

# Risk of fentanyl-involved overdose among those with past year incarceration: Findings from a recent outbreak in 2014 and 2015

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## ARTICLE INFO

### Keywords:

Incarceration

Fentanyl

Overdose

## ABSTRACT

Overdose is the leading cause of unintentional injury-related death. Rhode Island (RI) has the highest rate of illicit drug use nationally and the 5th highest overdose mortality rate. RI has experienced an outbreak of fentanyl-related overdoses. In incarcerated populations, risk of overdose is greatly elevated. However, little is known about fentanyl-related overdose post-release. In the current analyses, we identify changes in fentanyl-related fatal overdose among those who died in 2014 and 2015 who were incarcerated in the year before death. We linked data from the RI Office of the Medical Examiner with records from the RI Department of Corrections. We calculated risk ratios and 95% confidence intervals using log-binomial regression to compare risk of fentanyl-involved overdose death. We also compared median time to death since release, median sentence length, and median number of incarcerations in 2014 and 2015. Results indicate that the risk of dying of a fentanyl-related overdose increased (RR: 1.99 (95% CI: 1.11–3.57,  $p = 0.014$ )) from 2014 to 2015 among those with past year incarceration. This study is one of the first to describe fentanyl-related fatal overdose among those with past year incarceration. In 2015 the median sentence was longer among those with a fentanyl-related overdose death and the median time from release to death among all who had past year incarceration extended past 90 days. Access to medications for addiction treatment, overdose education, and naloxone should be available during community re-entry and extended beyond the early post-release period.

## 1. Introduction

Overdose is the leading cause of unintentional, injury-related death in the United States (Warner et al., 2009). Rhode Island (RI) has the highest rate of illicit drug use nationally and the 5th highest overdose mortality rate (Rudd, 2016; Substance Abuse and Mental Health Services Administration, 2014). Like other states, RI is experiencing a dramatic rise in overdose deaths with an increase of more than 90% from 2011 to 2016 (Rhode Island Department of Health, 2016). Across the US, increasing overdose deaths have been accompanied by an outbreak of fentanyl-contaminated heroin and other drugs. Fentanyl is a synthetic opioid that is 50–100 times stronger than most other opioids (O'Donnell et al., 2017; Drug Enforcement Administration, 2017). From

2013 to 2015, overdose deaths that involved synthetic opioids and heroin increased more sharply than deaths that only included heroin in the Southern, Midwestern, and Northeastern US (O'Donnell et al., 2017). The number of fentanyl-involved overdose deaths in RI increased 15-fold from 2009 to 2016 (Rhode Island Department of Health, 2016). In 2014, 35% of all overdose deaths involved fentanyl, increasing to 50% in 2016 (Marshall et al., 2017).

In criminal justice (CJ)-involved populations, the risk of overdose is greatly elevated (Binswanger et al., 2016; Merrill et al., 2010). Nearly a third of all individuals who are addicted to heroin pass through the CJ system in any given year, and a majority of those incarcerated in local jails report issues with substance use (James and Glaze, 2006). Over 23% of state prisoners report ever using heroin or other opiates, and

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13% report regular use before incarceration (Mumola and Karberg, 2006). Among those incarcerated at the Rhode Island Department of Corrections (RIDOC), 18.5% meet the criteria for opioid use disorder; in fiscal year 2015, about 12% of all people at the RIDOC were incarcerated due to a drug charge (Rhode Island Department of Corrections, 2015).

The time immediately after release from jail or prison is a period of extreme risk of fatal overdose. In Washington State, overdose death was the leading cause of death among those who were recently incarcerated (Binswanger et al., 2016). However, very little is known about fentanyl-related overdose deaths post-release. In the current analyses, we identify changes in fentanyl-related fatal overdose among those with recent incarceration from 2014 to 2015.

## 2. Methods

We linked data from the RI Office of the Medical Examiner on overdose deaths (occurring January 1, 2014, to December 31, 2015) with records from the RIDOC. Data were linked deterministically by name and date of birth. We calculated risk ratios (RR) and 95% confidence intervals (CI) using log-binomial regression to compare risk of fentanyl-involved overdose death among those who died in 2014 and 2015 and were incarcerated in the year prior to their death. During the study period, there were a total of 530 fatal overdoses, and 79 were among those who had past year incarceration. We also compared median time to death since release, median sentence length, and median number of incarcerations in 2014 and 2015.

