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SPECIAL ARTICLE

Release from Prison — A High Risk of Death for Former Inmates

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Abstract

BACKGROUND

The U.S. population of former prison inmates is large and growing. The period immediately after release may be challenging for former inmates and may involve substantial health risks. We studied the risk of death among former inmates soon after their release from Washington State prisons.

METHODS

We conducted a retrospective cohort study of all inmates released from the Washington State Department of Corrections from July 1999 through December 2003. Prison records were linked to

the National Death Index. Data for comparison with Washington State residents were obtained from the Wide-ranging OnLine Data for Epidemiologic Research system of the Centers for Disease Control and Prevention. Mortality rates among former inmates were compared with those among other state residents with the use of indirect standardization and adjustment for age, sex, and race.

RESULTS

Of 30,237 released inmates, 443 died during a mean follow-up period of 1.9 years. The overall mortality rate was 777 deaths per 100,000 person-years. The adjusted risk of death among former inmates was 3.5 times that among other state residents (95% confidence interval [CI], 3.2 to 3.8). During the first 2 weeks after release, the risk of death among former inmates was 12.7 (95% CI, 9.2 to 17.4) times that among other state residents, with a markedly elevated relative risk of death from drug overdose (129; 95% CI, 89 to 186). The leading causes of death among former inmates were drug overdose, cardiovascular disease, homicide, and suicide.

CONCLUSIONS

Former prison inmates were at high risk for death after release from prison, particularly during the first 2 weeks. Interventions are necessary to reduce the risk of death after release from prison.

Introduction

At the end of 2004, more than 3% of adults in the United States were in jail, in prison, or on probation or parole.[1] At the end of 2001, there were approximately 5.6 million adults who had ever been incarcerated in a state or federal prison,[2] not including stays in local jails.

Prisoners' reentry — their return to the community from prison — can be stressful as former inmates try to obtain housing, reintegrate into their families and communities, find employment,[3,4] and gain access to health care. Studies outside the United States have suggested a high mortality rate after the release from prison,[5-11] but these findings have not been confirmed in the United States, and data on the causes of death are limited. European studies have suggested that mortality rates after release from prison were high among persons with a history of injection drug use.[9,11] A history of prison release[12] and prior arrests[13] has been associated with fatal drug overdoses in Australia and with nonfatal drug overdoses in San Francisco. The first few weeks after release might be a time of high vulnerability to drug overdose. Former inmates may also be at risk for death from violence, unintentional injury, and a lapse in treatment of chronic health conditions.

Information about the risk and causes of death after release from prison could focus preventive efforts, improve transitional care, and guide policies to improve outcomes. Therefore, the objectives of this study were to determine the risk of death among persons released from Washington State prisons, compare the mortality rates among former inmates with those among other state residents, investigate whether the first 2 weeks after release were associated with an elevated risk of death, and describe the major causes of death.

Methods

STUDY DESIGN

In this retrospective cohort study, we identified 30,636 persons who were released from the Washington State Department of Corrections between July 1, 1999, and December 31, 2003, from electronic records of the Department of Corrections. The Washington State prison system does not include jails, and it houses approximately 15,000 felony offenders sentenced to imprisonment for more than 1 year.

Of the 30,636 former inmates, 399 (1%) were excluded from the analysis for the following reasons: age was less 18 years at the time of release (45 persons), data on race were missing (20 persons), date of death reported by the National Death Index (NDI) for a match to a former inmate occurred before the person's release date but the person was not known to have died in prison (31 persons), the recorded date of release occurred before the date of admission to prison and two attempts to correct the inconsistency by contacting the Department of Corrections did not resolve it (155 persons), or death occurred while the inmate was on “extraordinary medical placement” (compassionate release) for grave illness before the official release date (5 persons). Six inmates who were granted extraordinary medical placement and survived until the end of their prison sentences were included in the analysis. The 143 inmates reported by the Department of Corrections to have died or to have been executed while incarcerated were excluded if the death occurred during the first or only admission to prison during the study period; otherwise, data on former inmates were censored as of the date of readmission to prison before death. The final sample consisted of 30,237 former inmates. The study was approved by the Veterans Affairs committee of the institutional review board of the University of Washington and the research review committee of the Washington State Department of Corrections, with a waiver of consent by the University of Washington Human Subjects Division.

