White		Black		American Indian/ Alaska Native		Male		Female	
	Pre-Blake M(SD)	Post-Blake M(SD)	Pre-Blake M(SD)	Post-Blake M(SD)	Pre-Blake M(SD)	Post-Blake M(SD)	Pre-Blake M(SD)	Post-Blake M(SD)	Pre-Blake M(SD)	Post-Blake M(SD)	Pre-Blake M(SD)	Post-Blake M(SD)
Drug Possession Arrests												
Washington	9.2 (2.3)	0.8 (0.3)	9.9 (2.3)	0.8 (0.4)	25.7 (10.3)	1.8 (1.1)	27.3 (7.8)	5.4 (3.0)	13.8 (3.2)	1.2 (0.5)	4.6 (1.4)	0.3 (0.1)
Colorado	22.5 (6.0)	19.6 (1.5)	24.2 (6.1)	21.6 (1.6)	57.7 (19.7)	43.3 (5.1)	15.2 (6.0)	19.2 (3.0)	34.4 (8.7)	29.9 (2.4)	15.4 (4.5)	12.9 (0.8)
Idaho	–	–	–	–	–	–	–	–	–	–	–	–
Montana	14.6 (3.0)	10.4 (1.5)	12.9 (2.8)	8.2 (1.2)	92.4 (65.5)	58.1 (40.9)	44.2 (10.5)	51.9 (16.8)	19.6 (4.4)	13.5 (2.2)	9.5 (2.3)	7.2 (1.1)
Nevada	23.9 (4.9)	18.0 (3.0)	25.8 (4.6)	19.7 (3.1)	69.9 (16.8)	51.6 (11.4)	16.6 (8.7)	18.3 (5.1)	36.8 (7.2)	27.6 (5.1)	10.9 (2.8)	8.3 (1.2)
Equipment Possession Arrests[a]												
Washington	4.0 (0.9)	0.4 (0.4)	4.3 (0.9)	0.3 (0.4)	9.3 (2.9)	1.0 (0.9)	13.9 (6.2)	4.9 (2.7)	5.7 (1.1)	0.6 (0.5)	2.3 (0.6)	0.2 (0.2)
Colorado	13.6 (3.5)	12.4 (0.7)	14.9 (3.5)	14.0 (0.7)	31.5 (11.8)	25.0 (2.7)	8.4 (4.5)	9.5 (3.2)	20.4 (5.0)	18.6 (1.5)	10.1 (2.8)	8.8 (0.5)
Idaho	–	–	–	–	–	–	–	–	–	–	–	–
Montana	5.4 (1.2)	3.8 (0.5)	4.4 (1.1)	2.5 (0.5)	25.8 (22.4)	23.4 (24.00)	22.7 (6.8)	25.8 (6.6)	7.2 (1.6)	4.9 (0.7)	3.5 (1.2)	2.7 (0.5)
Nevada	–	–	–	–	–	–	–	–	–	–	–	–
All Arrests												
Washington	184.3 (29.6)	137.7 (8.5)	186.8 (29.0)	139.7 (9.0)	674.8 (112.0)	496.2 (31.9)	428.0 (61.3)	360.2 (28.3)	272.0 (40.3)	207.3 (13.2)	96.5 (19.1)	67.8 (4.0)
Colorado	529.2 (57.2)	590.8 (36.6)	278.0 (17.6)	284.4 (13.4)	1098.9 (98.8)	1095.5 (76.6)	237.0 (33.6)	274.6 (36.8)	447.0 (28.2)	470.4 (23.4)	179.9 (16.2)	170.5 (7.8)
Idaho	251.8 (36.1)	240.5 (18.6)	239.1 (32.2)	231.8 (18.7)	1115.5 (196.0)	1165.0 (143.4)	507.8 (84.3)	597.9 (126.6)	355.5 (49.1)	341.0 (28.1)	147.6 (23.4)	139.4 (9.3)
Montana	118.0 (10.1)	120.3 (8.7)	97.3 (9.2)	90.7 (4.9)	839.2 (224.9)	621.8 (136.2)	469.4 (73.6)	643.4 (74.8)	158.5 (13.8)	162.5 (13.0)	77.0 (6.9)	77.1 (5.4)
Nevada	347.9 (68.5)	286.3 (19.1)	350.1 (65.8)	291.2 (16.8)	1170 (228.3)	951.9 (88.1)	324.6 (81.6)	309.4 (37.0)	497.7 (90.7)	414.5 (28.7)	197.0 (46.5)	157.2 (10.2)
