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One-Year Association of Drug Possession Law Change With Fatal Drug Overdose in Oregon and Washington

Spruha Joshi, PhD, MPH; Bianca D. Rivera, MPH; Magdalena Cerdá, DrPH, MPH; Gery P. Guy Jr, PhD, MPH; Andrea Strahan, PhD, MPP; Haven Wheelock, MPH; Corey S. Davis, JD, MSPH

IMPORTANCE Two states modified laws to remove or substantially reduce criminal penalties for any drug possession. The hypothesis was that removing criminal penalties for drug possession may reduce fatal drug overdoses due to reduced incarceration and increased calls for help at the scene of an overdose.

OBJECTIVE To evaluate whether decriminalization of drug possession in Oregon and Washington was associated with changes in either direction in fatal drug overdose rates.

DESIGN, SETTING, AND PARTICIPANTS This cohort study used a synthetic control method approach to examine whether there were changes in drug possession laws and fatal drug overdose rates in Oregon and Washington in the postpolicy period (February 1, 2021, to March 31, 2022, in Oregon and March 1, 2021, to March 31, 2022, in Washington). A counterfactual comparison group (synthetic controls) was created for Oregon and Washington, using 48 states and the District of Columbia, that did not implement similar policies during the study period (January 1, 2018, to March 31, 2022). For 2018-2021, final multiple cause-of-death data from the National Vital Statistics System (NVSS) were used. For 2022, provisional NVSS data were used. Drug overdose deaths were identified using *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* underlying cause-of-death codes X40-X44, X60-X64, X85, and Y10-Y14.

EXPOSURES In Oregon, Measure 110 went into effect on February 1, 2021. In Washington, the Washington Supreme Court decision in *State v Blake* occurred on February 25, 2021.

MAIN OUTCOME Monthly fatal drug overdose rates.

RESULTS Following the implementation of Measure 110, absolute monthly rate differences between Oregon and its synthetic control were not statistically significant (probability = 0.26). The average rate difference post Measure 110 was 0.268 fatal drug overdoses per 100 000 state population. Following the implementation of the policy change in Washington, the absolute monthly rate differences between Washington and synthetic Washington were not statistically significant (probability = 0.06). The average rate difference post *Blake* was 0.112 fatal drug overdoses per 100 000 state population.

CONCLUSIONS AND RELEVANCE This study found no evidence of an association between legal changes that removed or substantially reduced criminal penalties for drug possession in Oregon and Washington and fatal drug overdose rates. Additional research could examine potential other outcomes as well as longer-term associations with fatal drug overdose overall and across racial and ethnic groups.

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Supplemental content

Author Affiliations: Department of Population Health, New York University Grossman School of Medicine, New York (Joshi, Rivera, Cerdá, Davis); Division of Overdose Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, Georgia (Guy, Strahan); Outside In, Portland, Oregon (Wheelock); Network for Public Health Law, Edina, Minnesota (Davis).

Corresponding Author: Spruha Joshi, PhD, MPH, Division of Epidemiology, Department of Population Health, NYU Grossman School of Medicine, 180 Madison Ave, 4th Floor, New York, NY 10016 (spruha.joshi@nyulangone.org).

The overdose crisis in the US continues to be a leading factor in potentially preventable morbidity and mortality. Nationwide, there were 106 699 drug overdose deaths in 2021,[1] a 16% increase over 2020.[2] In response to this ongoing public health emergency, states have enacted a number of laws designed to reduce overdose and other drug-related harms.[3-5] Additionally, it has been hypothesized that removing criminal penalties for possession of currently criminalized drugs may reduce drug overdose fatality and other drug-related harm, particularly in the context of an illicit drug market highly contaminated with fentanyl and fentanyl analogues.[6-8] Data from numerous states including Oregon show that persons who use drugs (PWUD) are often reluctant to call 911 during an overdose due to fear of arrest and other negative criminal-legal outcomes.[9-11] Removing these penalties may increase calls for help and reduce arrest rates and related incarceration leading to lower fatal overdose rates. Alternatively, removing criminal penalties for drug possession might increase overdose deaths by removing some disincentives for drug use. The possession of drugs other than cannabis was illegal in every state until legal changes in Oregon and Washington in early 2021.