SOURCES OF DATA

The Department of Corrections provided personal identifiers for all persons released from prison during the study period, including name, known aliases and nicknames, Social Security number,

date and state of birth, sex, race, marital status, and dates of incarceration. Race or ethnic group is self-reported on entry into the Washington State Department of Corrections. A second source was the NDI, a computerized database of information abstracted by states from death certificates that indexes deaths in the 50 states, the District of Columbia, the Virgin Islands, and Puerto Rico.[14] The NDI database provided potential matches of deaths for each record we submitted and a probabilistic score to determine which deaths were true matches to former inmates.[15] If an alias was classified as a true match, the person was considered to have died. Given the sensitive nature of the study, we did not contact family members or friends to confirm death.

The Wide-ranging OnLine Data for Epidemiologic Research (WONDER) system of the Centers for Disease Control and Prevention (CDC), known as CDC WONDER,[16] provided comparison data for Washington State residents in the form of death counts, population, and underlying causes of death according to age, sex, race, and year of death. The number of deaths in the state during 1999 was halved, because the study period began in mid-1999. Deaths and person-years of former inmates who died in Washington, according to the appropriate categories of age, sex, and race, were omitted, because these deaths were included in the total deaths reported in the CDC WONDER system.

STATISTICAL ANALYSIS

We calculated overall mortality rates (the number of deaths divided by the person-years at risk) and 95% confidence intervals (CIs). The time at risk was defined as the period between the release from prison and death, another incarceration, or the end of the study. For persons with repeated incarcerations during the study period, the time during a subsequent incarceration was excluded, whereas the time between the next release and death, another incarceration, or the end of the study was included. Data were censored as of December 31, 2003, or the date on which the inmate was reincarcerated, if the person remained in prison at the end of the study.

Using survival analysis, we examined the first 2 weeks and the three subsequent 2-week periods after release from prison. The relative risk of death was calculated by comparing mortality rates among former inmates to mortality rates among other Washington residents, with the use of indirect standardization,[17] adjusting for age, sex, and race with Poisson regression. We used indirect standardization to compare mortality rates in the study cohort with those in the reference population of Washington State residents stratified according to age (in groups of 18 to 19 years, 20 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, and 75 to 84 years), race (white, black, or other) and sex. Hispanic persons were categorized according to race, to correspond with the methods used in the CDC WONDER system. We examined potential interactions between release and age, release and sex, and release and race and used likelihood-ratio tests to detect significant differences in the fit of the models. The attributable-risk percentage

is the relative risk minus 1, divided by the relative risk times 100. The number of expected deaths for the category of age, sex, or race was calculated by multiplying the category-specific state mortality rate by the number of person-years among former inmates in the category. The results were summed for those categories to obtain the total expected deaths.

Causes of death were classified broadly according to the underlying cause of death. Accidental poisoning and exposure to noxious substances was described as a drug overdose. We examined the frequency of use of specific codes of the *International Classification of Disease, 10th Revision* (ICD-10)[18] in the list of multiple causes of death for each person provided in the NDI.[15] We estimated mortality rates for incarcerated inmates, using the number of deaths reported as occurring in prison, confirmed in the NDI (139 deaths during the study period), divided by half the midyear prison population of the State of Washington in 1999 plus the total midyear prison population from 2000 to 2003, to approximate the number of inmate person-years. SAS software (version 9.1) and Intercooled Stata software (version 9.1) were used to perform the analyses.

Results

Table 1.

Table 1. Characteristics of 30,237 Persons Released from the Washington State Department of Corrections, July 1999–December 2003.