Non-Drug Arrests												
Washington	168.6 (26.2)	135.5 (7.2)	170.0 (25.8)	137.5 (7.6)	631.1 (97.7)	490.3 (29.6)	382.3 (58.3)	344.0 (21.8)	248.8 (35.7)	203.8 (11.1)	88.2 (17.0)	66.9 (3.5)
Colorado	487.9 (62.0)	554.7 (35.8)	234.0 (13.2)	244.6 (13.0)	994.4 (90.6)	1014.6 (74.7)	210.8 (35.6)	242.8 (32.8)	384.4 (25.5)	415.2 (23.2)	151.3 (10.0)	146.3 (7.6)
Idaho	189.7 (29.8)	178.8 (11.7)	182.2 (26.5)	174.6 (11.7)	857.8 (158.6)	872.9 (130.1)	428.7 (80.2)	488.5 (85.5)	270.6 (40.8)	256.7 (19.4)	108.4 (19.3)	100.5 (4.6)
Montana	93.5 (7.9)	102.7 (7.1)	76.0 (6.6)	77.8 (4.6)	685.2 (180.4)	537.6 (118.8)	385.9 (63.3)	540.8 (55.9)	125.5 (10.5)	139.7 (11.1)	61.1 (5.9)	64.8 (4.6)
Nevada	312.9 (67.2)	247.6 (13.4)	312.7 (65.6)	248.8 (12.0)	1065.8 (220.9)	842.3 (63.7)	301.6 (76.4)	272.0 (37.4)	443.7 (89.1)	355.3 (19.6)	181.2 (45.6)	139.3 (8.1)
Violent Arrests												
Washington	39.2 (4.7)	31.0 (1.4)	38.0 (4.5)	30.3 (1.4)	173.2 (22.1)	132.1 (10.3)	106.7 (16.5)	103.6 (8.5)	56.2 (5.4)	47.3 (2.1)	22.1 (4.2)	14.6 (1.1)
Colorado	282.0 (31.5)	323.8 (14.2)	115.6 (6.8)	118.8 (5.7)	498.8 (55.0)	509.9 (45.4)	96.8 (18.7)	95.0 (15.6)	195.6 (15.5)	212.0 (11.8)	73.6 (5.2)	68.4 (4.1)
Idaho	29.8 (4.1)	24.1 (1.1)	29.2 (3.3)	24.3 (1.3)	144.6 (48.0)	142.2 (53.5)	65.1 (24.2)	57.6 (22.9)	41.3 (4.9)	34.7 (2.1)	18.3 (3.7)	13.5 (1.4)
Montana	44.6 (4.3)	43.4 (3.7)	35.6 (3.8)	34.0 (2.9)	320.2 (95.6)	241.6 (83.5)	194.0 (23.6)	212.8 (23.8)	57.0 (5.8)	57.5 (6.8)	31.9 (4.2)	28.9 (2.9)
Nevada	44.0 (8.0)	37.2 (1.8)	42.5 (8.3)	34.3 (2.5)	163.3 (25.1)	153.3 (8.6)	37.5 (13.0)	29.7 (12.0)	63.4 (9.0)	57.3 (3.2)	24.5 (7.4)	16.9 (0.9)
Displaced Arrests												
Washington	39.8 (7.1)	33.0 (2.9)	41.5 (7.2)	34.5 (3.3)	120.8 (22.4)	101.7 (10.0)	76.0 (16.4)	74.5 (9.0)	59.0 (10.2)	49.2 (4.4)	20.3 (4.1)	16.8 (1.5)
Colorado	53.1 (8.6)	47.7 (3.4)	55.4 (8.3)	51.4 (3.8)	144.8 (30.5)	111.2 (65.8)	72.2 (16.9)	80.9 (20.5)	78.4 (12.4)	70.6 (5.2)	27.6 (4.9)	24.5 (1.7)
Idaho	3.9 (0.8)	2.7 (0.3)	3.3 (0.8)	2.2 (0.3)	14.4 (12.5)	5.2 (6.1)	6.2 (4.4)	3.5 (5.7)	5.9 (1.5)	4.0 (0.6)	1.9 (0.6)	1.4 (0.3)
Montana	1.4 (0.6)	3.7 (0.7)	1.0 (0.5)	0.8 (0.3)	6.4 (12.9)	9.4 (13.2)	8.4 (11.3)	49.5 (10.8)	1.7 (0.7)	4.5 (1.0)	1.1 (0.7)	2.8 (0.6)
Nevada	–	–	–	–	–	–	–	–	–	–	–	–