On February 1, 2021, a citizen initiative termed Measure 110 went into effect in Oregon. This law, approved by over 58% of Oregon voters,[12] changed the possession of small amounts of all previously criminalized drugs[13] from a crime to a noncriminal Class E violation for which no jail, supervision, or other criminal penalties can be imposed. The maximum fine for a Class E violation is $100, which is waived if the person completes a health assessment within 45 days of receiving a citation. The law also reduced the penalties for possession of drugs in amounts over the Class E threshold from a felony to a low-level misdemeanor in most cases. Measure 110 also directs hundreds of millions of dollars in state cannabis tax revenue to increasing access to programs aimed at reducing overdose risk such as substance use disorder treatment, harm reduction programs, and related services.

Shortly thereafter, Washington arrived at a similar policy change through a combination of a court decision and ensuing action by the state legislature. On February 25, 2021, the Washington Supreme Court found the state's drug possession statute unconstitutional in a case termed *State v Blake*.[14] As a result, the possession of small amounts of drugs in the state was immediately legalized. On May 13, 2021, drug possession was recriminalized by the state legislature. The new law, however, was markedly different from the pre-*Blake* law. It reclassifies most drug possession crimes from felonies to misdemeanors and substantially reduces the types of objects that qualify as drug paraphernalia under state law. It also requires that a law enforcement officer offer a referral to substance use disorder assessment and services such as outpatient treatment, a triage facility, or a recovery navigator 2 or more times before arresting a person for low-level drug possession and permits them to make those referrals indefinitely in lieu of arrest.[15] Similarly, the law encourages prosecutors to divert possession cases for assessment, treatment, or other related services.

Both drug policy changes occurred amidst substantial increases in overdose-related deaths, largely due to the adulteration of the drug supply with fentanyl and fentanyl analogues. In Oregon, drug overdose deaths increased 76% from 2011 to 2021, and overdose deaths from synthetic opioids (eg, fentanyl) increased 84% from 2020 to 2021.[16] Similarly, drug-related overdose deaths in Washington increased more than 66% from 2019 to 2021.[17]

We used restricted-use National Center for Health Statistics mortality data and provisional mortality data to estimate the associations of the policy changes in Oregon and Washington with fatal drug overdoses using a synthetic control approach. Our evaluation approach was undertaken after formative research with PWUD in Oregon, which identified metrics of importance and provided advice on designing the research project.[18,19] To our knowledge, this is the first study to evaluate whether changes to decriminalize possession of small amounts of drugs (Oregon) or prioritize public health over criminal-legal interventions for such possession (Washington) were associated with changes in fatal drug overdose rates in the year following these law changes.

Key Points

Question Were laws that fully or partially decriminalize drug possession in Oregon and Washington associated with fatal drug overdose rates 1 year post implementation?

Findings In this cohort study using synthetic control analysis, laws decriminalizing drug possession in Oregon and Washington were not associated with changes in fatal drug overdose rates in either state. The average rate difference in Oregon post change was 0.268 fatal drug overdoses per 100 000 state population, while the average rate difference in Washington post change was 0.112 fatal drug overdoses per 100 000 state population.

