Opioid Overdose Deaths Among Formerly Incarcerated Persons and the General Population: North Carolina, 2000–2018

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Objectives. To compare opioid overdose death (OOD) rates among formerly incarcerated persons (FIPs) from 2016 to 2018 with the North Carolina population and with OOD rates from 2000 to 2015.

Methods. We performed a retrospective cohort study of 259 861 North Carolina FIPs from 2000 to 2018 linked with North Carolina death records. We used indirectly standardized OOD mortality rates and ratios and present 95% confidence intervals (CIs).

Results. From 2017 to 2018, the OOD rates in the North Carolina general population decreased by 10.1% but increased by 32% among FIPs. During 2016 to 2018, the highest substance-specific OOD rate among FIPs was attributable to synthetic narcotics (mainly fentanyl and its analogs), while OOD rates for other opioids were half or less than that from synthetic narcotics. During 2016 to 2018, the OOD risk for FIPs from synthetic narcotics was 50.3 (95% CI = 30.9, 69.6), 20.2 (95% CI = 17.3, 23.2), and 18.2 (95% CI = 15.9, 20.5) times as high as that for the North Carolina population at 2-week, 1-year, and complete follow-up after release, respectively.

Conclusions. While nationwide OOD rates declined from 2017 to 2018, OOD rates among North Carolina FIPs increased by about a third, largely from fentanyl and its analogs. (*Am J Public Health*. 2022; 112(2):300–303. https://doi.org/10.2105/AJPH.2021.306621)

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Formerly incarcerated persons (FIPs) have high prevalence of substance use and mental health disorders[1-3] and are at high risk of opioid overdose death (OOD) after release from incarceration.[4,5] In a previous North Carolina study, we found that from 2000 to 2015 the OOD rate among FIPs at 2 weeks and 1 year after release was 40 and 10.5 times that in the North Carolina general population, respectively.[4] Because of the dynamic OOD epidemic from commonly prescribed opioids (2011) to heroin (2014) and now to fentanyl and its analogs, it is unclear how the OOD rates have changed among FIPs.[6] This analysis adds 2016–2018 North Carolina incarceration release data to compare OOD rates among FIPs with the general population and examines effect measure modification by race, sex, and age.

METHODS

We conducted a retrospective cohort study among North Carolina FIPs released from incarceration from 2000 to 2018 to estimate postrelease OOD rates relative to the North Carolina general population OOD rates[4] and examined modification by age, sex, and race.

Data Sources

We linked the North Carolina Department of Public Safety's incarceration release data from January 1, 2000, to December 31, 2018, with North Carolina death records from the same period, using a deterministic algorithm including exact matches of Soundex for last and first names, date of birth, and sex.[4] The North Carolina Department of Public Safety data included dates of

prison entry and exit and demographics. The death records included death date and cause documented with *International Classification of Diseases, 10th Revision,* codes (*ICD-10*; Geneva, Switzerland: World Health Organization; 1992). We used the National Vital Statistics System's bridged-race intercensal population estimates from 2000 to 2018 for annual North Carolina demographic and population estimates.

FIPs, aged 18 years or older at release, contributed person-time to OOD rates from their release date until reincarceration, death, or end of study, whichever occurred first.[4] For the general population, each North Carolina resident contributed 1 person-year (PY) per calendar year. Between 2000 and 2018, there were 451 453 releases from North Carolina prisons among 259 861 unique individuals. Those released accrued 2 458 639 PYs. During this time, 17 422 individuals suffered out-of-prison deaths.

We defined OOD using underlying and contributing causes of death with an *ICD-10* code of X40–X44, T40.0 (opium), T40.1 (heroin), T40.2 (other opioids), T40.3 (methadone), and T40.4 (other synthetic narcotics, commonly fentanyl or its analogs).[7] Upon recent Centers for Disease Control and Prevention (CDC) guidance, *ICD-10* code T40.6 (unspecified narcotics) was also added. We examined all OODs combined and for specific opioids, including heroin, methadone, prescription opioids, and fentanyl. Covariates included age (18–24, 25–34, 35–44, 45–54, 55–64, and ≥ 65 years), sex (female or male), race (White or non-White), and calendar year of incarceration release among FIPs.

Statistical Analysis

We calculated FIPs' OOD rates by dividing the number of OODs by the PYs contributed at 2-week, 1-year, and complete follow-up after incarceration release, and for North Carolina general population by dividing total OODs among North Carolina residents by the state population for each calendar year. Complete follow-up indicates all available postrelease person-time.