Note: The *Blake* Decision went into effect February 25, 2021. Pre-Blake Decision is a period from January 2019 through February 2021.

[a] Equipment possession legislation went into effect in May 13, 2021. Average equipment possession arrests pre-post policy reflect this date.

Table 3
Interrupted time series regression analysis of selected arrests, before and after Oregon M110, 2019-2021

	Oregon β (95% CI)	Controls β (95% CI)	Difference Oregon/Controls β (95% CI)
Drug Possession Arrests[a]			
Pre-M110 Slope	**−0.78 (−0.97, −0.59)**	**−0.51 (−0.89, −0.13)**	−0.27 (−0.69, 0.15)
Post-M110 Slope	**−0.41 (−0.48, −0.33)**	−0.39 (−1.1, 0.33)	−0.02 (−0.75, 0.70)
Changes in slope from pre- to post-M110	**0.38 (0.16, 0.59)**	0.12 (−0.77, 1.02)	0.25 (−0.67, 1.17)
Changes in level from pre- to post-M110	**−2.78 (−3.68, −1.88)**	3.96 (−1.49, 9.42)	**−6.75 (−12.27, −1.22)**
All Arrests[b]			
Pre-M110 Slope	**−5.53 (−6.76, −4.30)**	−1.63 (−10.64, 7.39)	−3.90 (−13.00, 5.20)
Post-M110 Slope	0.26 (−0.96,1.48)	−2.57 (−16.57, 11.43)	2.83 (−11.22, 16.89)
Changes in slope from pre- to post-M110	**5.79 (4.06,7.53)**	−0.94 (−18.51, 16.62)	6.73 (−10.92, 24.39)
Changes in level from pre- to post-M110	**14.20 (6.47,21.93)**	29.14 (−59.50, 117.78)	−14.94 (−103.91, 74.04)
Non-Drug Arrests[b]			
Pre-M110 Slope	**−4.65 (−5.74, −3.56)**	−1.08 (−10.14, 7.98)	−3.57 (−12.70, 5.55)
Post-M110 Slope	0.79 (−0.42, 1.99)	−1.51 (−15.36, 12.34)	2.30 (−11.60, 16.20)
Changes in slope from pre- to post-M110	**5.44 (3.82, 7.06)**	−0.43 (−18.14, 17.28)	5.87 (−11.91, 23.65)
Changes in level from pre- to post-M110	**18.03 (10.65, 25.42)**	19.17 (−69.40, 107.74)	−1.13 (−90.01, 87.74)
Violent Arrests[b]			
Pre-M110 Slope	**−0.66 (−0.83, −0.49)**	0.43 (−5.39, 6.25)	−1.08 (−6.91, 4.74)
Post-M110 Slope	**0.61 (0.48,0.74)**	1.09 (−8.71, 10.88)	−0.48 (−10.27, 9.31)
Changes in slope from pre- to post-M110	**1.26 (1.05,1.48)**	0.66 (−10.63, 11.96)	0.60 (−10.70, 11.90)
Changes in level from pre- to post-M110	**−2.27 (−3.18, −1.36)**	−5.12 (−67.28, 57.03)	2.86 (−59.30, 65.02)
Displaced Arrests[c]			
Pre-M110 Slope	**−0.90 (−1.43, −0.37)**	–	–
Post-M110 Slope	0.12 (−0.64,0.88)	–	–
Changes in slope from pre- to post-M110	**1.02 (0.05,1.99)**	–	–
Changes in level from pre- to post-M110	**6.13 (1.22,11.04)**		

Note: Oregon Measure 110 was passed on February 1, 2021.
[a] Control states include Colorado, Montana and Nevada
[b] Control states include Colorado, Idaho, Montana, and Nevada
[c] No appropriate control, final analysis as single interrupted time series

Table 4
Interrupted time series regression analysis of selected arrests, before and after the *Blake* Decision, 2019-2021