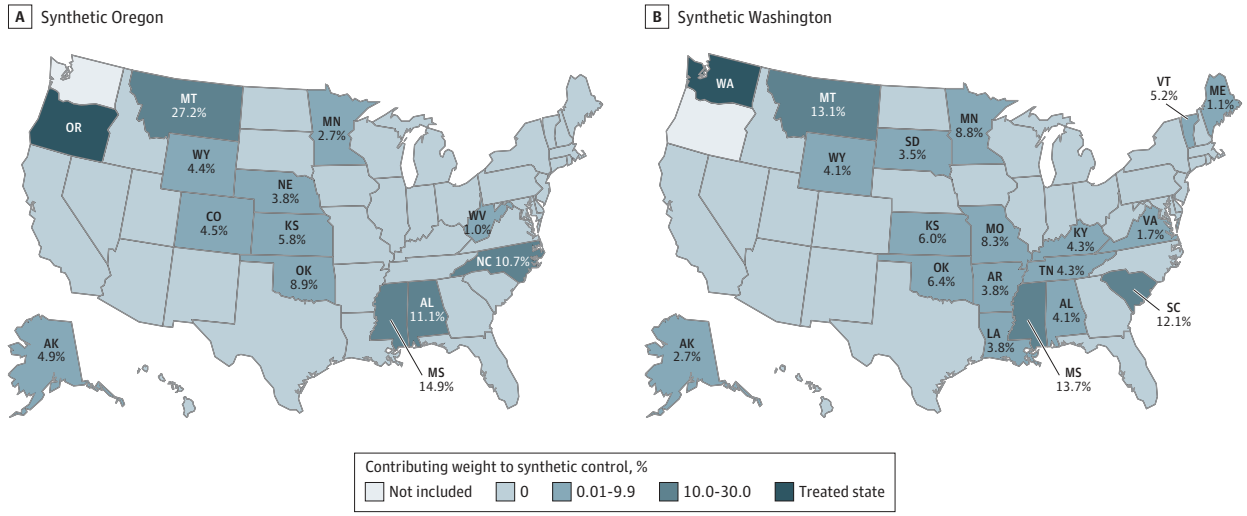
Meaning The findings of this study suggest that legal changes to remove or decrease criminal penalties for drug possession are not associated with the fatal drug overdose rate 1-year post implementation; further research is needed to examine the medium- and long-term consequences of these legal changes.

Methods

Study Design

We used a quasi-experimental method to compare observed and expected fatal drug overdose rates from February 1, 2021, through March 22, 2022, for Oregon, and March 1, 2021, through March 31, 2022, for Washington, following changes to the drug possession laws in each state. In Oregon, our primary exposure was the implementation of Measure 110, which went into effect on February 1, 2021. In Washington, our primary exposure was the Washington Supreme Court decision in *State v Blake*, which occurred on February 25, 2021. We created a counterfactual comparison group for Oregon, using January 1, 2018, through January 31, 2021, as the prepolicy period, and a counterfactual comparison group for Washington using January 1, 2018, through February 28, 2021, as the prepolicy period. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for observational studies.[20] It was deemed exempt

Figure 1. Donor Pool Units With Nonzero Weights Contributing to Synthetic Oregon and Synthetic Washington



Data from National Vital Statistics System for Oregon (A) and Washington (B), January 2018-February/March 2021.

by the New York University Grossman School of Medicine Institutional Review Board because the study did not involve human participants.

Our outcome of interest, fatal drug overdose, was measured using death certificate data from the Centers for Disease Control and Prevention's National Vital Statistics System. For 2018 through 2021, we used final multiple cause-of-death data.[21] For 2022, we used reported provisional data, as final data were not available at the time of the analysis.[22,23] Drug overdose deaths were identified using *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* underlying cause-of-death codes X40-X44, X60-X64, X85, and Y10-Y14 and multiple cause-of-death codes T36-T50. Monthly fatal drug overdose rates were calculated using state population denominators from American Community Survey 5-year estimates.[24] Hereinafter, findings reported as rates per 100 000 represent rates per 100 000 state population.

We considered covariates to optimize the match between the outcomes predicted by the estimated counterfactual comparison group and the observed outcomes in the prepolicy matching period. For each model, we tested whether the inclusion of various sociodemographic and policy covariates improved fit beyond inclusion of matching prepolicy period outcomes alone (eMethods in Supplement 1). For our models, including covariates did not improve fit in any model, so they were not included in the main analyses (eTable 1 in Supplement 1).