## 3. Results

Among those with past year incarceration ( $n = 79$ ), 35 overdose deaths (44%) involved fentanyl (see Table 1). The majority of decedents with past year incarceration were white, male, and aged 18–39. From 2014 to 2015, the total number of overdose deaths in RI increased; there were 240 overdose deaths in 2014 and 290 in 2015. The number of overdose deaths among those with past year incarceration remained relatively steady over the study period, with 35 (14.6%) overdose deaths in 2014 and 44 (15.2%) in 2015.

Among all overdose decedents, the number of fentanyl-involved overdose deaths increased each year as well, with 84 (35%) fentanyl-involved overdose deaths in 2014 and 136 (47%) in 2015. Among those with past year incarceration, the proportion of fentanyl-involved overdose deaths increased significantly from 2014 to 2015 (from 29%

to 56%,  $p = 0.02$ ). The RR for fentanyl-related overdose death among those with past year incarceration in 2015 compared to 2014 was 1.99 (95% CI: 1.11–3.57,  $p = 0.014$ ).

Among those with past year incarceration, for those whose overdose death did not involve fentanyl, the median length of sentence decreased from 50 days in 2014–15 days in 2015 ( $p = 0.1572$ ). However, among those whose overdose death involved fentanyl, the median length of sentence increased from 21 days in 2014–58 days in 2015 ( $p = 0.4342$ ). The median number of past year incarcerations at the RIDOC and the number of decedents with 30 or fewer days between release and death remained steady during the study period for all those with past year incarceration. However, the median days from release to death for both non-fentanyl-related (99 days to 103 days;  $p = 0.8344$ ) and only fentanyl-related (40 days to 135 days,  $p = 0.2735$ ) deaths among those with past year incarceration increased from 2014 to 2015. While these changes were not significant, it is worth noting that, for 2015, in all overdose deaths among those with past year incarceration the median time from release to death was over 90 days.

## 4. Discussion

This is one of only a few recent studies that have described past year incarceration among people who died of overdose and is the first report of fentanyl-involved overdose among those with recent incarceration during the current fentanyl crisis (Marshall et al., 2017; Merrall et al., 2010). Findings suggest that, compared to 2014, 2015 is marked by a higher risk of fentanyl-involved deaths for those with past year incarceration. Identifying the mechanisms driving the increase in fentanyl-related deaths among those with recent incarceration requires further investigation, but uncovering the ways that incarceration impacts people during community re-entry is warranted. For instance, incarceration may lower knowledge of the drug supply’s quality and possible contamination. During incarceration, people are removed from their communities and often abstain from drug use. Therefore, when people are released from jail or prison, they may be unfamiliar with the presence of fentanyl contaminants in other opioids. In addition, incarceration may interrupt people’s regular supply chain. People who use opioids have reported that maintaining long-term relationships with dealers, whom they trust to test their products prior to sale, is one strategy to guard against unwanted fentanyl adulteration (Carroll et al., 2017). These relationships are disrupted when dealers or users are arrested. Finally, law enforcement-driven responses to the fentanyl overdose epidemic might also increase the likelihood of incarceration

**Table 1**  
Sociodemographic characteristics of individuals who had a fatal overdose, 2014–2015.

	Recent incarceration ( $n = 79$ )							No incarceration ( $n = 451$ )							Recent vs. no incarceration
	Total ( $n = 79$ )		2015 ( $n = 44$ )		2014 ( $n = 35$ )		2015 v. 2014	Total ( $n = 451$ )		2015 ( $n = 246$ )		2014 ( $n = 205$ )		2015 v. 2014	
	$n$	%	$n$	%	$n$	%	$p$ -value	$n$	%	$n$	%	$n$	%	$p$ -value	
<b>Race</b>															
White	71	89.9	42	95.5	29	82.9		407	90.2	224	91.1	183	89.3		
Non-white	8	10.1	2	4.6	6	17.1	0.165	44	9.8	22	8.9	22	10.7	0.542	0.918
<b>Age</b>															
18–29	28	35.4	15	34.1	13	37.1	0.780	85	18.8	55	22.4	30	14.6	0.023 <sup>*</sup>	0.000 <sup>*</sup>
30–39	23	29.1	12	27.3	11	31.4	0.693	104	23.1	52	21.1	52	25.4	0.306	0.241
40–49	18	22.8	11	25.0	7	20.0	0.583	104	23.1	48	19.5	56	27.3	0.067	0.957
50+	10	12.7	6	13.6	4	11.4	0.760	158	35.0	91	37.0	67	32.7	0.333	0.000 <sup>*</sup>
<b>Gender</b>															
Male	64	81.0	34	77.3	30	85.7		312	69.2	174	70.7	138	67.3		
Female	15	19.0	10	22.7	5	14.3	0.296	139	30.8	72	29.3	67	32.7	0.442	0.039 <sup>*</sup>
Fentanyl	35	44.3	25	56.8	10	28.6	0.013 <sup>*</sup>	185	41.0	111	45.1	74	36.1	0.049 <sup>*</sup>	0.584

Note: for chi-square tests, referent level for race is “white”, reference value for gender is “male”.