	Washington β (95% CI)	Controls β (95% CI)	Difference Washington/ Controls β (95% CI)
Drug Possession[a]			
Pre-Blake Decision Slope	**−0.24 (−0.34, −0.14)**	–	–
Post-Blake Decision Slope	−0.04 (−0.11,0.04)	–	–
Changes in slope from pre- to post- Blake Decision	**0.20 (0.05,0.35)**	–	–
Changes in level from pre- to post Blake Decision	**−4.68 (−5.84, −3.53)**	–	–
Equipment Possession[a,b]			
Pre-Blake Decision Slope	**−0.04 (−0.08, −0.01)**	–	–
Post-Blake Decision Slope	**−0.09 (−0.17, −0.01)**	–	–
Changes in slope from pre- to post- Blake Decision	−0.05 (−0.14,0.04)	–	–
Changes in level from pre- to post Blake Decision	**−1.79 (−2.14, −1.43)**	–	–
All Arrests[c]			
Pre-Blake Decision Slope	**−3.27 (−3.76, −2.78)**	−1.64 (−10.43, 7.15)	−1.63 (−10.43, 7.17)
Post-Blake Decision Slope	**−1.23 (−1.93, −0.53)**	−4.61 (−19.54, 10.31)	3.38 (−11.57, 18.32)
Changes in slope from pre- to post- Blake Decision	**2.04 (1.18,2.89)**	−2.97 (−21.32, 15.39)	5.01 (−13.37, 23.38)
Changes in level from pre- to post Blake Decision	**9.13 (2.83,15.43)**	40.65 (−48.79, 130.09)	−31.52 (−121.18, 58.15)
Non-Drug Arrests[d]			
Pre-Blake Decision Slope	**−2.92 (−3.35, −2.49)**	−1.12 (−9.94, 7.70)	−1.80 (−10.63, 7.03)
Post-Blake Decision Slope	**−1.12 (−1.75, −0.48)**	−3.11 (−17.91, 11.69)	1.99 (−12.82, 16.80)
Changes in slope from pre- to post- Blake Decision	**1.80 (1.04, 2.57)**	−1.99 (−20.49, 16.51)	3.79 (−14.73, 22.31)
Changes in level from pre- to post Blake Decision	**15.27 (9.78, 20.76)**	29.04 (−60.43, 118.52)	−13.77 (−103.41, 75.87)
Violent Arrests[e]			
Pre-Blake Decision Slope	**−0.49 (−0.59, −0.39)**	0.35 (−5.30, 5.99)	−0.84 (−6.48, 4.81)
Post-Blake Decision Slope	**0.19 (0.06,0.32)**	0.80 (−9.57, 11.17)	−0.61 (−10.98, 9.76)
Changes in slope from pre- to post- Blake Decision	**0.68 (0.51,0.84)**	0.45 (−11.34, 12.25)	0.23 (−11.57, 12.02)
Changes in level from pre- to post Blake Decision	−0.58 (−2.01,0.85)	−1.24 (−63.95, 61.47)	0.67 (−62.06, 63.39)
Displaced Arrests[e]			
Pre-Blake Decision Slope	**−0.67 (−0.85, −0.49)**	−0.31 (−2.21,1.59)	−0.36 (−2.26, 1.55)
Post-Blake Decision Slope	**−0.63 (−1.00, −0.26)**	−0.17 (−3.03, 2.69)	−0.46 (−3.34, 2.42)
Changes in slope from pre- to post- Blake Decision	0.04 (−0.36,0.44)	0.14 (−3.79, 4.08)	−0.10 (−4.06, 3.85)
Changes in level from pre- to post Blake Decision	**5.88 (3.29, 8.47)**	3.51 (−19.21, 26.24)	2.24 (−20.51, 25.24)

Note: The *Blake* Decision went into effect February 25, 2021.
[a] No appropriate control, final analysis as single interrupted time series.
[b] Equipment possession legislation went into effect in May 13, 2021. Pre-post policy changes reflect this date.

Limitations

This analysis has several limitations. First, due to the way the data are reported, our primary outcomes only reflect arrests where the crimes of interest are the most serious recorded for each arrest encounter. This may lead to an under-counting of the arrests of interest, although we have no reason to believe it would systematically bias the results. Second, in Oregon, law enforcement officers are permitted to issue the individual a citation that, while not criminal in nature, is entered into the NIBRS/ONIBRS system as an arrest (Sierra Kendall, Oregon State Police,

[c] Control states include Colorado, Idaho, Montana, and Nevada.
[d] Control states include Colorado, Montana and Idaho.

personal communication, January 27, 2023). Similarly, law enforcement officers in Washington are permitted to record the first and second drug possession incident as an arrest even if the individual is referred to a health assessment and not arrested (Tonya Todd, Washington Association of Sheriffs and Police Chiefs, personal communication, August 16, 2022). Our analysis may therefore underestimate the effect of the policy changes in both states, as actions that are not "arrests" in the classical sense may nevertheless be recorded as arrests in the dataset.