Using indirect standardization, we calculated standardized mortality ratios (SMRs) and 95% confidence intervals (CIs) at 2-week, 1-year, and complete follow-up after incarceration release, by comparing observed OODs among FIPs with expected OODs, had they had the same age–race–sex distribution as the North Carolina general population. We also calculated SMRs and 95% CIs comparing FIPs' observed versus expected OODs from heroin, commonly prescribed opioids (T40.2+T40.3), and other synthetic narcotics and measured effect measure modification by age, sex, and race. We also present directly standardized rates.

RESULTS

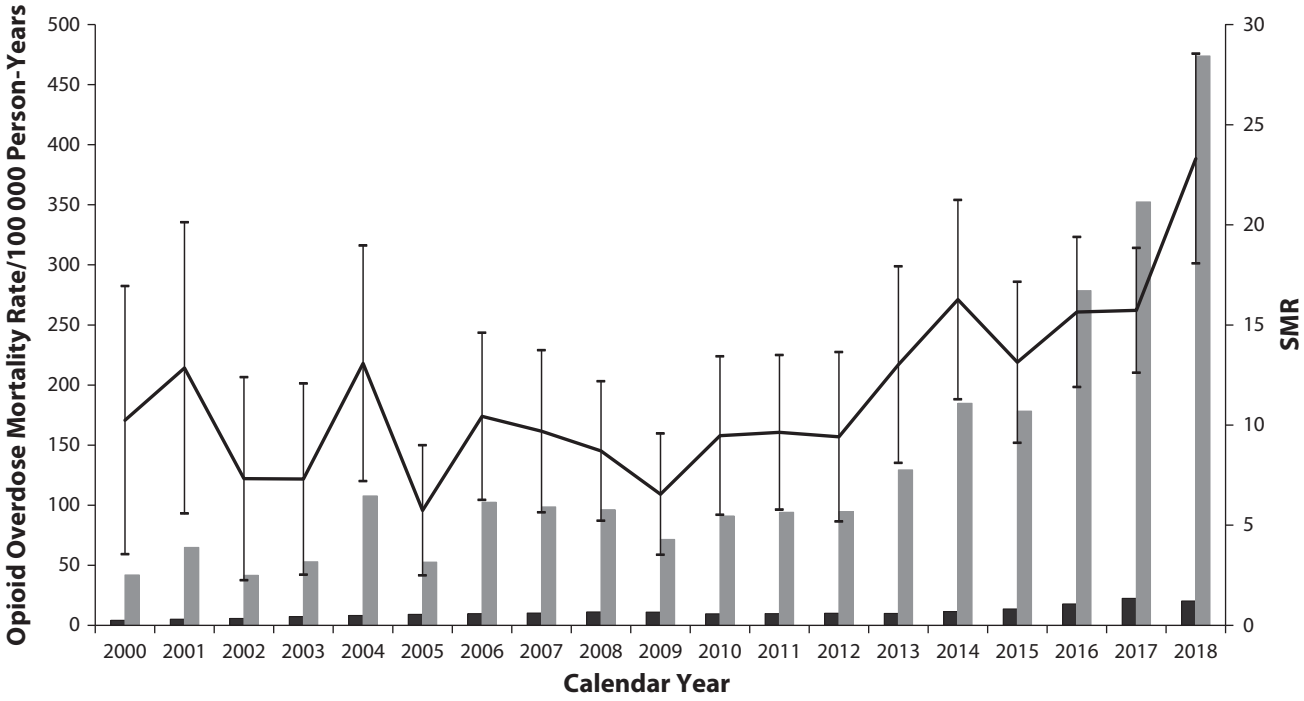
Of the 17 422 out-of-prison deaths among FIPs released between 2000 and 2018 in North Carolina, 2078 (11.1%) were OODs. The OOD rate in the North Carolina general population decreased from 22.8 per 100 000 PYs in 2017 to 20.7 per 100 000 PYs in 2018 (10.1% decline). However, the OOD rate among FIPs increased by 32% from 362 per 100 000 PYs in 2017 to 479 per 100 000 PYs in 2018 (Figure 1), largely attributable to other synthetic narcotics, mostly fentanyl (Table A, available as a supplement to the online version of this article at http://www.ajph.org). As a result, whereas the SMR remained stable from 2014 to 2017, it increased significantly in 2018 (Figure 1).

The overall age-, sex-, race-, and calendar year–standardized postrelease OOD rate among FIPs from 2016 to 2018 was 960 per 100 000 PYs (95% CI = 646, 1274) at 2 weeks after release, 359 per 100 000 PYs (95% CI = 314, 404) at 1 year after release, and 302 per 100 000 PYs (95% CI = 268, 335) at complete follow-up after release (Table A). The highest substance-specific OOD mortality rate at 2-week, 1-year, and complete follow-up after release during 2016 to 2018 was attributable to synthetic narcotics, followed by heroin and commonly prescribed opioids (Table A).