\*  $p < 0.05$ .

for drug users and may also explain the increase in median sentence length for those with a fentanyl-related overdose in 2015.

The increase in fentanyl-related deaths among those with past year incarceration from 2014 to 2015 also demonstrates the need for evidence-based overdose education and interventions, especially the provision of naloxone at release and treatment with medications for addiction treatment. The results of this study provide a strong rationale to prioritize training and the provision of the antidote naloxone to individuals leaving correctional custody in both jails and prisons, regardless of sentence length. Exemplar programs that could be adapted in jail or prison settings include the DOPE Project in California and the Harm Reduction Coalition's work in the New York state prison system, both of which have developed overdose training modules and naloxone provision strategies (see: <http://harmreduction.org/issues/overdose-prevention/tools-best-practices/naloxone-program-case-studies/dope-project/and> <http://harmreduction.org/miscellaneous/overdose-prevention-nyc-prison/>).

Most previous research has demonstrated that the early post-release period (anywhere from the first two weeks to the first 90 days) is the time when recently incarcerated individuals are at the highest risk of overdose (Binswanger et al., 2007; Spaulding et al., 2011; Zlodre and Fazel, 2012). However, our findings indicate that people may be experiencing fatal overdoses for a more extended period during community re-entry, underscoring the importance of continued access to medications for addiction treatment and naloxone many months after release. The longer median time from release to death may be explained by an increase in the number of overdose-related interventions that have been rapidly implemented in RI, translating into an uptick in services available for individuals immediately after release (Montanaro et al., 2015).

Finally, it is worth noting that this study was made possible because we were able to match RIDOC data with records from the RI Office of the Medical Examiner. Other jurisdictions should similarly link administrative datasets to obtain a more comprehensive understanding of their local overdose epidemic. Several states and cities such as RI, Maryland, and New York City have published reports that can help guide this process (Marshall et al., 2017; Cherisco-Hsii et al., 2014; Heller et al., 2014).

## 5. Conclusion

This study is one of the first to describe fentanyl-related fatal overdose among those with past year incarceration. Results indicate that, while the proportion of past year incarceration among those who died of an overdose in 2014 and 2015 remained steady, the risk of dying of a fentanyl-related overdose increased. These findings underscore the importance of comprehensive access to medications for addiction treatment and naloxone during the extended community re-entry period.

## Role of funding

Funding for this study was provided by The Brown Initiative in HIV and AIDS Clinical Research for Minority Communities, R25MH083620, The UCLA HIV/AIDS, Substance Abuse and Trauma Training Program (HA-STTP), The HIV and Other Infectious Consequences of Substance Abuse, T32DA013911, and The Lifespan/Brown Criminal Justice Research Program on HIV and Substance Use, R25DA037190.

## Contributors

All authors made significant contributions to the study's design and conduct. LBR was the lead author and prepared initial drafts of this report. AM and LBR conducted study analyses. AM, BDLM, AH, SIR, JDR, and TCG critiqued the analysis plan, assisted with the interpretation of findings, and contributed to multiple versions of this brief. All authors contributed to and have approved the final manuscript for

publication.

## Conflict of interest

All authors declare that they have no conflicts of interest.

## Acknowledgements

This work is supported by NIH grant R21DA029201. The work of Drs. Green and Rich are also supported by NIH grants K24DA022112 and P30AI042853(JDR) and CDC grant R21CE001846 (TCG). Dr. Marshall is supported by the National Institute on Drug Abuse (DP2DA040236). Dr. Brinkley-Rubinstein is supported by the UCLA HIV/AIDS, Substance Abuse and Trauma Training Program (HA-STTP) (R25DA035692), the HIV and Other Infectious Consequences of Substance Abuse Training Program T32DA013911), and the Lifespan/Brown Criminal Justice Research Program on HIV and Substance Use (R25DA037190). The funders had no role in the design, analysis, interpretation, writing, review, preparation, or decision to publish this manuscript.

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