Third, it is possible that location-based controls selected may not represent a true counterfactual. However using the methods outlined by Linden, we believe these states represent valid controls (Linden, 2015). Fourth, three analyses (drug possession and equipment possession in Washington; displaced arrests in Oregon) were conducted as a single ITS due to a lack of statistically appropriate controls. Fifth, due to data availability limitations the analysis includes only 36 data points. Finally, these data examine a relatively small time period after the policy change. While we do not observe a regression to previous arrest practices in either state, it is possible that the changes we observed will not be sustained in the longer term.

Conclusion

The Director of the U.S. National Institute on Drug Abuse recently noted that "Punitive policies are not effective at addressing substance use disorder and, if anything, only exacerbate its societal risk factors, including worsening of racial health disparities." (Volkow, 2023). Similarly, the Secretary of the Department of Health and Human Services has declared that the "War on Drugs" is really a "war on people."(Becerra, 2021). The examples of Oregon and Washington demonstrate that it is possible for states to dramatically reduce arrests of people who use drugs and adopt a health-forward approach to drug use, at least in the short term.

It is not yet known whether and to what extent these changes may impact health measures such as overdose and other drug-related harm. As data on health outcomes become available, other states should consider whether, in light of the moral, physical, social, and economic harms caused by arresting individuals solely for possession of drugs, they wish to pass laws similar to those in Oregon or Washington.

These results also suggest that the changes enacted in these states may not be sufficient, on their own, to eliminate the criminalization of people who use drugs. They also suggest that further action is needed to eliminate racial disparities in arrests. Future research should examine the impact of these legal changes as longer-term data become available as well as whether and how they impact health harms to individuals who use drugs, their families, and communities.

Ethics approval

The authors declare that the work reported herein did not require ethics approval because it did not involve animal or human participation.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Corey S. Davis: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision, Project administration.