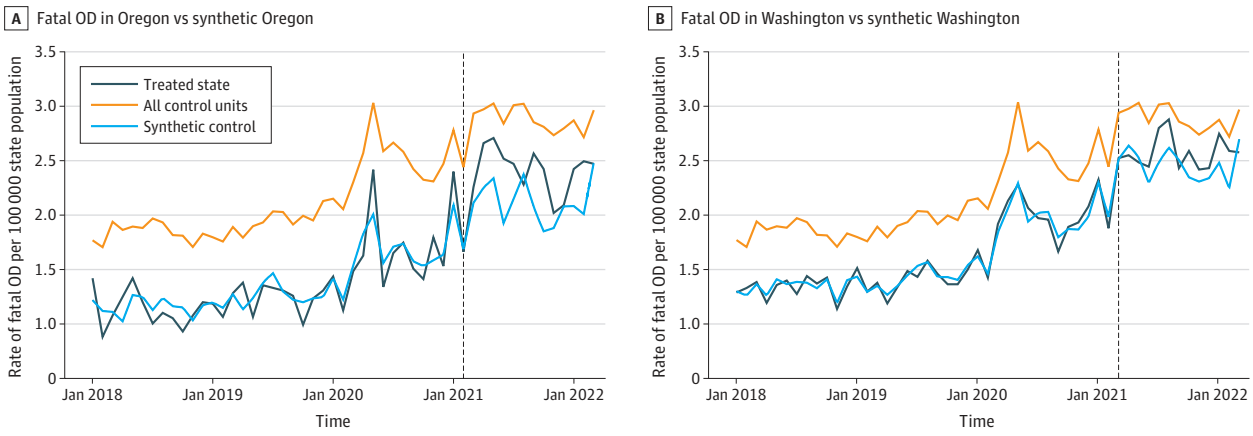
Statistical Analysis

We used the synthetic control method (SCM)[25] to compare postpolicy outcomes between both Oregon and Washington and their estimated counterfactual comparison groups. The SCM allows for estimation of the outcomes of interventions that occurred in a small number of treated units (Measure 110 in Oregon, and the *State v Blake* decision and subsequent legislative change in Washington). Unlike commonly used methods in policy evaluation, such as the difference-in-differences approach, the SCM generates a synthetic preintervention and postintervention counterfactual, which avoids the often-implausible parallel trends assumption required by difference in differences.[25] The synthetic control, or estimated counterfactual, is a weighted average of the outcomes in the untreated comparison or donor units—places without a similar policy. The donor units are selected to maximize the preintervention fit of the synthetic control to the observed outcomes in the treated unit. To assess fit, we evaluated the root mean square prediction error (RMSPE) of the synthetic control. The lower the RMSPE, the better the fit in the preintervention period. The weighted mean of the donor units is then used to estimate the outcome trend in the postintervention period in the absence of the policy change (the counterfactual). As we hypothesized that the policy changes may be associated with a change in either direction of fatal drug overdose, a 2-sided test was appropriate. Analyses were conducted in Stata, version 17.0 (StataCorp LLC), using *synth* and *synth_runner* commands with nested option.[26]

In creating the synthetic controls, Oregon and Washington were excluded from each other's donor pool. The donor pool for the synthetic controls included all other 48 states and the District of Columbia, for a total of 49 donor units. The synthetic control group estimation was based on monthly fatal overdose rates in the prepolicy period in the treated and donor pool units. Once we obtained well-fitting synthetic controls for Oregon and Washington, we compared the postpolicy fatal drug overdose rates of each treated state with its synthetic control through March 31, 2022. Each treated state's synthetic control weighting is shown in **Figure 1.**

To examine whether the difference in fatal drug overdose rates in Oregon and Washington and their synthetic controls after the policy changes in each state were due to chance, we conducted permutation-based tests (also termed placebo

Figure 2. Monthly Fatal Drug Overdose (OD) Rates per 100 000 State Population



Oregon vs synthetic Oregon (A) and Washington vs synthetic Washington (B), January 2018-March 2022. The vertical line represents the implementation of Measure 110 and the *Blake* decision. All control units reflect an unweighted average rate of fatal drug overdose over the study period, inclusive of all 49 control units. The vertical line indicates the implementation of the drug policy change.

tests), in which each donor unit was successively treated as an intervention unit.[25] We repeated the analysis to generate synthetic controls for each of the 49 donor units for Oregon and Washington to assess whether the estimated association was larger than in most of the placebo trials. We report the number of placebo trials in which this estimated association was larger than the association in Oregon and Washington out of the 49 donor units. The probability reported subsequently includes the treated state in the numerator and denominator (out of 50 units).

As a sensitivity analysis, we calculated SCM models in which we excluded units with a poor preintervention fit (RMSPE >5 times or >2 times that of the treated state).[25] We also conducted controlled interrupted time series analyses with synthetic Oregon or Washington serving as the control group.[27] This allowed for the quantification of the differences in both level and slope changes post-Measure 110 and post-*Blake* decision. As we hypothesized that the policy changes may be associated with a change in either direction of fatal drug overdose, a 2-sided test was 5 appropriate (α = .05).