Similarly, the 2016–2018 SMRs comparing observed and expected OOD rates from FIPs were highest for synthetic narcotics. Compared to the general population, FIPs were 50.3 times (95% CI = 30.9, 69.6), 20.2 times (95% CI = 17.3, 23.2), and 18.2 times (95% CI = 15.9, 20.5) more likely to die from a synthetic narcotic overdose by 2-week, 1-year, and complete follow-up after release, respectively (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). This is a large increase compared with 2000 to 2015 that is congruent with decreases for heroin and commonly prescribed OODs.[4] Hence, the majority of the 2018 SMR increase is attributable to synthetic narcotics, commonly involving fentanyl.

Overall, compared with general North Carolina population, from 2016 to 2018, FIPs were 46.6 times (95% CI = 31.4, 61.8), 17.4 times (95% CI = 15.2, 19.6), and 14.6 times (95% CI = 13.0, 16.6) as likely to die from OODs by 2-week, 1-year, and complete follow-up after release from incarceration, respectively (Figure A).

While there was no substantial effect measure modification by age, the 1-year postrelease SMR for female FIPs (42.6; 95% CI = 31.7, 53.4) was higher than for



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NC GP	4.09	5.04	5.68	7.24	8.23	9.17	9.81	10.16	11.06	10.92	9.60	9.76	10.06	9.94	11.36	13.58	17.80	22.40	20.33
FIPS	41.94	64.76	41.59	52.85	107.70	52.63	102.40	98.51	96.29	71.51	90.98	94.11	94.69	129.30	184.0	178.30	278.60	352.30	473.80
SMR	10.25	12.85	7.32	7.30	12.08	5.74	10.44	9.69	8.71	6.55	9.47	9.64	9.42	13.02	16.26	13.14	15.65	15.73	23.31
SMR L95	3.55	5.58	2.25	2.53	7.20	2.49	6.26	5.64	5.22	3.52	5.52	5.78	5.18	8.11	11.29	9.12	11.90	12.62	18.07
SMR U95	16.94	20.13	12.40	12.08	18.96	8.99	14.61	13.74	12.19	9.58	13.43	13.50	13.65	17.93	21.24	17.16	19.39	18.85	28.55

FIGURE 1— Standardized Annual Opioid Overdose Death Rates and Standardized Mortality Ratio Comparing Formerly Incarcerated Persons With North Carolina Residents: 2000–2018

Note. FIPS = formerly incarcerated persons; NC GP = North Carolina general population; SMR = standardized mortality ratios calculated using indirect standardization for age, sex, race, and calendar year; SMR L95 = lower 95% confidence interval for SMR; SMR U95 = upper 95% confidence interval for SMR.

male FIPs (14.7; 95% CI = 12.6, 16.8), and the SMR for White FIPs (20.9; 95% CI = 18.0, 23.8) was higher than for non-White FIPs (9.8; 95% CI = 6.9, 12.7).

DISCUSSION

While nationally and in North Carolina the OOD rates declined from 2017 to 2018,[8] OOD rates among FIPs increased by 32%, largely attributable to synthetic narcotics like fentanyl and its analogs. While the risk of OODs from heroin and commonly prescribed opioids among FIPs decreased during 2016 to 2018, the risk of OOD from synthetic narcotics increased substantively.[4] Compared with the 2000–2015 estimates,[4] the 1-year and complete follow-up SMRs for OODs comparing FIPs to North Carolina residents have increased substantially, even after excluding unspecified narcotics. Although there is effect measure modification by sex and race, all FIP subgroup SMRs are 10 times or more higher than the general population.

The North Carolina correctional system began successfully piloting programs to link FIPs to medications for opioid use disorders in community correction in 2017.[9] In addition, the North Carolina opioid action plan has increased naloxone access for everyone including community corrections officers.[10] Despite these interventions, FIPs continue to be vulnerable to OODs,[1] likely because our data predate these interventions; the 3-year period between 2016 and 2018 coincides with the 2017 peak of the synthetic opioid overdose epidemic in the United States,[8] and FIPs face barriers to medication for opioid use disorders initiation and retention upon re-entry including lack of health insurance, housing, and employment, and stigma around drug use and incarceration.[11] Furthermore, the North Carolina prison-based medication for opioid use disorders implementation has experienced COVID-19–related delays.

A potential limitation is the lack of death data for FIPs who move out of state. However, most incarcerated

people are released on probation or parole, so the 1-year postrelease OOD rates should not be underestimated. A CDC health alert from December 2020 shows an increase in OOD beyond the 2017 highs.[12] Future research will need to examine how the drug overdose epidemic under the shadow of the COVID-19 pandemic affects the health of FIPs. AJPH

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CONTRIBUTORS

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study was approved by the University of North Carolina at Chapel Hill's institutional review board.

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