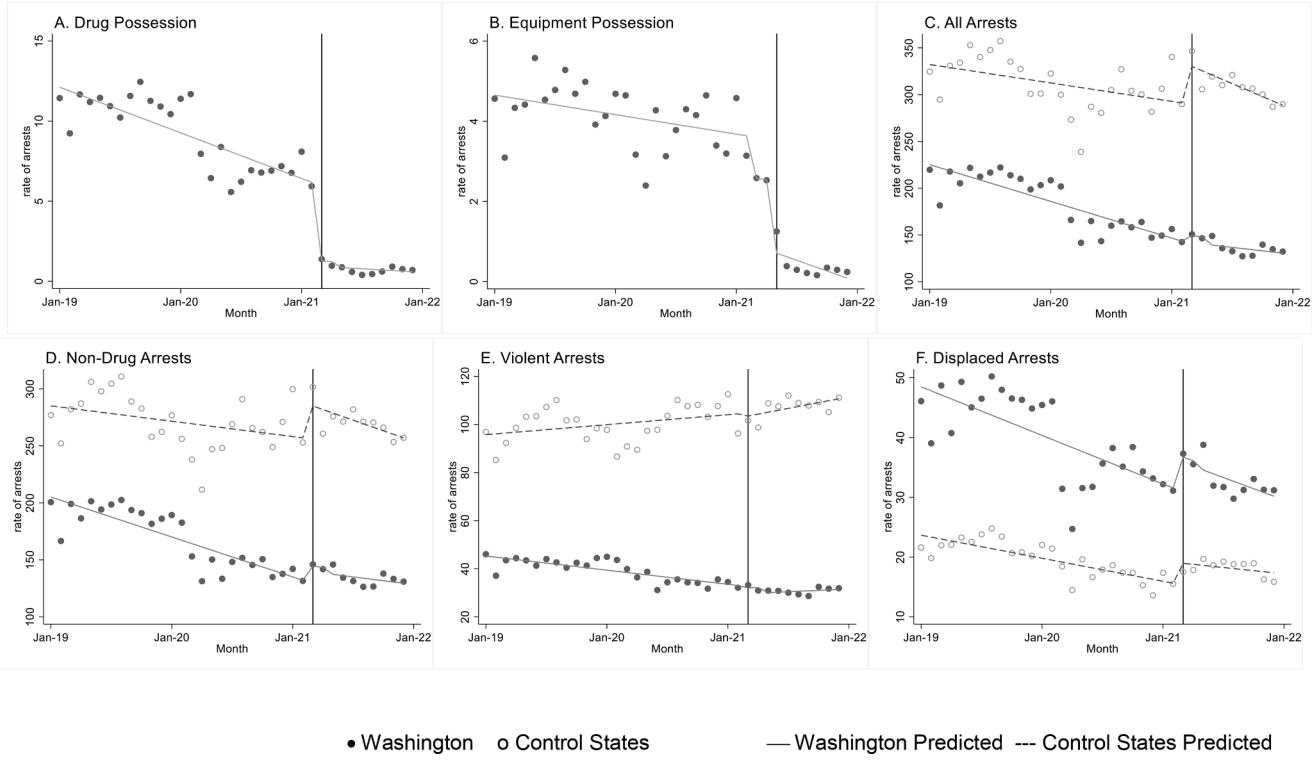

Fig. 2. Monthly rates of selected arrests per 100,000, before and after the *Blake* Decision, 2019–2021.
[A,B]No appropriate control, final analysis as single interrupted time series 24.
[C,D,E]Control states include Colorado, Idaho, Montana, and Nevada.
[F]Control states include Colorado, Montana and Idaho.
Note: The *Blake* Decision went into effect February 25, 2021.

Spruha Joshi: Conceptualization, Methodology, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Bianca D. Rivera:** Methodology, Formal analysis, Data curation, Visualization, Writing – original draft, Writing – review & editing. **Magdalena Cerdá:** Methodology, Formal analysis, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2023.104155.

References

Barocas, J. A., Eftekhari Yazdi, G., Savinkina, A., Nolen, S., Savitzky, C., Samet, J. H., … Linas, B. P. (2021). Long-term infective endocarditis mortality associated with injection opioid use in the United States: A modeling study. *Clinical Infectious Diseases, 73*(11), e3661–e3669. https://doi.org/10.1093/cid/ciaa1346

Becerra, X. (2021). *Secretary Becerra delivers remarks during joint HHS-ONDCP press call on Biden-Harris administration harm reduction investments* [Press release]Retrieved from https://www.hhs.gov/about/news/2021/12/08/secretary-becerra-delivers-remarks-during-joint-hhs-ondcp-press-call-on-biden-harris-administration-harm-reduction-investments.html.

Beletsky, L., LaSalle, L., Newman, M., Pare, J. M., Tam, J. S., & Tochka, A. B. (2015). Fatal re-entry: Legal and programmatic opportunities to curb opioid overdose among individuals newly released from incarceration. *Northeastern University Law Journal, 7*(1), 155–215.

Bick, J. A. (2007). Infection control in jails and prisons. *Clinical Infectious Diseases, 45*(8), 1047–1055. https://doi.org/10.1086/521910

Binswanger, I. A., Blatchford, P. J., Mueller, S. R., & Stern, M. F. (2013). Mortality after prison release: Opioid overdose and other causes of death, risk factors, and time trends from 1999 to 2009. *Annals of Internal Medicine, 159*(9), 592–600. https://doi.org/10.7326/0003-4819-159-9-201311050-00005

Binswanger, I. A., Stern, M. F., Deyo, R. A., Heagerty, P. J., Cheadle, A., Elmore, J. G., & Koepsell, T. D. (2007). Release from prison–A high risk of death for former inmates. *The New England Journal of Medicine, 356*(2), 157–165.

Bohnert, A. S., Nandi, A., Tracy, M., Cerda, M., Tardiff, K. J., Vlahov, D., & Galea, S. (2011). Policing and risk of overdose mortality in urban neighborhoods. *Drug and Alcohol Dependence, 113*(1), 62–68. https://doi.org/10.1016/j.drugalcdep.2010.07.008

Brinkley-Rubinstein, L. (2013). Incarceration as a catalyst for worsening health. *Health & Justice, 1*(1), 3. https://doi.org/10.1186/2194-7899-1-3

Ciccarone, D., Unick, G. J., Cohen, J. K., Mars, S. G., & Rosenblum, D. (2016). Nationwide increase in hospitalizations for heroin-related soft tissue infections: Associations with structural market conditions. *Drug and Alcohol Dependence, 163*, 126–133. https://doi.org/10.1016/j.drugalcdep.2016.04.009

Cohen, A., Vakharia, S. P., Netherland, J., & Frederique, K. (2022). How the war on drugs impacts social determinants of health beyond the criminal legal system. *Annals of Medicine, 54*(1), 2024–2038. https://doi.org/10.1080/07853890.2022.2100926

Congressional Research Service. (2022). *NIBRS Participation Rates and Federal Crime Data Quality*. https://crsreports.congress.gov/product/pdf/IN/IN11936.