Results

Oregon

Oregon's synthetic control was composed of 12 donor units with nonzero weights (Figure 1A; eTable 2 in Supplement 1). **Figure 2** shows that monthly fatal drug overdose rates followed the same prepolicy change trend closely in Oregon and its synthetic control (RMSPE = 0.154). The unweighted average fatal drug overdose rate of all control units is represented in Figure 2. This rate was higher relative to that of Oregon in the prepolicy change period, supporting the approach of using a counterfactual weighted synthetic Oregon. A comparison of individual control unit rates and that of the treated state are shown in eFigure 1 in Supplement 1. The monthly fatal drug overdose rates in Oregon and synthetic Oregon in the prechange period, also supporting model fit, are available in eTable 3 in Supplement 1.

Following the implementation of Measure 110, absolute monthly rate differences between Oregon and synthetic Oregon were not statistically significant (**Table 1**), indicating that Measure 110 was not associated with fatal drug overdoses in Oregon. The average rate difference post change was 0.268 fatal drug overdoses per 100 000 (**Table 2**). Similar findings were observed in several permutation tests (12 of 49 tests, 13 of 50 units overall) (**Figure 3**). This suggests that any observed association of Measure 110 in Oregon had a higher probability of being due to chance than a result of policy change (probability = 0.26). A list of these units and their RMSPE ratios relative to Oregon are shown in eFigure 2 in Supplement 1.

Washington

Washington's synthetic control was composed of 18 donor units with nonzero weights (Figure 1B). Monthly fatal drug overdose rates followed the same prepolicy trend closely, with an excellent fit (RMSPE = 0.063) (Figure 2). The unweighted average fatal drug overdose rate of all control units was higher relative to that of Washington in the prechange period, supporting the approach of using a counterfactual weighted synthetic Washington. Monthly fatal drug overdose rates in Washington and synthetic Washington in the prechange period, also supporting model fit, are available in eTable 3 in Supplement 1.

Following the implementation of policy change in Washington, absolute monthly rate differences between Washington and synthetic Washington were not statistically significant (Table 1). The average rate difference post change was 0.112 fatal drug overdoses per 100 000 (Table 2). This difference is likely due to chance, since permutation tests suggested that other individual donor units exhibited a change as high or higher than that of Washington (2 of 49 tests, 3 of 50 units overall, probability = 0.06) (Figure 3). A list of donor units and their RMSPE ratios relative to Washington are shown in eFigure 2 in Supplement 1.

Table 1. Difference in Monthly Fatal Drug Overdose Rate Post–Policy Change Oregon vs Synthetic Oregon and Washington vs Synthetic Washington[a]

Month	Rates of overdose per 100 000 state population					
	Oregon	Synthetic Oregon	Rate difference[b]	Washington	Synthetic Washington	Rate difference[b]
2021						
Feb	1.66	1.69	−0.02	NA	NA	NA
Mar	2.26	2.11	0.14	2.52	2.51	0.01
Apr	2.66	2.25	0.41	2.55	2.64	−0.09
May	2.71	2.34	0.37	2.48	2.53	−0.05
Jun	2.52	1.93	0.59	2.44	2.29	0.15
Jul	2.47	2.15	0.32	2.80	2.48	0.31
Aug	2.28	2.38	−0.09	2.88	2.62	0.26
Sep	2.57	2.07	0.49	2.43	2.50	−0.07
Oct	2.42	1.85	0.57	2.59	2.34	0.24
Nov	2.02	1.88	0.14	2.42	2.31	0.11
Dec	2.09	2.08	0.01	2.43	2.34	0.09
2022						
Jan	2.42	2.08	0.34	2.74	2.48	0.27
Feb	2.50	2.01	0.49	2.59	2.24	0.34
Mar	2.47	2.48	−0.01	2.57	2.69	−0.12

Abbreviation: NA, not applicable.

[a] Dates from February 2021 to March 2022 for Washington vs March 2021 to March 2022 for synthetic Washington.

[b] Rate differences were tested at an α = .05 significance level. None were statistically significant.