Davis, C. S., & Carr, D. H. (2022). Repealing state drug-paraphernalia laws - The need for federal leadership. *The New England Journal of Medicine, 387*(15), 1344–1346. https://doi.org/10.1056/NEJMp2207866

Davis, C. S., Lieberman, A. J., & O'Kelley-Bangsberg, M (2022). Legality of drug checking equipment in the United States: A systematic legal analysis. *Drug and Alcohol Dependence, 234*, Article 109425. https://doi.org/10.1016/j.drugalcdep.2022.109425

Federal Bureau of Investigation. (2019a). *A Guide to Understanding NIBRS*. https://www.fbi.gov/file-repository/ucr/a-guide-to-understanding-nibrs.pdf/view.

Federal Bureau of Investigation. (2019b). *2019 Crime in the United States: Offense definitions*. Retrieved from Washington, D.C. https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/topic-pages/offense-definitions

Federal Bureau of Investigation. (2020). *Crime in the United States 2019*. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2019/crime-in-the-u.s.-2019/topic-pages/persons-arrested.pdf.

Fernandez-Vina, M. H., Prood, N. E., Herpolsheimer, A., Waimberg, J., & Burris, S. (2020). State laws governing syringe services programs and participant syringe possession, 2014-2019. *Public Health Reports, 135*(1_suppl), 128S–137S. https://doi.org/10.1177/0033354920921817

Ferri, M., Davoli, M., & Perucci, C. A. (2011). Heroin maintenance for chronic heroin-dependent individuals. *Cochrane Database of Systematic Reviews, 2011*(12), Article CD003410. https://doi.org/10.1002/14651858.CD003410.pub4

Firth, C. L., Maher, J. E., Dilley, J. A., Darnell, A., & Lovrich, N. P. (2019). Did marijuana legalization in Washington State reduce racial disparities in adult marijuana arrests? *Substance Use & Misuse, 54*(9), 1582–1587. https://doi.org/10.1080/10826084.2019.1593007

Kilmer, B., Taylor, J., Caulkins, J. P., Mueller, P. A., Ober, A. J., Pardo, B., … Reuter, P. (2018). *Considering heroin-assisted treatment and supervised drug consumption sites in the United States*. RAND Corporation.

Krawczyk, N., Schneider, K. E., Eisenberg, M. D., Richards, T. M., Ferris, L., Mojtabai, R., … Saloner, B. (2020). Opioid overdose death following criminal justice involvement: Linking statewide corrections and hospital databases to detect individuals at highest risk. *Drug and Alcohol Dependence, 213*, Article 107997. https://doi.org/10.1016/j.drugalcdep.2020.107997

Laqueur, H. (2015). Uses and abuses of drug decriminalization in Portugal. *Law & Social Inquiry, 40*(3), 746–781. https://doi.org/10.1111/lsi.12104

Linden, A. (2015). Conducting interrupted time-series analysis for single- and multiple-group comparisons. *The Stata Journal, 15*(2), 480–500. https://doi.org/10.1177/1536867x1501500208

Lopez Bernal, J., Cummins, S., & Gasparrini, A (2018). The use of controls in interrupted time series studies of public health interventions. *International Journal of Epidemiology, 47*(6), 2082–2093. https://doi.org/10.1093/ije/dyy135

Maier, S. L., Mannes, S., & Koppenhofer, E. L. (2017). The implications of marijuana decriminalization and legalization on crime in the United States. *Contemporary Drug Problems, 44*(2), 125–146. https://doi.org/10.1177/0091450917708790

National Center for Health Statistics. (2022). *Vital statistics rapid release: Provisional drug overdose death counts*. Retrieved from https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm.

Netherland, J., Kral, A. H., Ompad, D. C., Davis, C. S., Bluthenthal, R. N., Dasgupta, N., … Wheelock, H. (2022). Principles and metrics for evaluating Oregon's innovative drug decriminalization measure. *Journal of Urban Health, 99*(2), 328–331. https://doi.org/10.1007/s11524-022-00606-w

O'Connor, A. W., Sears, J. M., & Fulton-Kehoe, D. (2022). Overdose and substance-related mortality after release from prison in Washington State: 2014-2019. *Drug and Alcohol Dependence, 241*, Article 109655. https://doi.org/10.1016/j.drugalcdep.2022.109655

Oregon Criminal Justice Commission. (2020). *IP 44 Racial and ethnic impact statement*. Retrieved from https://www.theskanner.com/images/stories/2020/August/IP44-REI-Statement-Supplement.pdf.

Oregon National Incident-Based Reporting System. (2022). *ONIBRS system specification*. Retrieved from https://www.oregon.gov/osp/Docs/ONIBRS%20System%20Specification%20V3.6.pdf.

Pew Charitable Trusts. (2022). *Drug arrests stayed high even as imprisonment fell from 2009 to 2019*. Retrieved from https://www.pewtrusts.org/-/media/assets/2022/02/drug-arrests-stayed-high-even-as-imprisonment-fell-from-2009-to-2019.pdf.

Plunk, A. D., Peglow, S. L., Harrell, P. T., & Grucza, R. A. (2019). Youth and adult arrests for cannabis possession after decriminalization and legalization of cannabis. *JAMA Pediatrics, 173*(8), 763–769. https://doi.org/10.1001/jamapediatrics.2019.1539

Rosmarin, A., & Eastwood, N. (2012). A quiet revolution: drug decriminalisation policies in practice across the globe. *Drugs, the law and human rights (Release, London, 2012)*.

Schnittker, J., & John, A. (2007). Enduring stigma: the long-term effects of incarceration on health. *Journal of Health and Social Behavior, 48*(2), 115–130.

Schranz, A. J., Fleischauer, A., Chu, V. H., Wu, L. T., & Rosen, D. L. (2018). Trends in drug use-associated infective endocarditis and heart valve surgery, 2007 to 2017: A study of statewide discharge data. *Annals of Internal Medicine*. https://doi.org/10.7326/M18-2124

Sheehan, B. E., Grucza, R. A., & Plunk, A. D. (2021). Association of racial disparity of cannabis possession arrests among adults and youths with statewide cannabis decriminalization and legalization. *JAMA Health Forum, 2*(10), Article e213435. https://doi.org/10.1001/jamahealthforum.2021.3435

Smart, R., Pardo, B., & Davis, C. S. (2021). Systematic review of the emerging literature on the effectiveness of naloxone access laws in the United States. *Addiction, 116*(1), 6–17. https://doi.org/10.1111/add.15163

Sundaresh, R., Yi, Y., Roy, B., Riley, C., Wildeman, C., & Wang, E. A. (2020). Exposure to the US Criminal Legal System and Well-Being: A 2018 cross-sectional study. *American Journal of Public Health, 110*(S1), S116–S122. https://doi.org/10.2105/AJPH.2019.305414

Supreme Court of the United States. (1932). *New State Ice Co. v. Liebmann, 285 U.S. 262*. Supreme Court of the United States.

Townsend, T. N., Hamilton, L. K., Rivera-Aguirre, A., Davis, C. S., Pamplin, J. R., Kline, D., … Cerda, M. (2022). Use of an inverted synthetic control method to estimate effects of recent drug overdose good samaritan laws, overall and by black/white race/ethnicity. *American Journal of Epidemiology, 191*(10), 1783–1791. https://doi.org/10.1093/aje/kwac122

Tsai, A. C., Kiang, M. V., Barnett, M. L., Beletsky, L., Keyes, K. M., McGinty, E. E., … Venkataramani, A. S. (2019). Stigma as a fundamental hindrance to the United States opioid overdose crisis response. *PLoS Medicine, 16*(11), Article e1002969. https://doi.org/10.1371/journal.pmed.1002969

U.S. Census Bureau. (2021). *American community survey, 5-year estimates, 2019-2020*. Retrieved from https://www.census.gov/programs-surveys/acs/data.html.

Unlu, A., Tuukka, T., & Hakkarainen, P. (2020). *Drug decriminalization policy: Literature review: Models, implementation and outcomes*. Retrieved from Helsinkii, Finland https://www.julkari.fi/bitstream/handle/10024/140116/URN_ISBN_978-952-343-504-9.pdf?sequence=1&isAllowed=y.

Volkow, N. (2023). *Pregnant people with substance use disorders need treatment, not criminalization*. Retrieved from https://nida.nih.gov/about-nida/noras-blog/2023/02/pregnant-people-substance-use-disorders-need-treatment-not-criminalization.

Washington Code. Washington Statute 69.50.4013.

Washington Legislature. (2021). *Enrolled Senate Bill*, 5476.

Wildeman, C., & Muller, C. (2012). Mass imprisonment and inequality in health and family life. *Annual Review of Law and Social Science, 8*(1), 11–30. https://doi.org/10.1146/annurev-lawsocsci-102510-105459

Wurcel, A. G., Anderson, J. E., Chui, K. K., Skinner, S., Knox, T. A., Snydman, D. R., & Stopka, T. J. (2016). Increasing infectious endocarditis admissions among young people who inject drugs. *Open Forum Infectious Diseases, 3*(3), ofw157. https://doi.org/10.1093/ofid/ofw157