Sensitivity Analysis

Results were consistent with the primary analyses after restricting the donor pool to states with a preimplementation fit no higher than 5 times that of the treated states (permutation tests: Oregon: 12 of 49, Washington: 2 of 49) (eFigure 3 in Supplement 1). When restricting the donor pool to units with a preimplementation fit no higher than 2 times that of the treated states there were fewer donor units with post-pre RMSPE ratios higher or equal to those of the treated states, but the direction of the association was unchanged for Oregon (permutation test: 10 of 49 tests; probability = 0.22). For Washington, the association of policy change became statistically significant (permutation test: 1 of 49 tests; probability = 0.04) (eFigure 4 in Supplement 1).

Results from the weighted controlled interrupted time series analyses were consistent with the findings of the primary analyses (eFigure 5 in Supplement 1). There were no statistically significant changes in the level or slope of the monthly rate of fatal drug overdose in treated states compared with their weighted controls following policy change in either state (eTable 4 and eTable 5 in Supplement 1).

Table 2. Difference in Fatal Drug Overdose Rates Between Oregon and Washington and Synthetic Controls in the Postimplementation Period, February/March 2021-March 2022

Variable	Oregon	Washington
Mean postdecriminalization rate difference	0.268	0.112
Pre-RMSPE	0.154	0.063
Post-RMSPE	0.365	0.193
Post pre-RMSPE ratio[a]	2.369	3.042
Permutation ratio result[b]	13 of 50	3 of 50
Probability, %	26	6

Abbreviation: RMSPE, root mean square prediction error.

[a] Ratios were calculated before rounding.

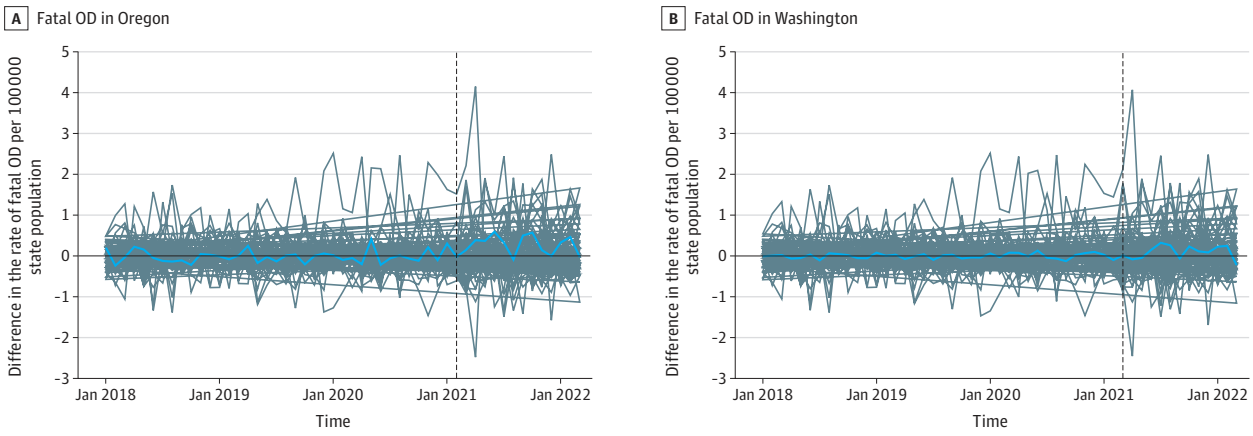
[b] Permutation ratio results reflect the proportion of control units with a post-prepolicy change RMSPE ratio higher than or equal to that of the treated state, inclusive of the treated state in the numerator and denominator. For example, 12 of 49 placebo tests had a ratio greater than Oregon's ratio. This results in 13 of 50 units overall. Washington was not counted in the denominator for Oregon and vice versa.

Discussion

Oregon and Washington have recently made changes to their drug laws to fully or partially legalize possession of small amounts of drugs and increase investment in treatment access. To our knowledge, this is the first study to evaluate the association between those changes and fatal drug overdose. Using the synthetic control method to compare post-drug policy changes in fatal drug overdose rates in Oregon and Washington and estimated rates in the absence of these drug policy changes, we found no evidence that either Measure 110 in Oregon or the Washington *Blake* decision and subsequent legislative amendments were associated with changes in fatal drug overdose rates in either state. These findings were also robust to variations in the donor pool and the modeling strategy.

The Oregon Criminal Justice Commission estimated that approximately 1800 fewer Oregonians per year would be convicted of felony possession of controlled substances and nearly 1900 fewer Oregonians per year would be convicted of mis-

Figure 3. Permutation Tests of Monthly Fatal Drug Overdose (OD)



Rates for Oregon (A) and Washington (B) obtained from the National Vital Statistics System, January 2018-March 2022. Each line displays the difference between the observed and estimated rate of fatal drug OD. The vertical line indicates the implementation of the drug policy change.

demeanor possession after Measure 110 was enacted. The Commission also noted that the measure would "likely lead to significant reductions in racial/ethnic disparities in both convictions and arrests."[28] In Oregon, Measure 110 was promoted to voters as a policy change that would treat drug use as a public health issue by decriminalizing possession and investing in health services and ultimately reduce drug overdoses. In Washington, 260 000 drug convictions were vacated or are subject to resentencing as a result of the *Blake* decision.[29] Arrest and incarceration increase the risk for future overdose.[30] Between 2014 and 2018, drug overdose was the leading cause of death among persons released from prison in Washington (216 deaths per 100 000 person-years post release).[31] Additionally, research shows being arrested for a drug charge even without subsequent incarceration is a risk factor for opioid overdose death, and that this risk increases with the number of arrests an individual experiences.[32] Given the link between arrests and incarceration and overdose, it is plausible that the Oregon and Washington policy changes could result in fewer fatal drug overdoses.

This study, however, did not find such a reduction. There may be several reasons for this. Most importantly, the post-intervention period observed (approximately 1 year) is relatively short. It is possible that any difference in monthly fatal drug overdose rates we found may be more attenuated, because both policies included access to treatment provisions. The first round of Oregon Access to Care grants were distributed in 2020, with additional awards totaling approximately $287.3 million allocated to the behavioral health resource partners. The rollout of funding was slow and most was distributed between April and September 2022, after our study period.[33-36] Funded programming has the potential to decrease risky drug-related behaviors and support pathways to addiction recovery, which can reduce nonfatal and fatal drug overdose. Additionally, there have been few calls for the Measure 110 treatment hotline, potentially due to variability in law enforcement practices on Class E citations and associated referrals.[33,37] Furthermore, the influence of arrest and criminal legal system involvement may be cumulative and attenuated, such that reductions in fatal drug overdose might be lagged.

Limitations

These analyses have limitations. First, due to the lag in complete death data, we combined finalized National Center for Health Statistics data for 2018-2021 with provisional data for 2022. State-month provisional counts are subject to change given that there may be death records pending investigation. However, fewer than 1% of deaths were pending investigation as of March 2022 in Oregon, Washington, or their respective donor units.[22] Second, given that the synthetic control group is an estimate of the counterfactual and relies on several assumptions, it is possible that the synthetic control did not provide a good estimation of the counterfactual. We included pre-drug policy change outcome data to account for unobserved factors, assuming that similar trends indicate similar values with respect to variables that contribute to those trends.[25] However, given that our synthetic controls fit the pre-intervention trends well, there was not likely to be a large degree of unmeasured confounding.[38] There is a chance for residual confounding that could arise from other changes that affect fatal drug overdoses differentially between Oregon and Washington and the other states in the donor pool. However, when including potential confounding policies as covariates, none improved the fit of our counterfactual. Additionally, we were unable to evaluate the outcomes by age or race and ethnicity due to lack of data. Further research can examine these outcomes, particularly for Black American and Native American groups, given they face the highest overdose rates in these states.[16]

Conclusions

In the first year after policy implementation, this cohort study found no evidence of an association between drug policy

changes that remove or reduce criminal penalties for drug possession (Oregon) or require prearrest diversion for drug possession (Washington) and fatal drug overdose rates. Because some aspects of these laws may take time to be associated with fatal drug overdoses, it is important to evaluate the medium- and long-term consequences of these laws when more data become available. It is also important to examine other outcomes, such as nonfatal overdose, and arrests, with emphasis on how they vary by race, ethnicity, and socioeconomic status.[18,19]

ARTICLE INFORMATION

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