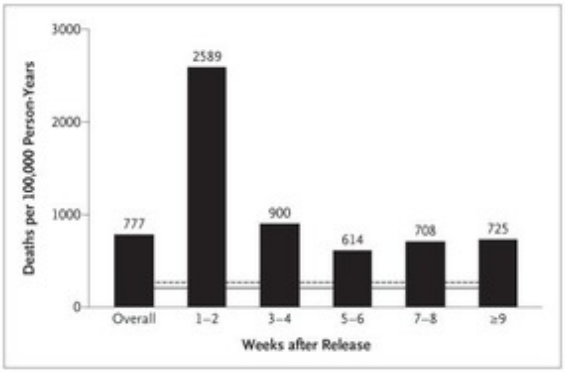
Characteristic	Value
Age — no. (%)	
18–24 yr	7,008 (23)
25–34 yr	10,675 (35)
35–44 yr	8,672 (29)
45–54 yr	3,137 (10)
55–64 yr	589 (2)
≥65 yr	156 (1)
Sex — no. (%)	
Male	26,270 (87)
Female	3,967 (13)
Race or ethnic group — no. (%)*	
White, non-Hispanic	18,857 (62)
Black, non-Hispanic	5,929 (20)
Hispanic	3,795 (13)
Native American, Alaska Native, non-Hispanic	1,012 (3)
Asian or Pacific Islander, non-Hispanic	575 (2)
Other or unknown	69 (0)
Number of releases during study period — no. (%)	
1	23,297 (77)
≥2	6,940 (23)
Positive on screening for chemical dependence while in prison — no./ total no. (%)	
First incarceration	11,408/18,200 (63)
Any incarceration	18,428/25,925 (71)
Serious mental health problem noted in prison — no. (%)	2,263 (8)
Type of release — no. (%)	
Community custody or parole	20,238 (67)
Discharge without community custody	8,018 (27)
Other	1,981 (7)

* Race or ethnic group was self-reported on entry into prison.

Characteristics of 30,237 Persons Released from the Washington State Department of Corrections, July 1999–December 2003.

We followed 30,237 persons who had been released from the Washington State Department of Corrections for a total of 57,049 person-years (a total of 38,809 releases). The mean (±SD) age at release was 33.4±9.8 years (range, 18 to 84) (Table 1). The majority were non-Hispanic white (62%) and male (87%); 91% of those who reported that they were Hispanic also reported being white. The mean length of incarceration was 22.9±37.8 months; in many cases, incarceration had begun before the start of the study. Approximately a quarter of the study cohort was released more than once during follow-up (range, 1 to 10 releases).

Figure 1.



Mortality Rates among Former Inmates of the Washington State Department of Corrections during the Study Follow-up (Overall) and According to 2-Week Periods after Release from Prison.

Table 2.

Table 2. Deaths and the Relative Risk (RR) of Death among Former Inmates of the Washington State Department of Corrections, as Compared with Other State Residents, Adjusted for Age, Sex, and Race.

Variable	Deaths		RR (95% CI)
	Observed	Expected	
Overall deaths	443	127	3.5 (3.2–3.8)
Deaths since release			
0–2 wk	38	3	12.7 (9.2–17.4)
3–4 wk	12	3	4.4 (2.6–7.6)
≥5 wk	392	121	3.2 (2.9–3.6)
Age*			
18–24 yr	37	11	3.4 (2.5–4.7)
25–34 yr	106	22	4.8 (4.0–5.8)
35–44 yr	135	33	4.0 (3.4–4.7)
≥45 yr	165	61	2.7 (2.3–3.2)
Sex*			
Male	390	117	3.3 (3.0–3.7)
Female	53	10	5.5 (4.2–7.3)
Race*			
White	301	86	3.8 (3.4–4.3)
Black	82	35	2.3 (1.9–2.9)
Other	60	6	5.5 (3.9–7.9)
Cause of death			
Overdose	109	9	12.2 (10.2–14.9)
Cardiovascular disease	57	27	2.1 (1.6–2.7)
Homicide	55	5	10.4 (8.0–13.6)
Suicide	40	12	3.4 (2.5–4.7)
Cancer	39	24	1.67 (1.2–2.2)
Motor vehicle accident	35	10	3.4 (2.4–4.8)
Liver disease	23	5	4.7 (3.2–7.2)

* For this category, relative risks were calculated by comparing former inmates with other Washington State residents for the subgroups defined. P<0.005 was considered to indicate statistical significance.

Deaths and the Relative Risk (RR) of Death among Former Inmates of the Washington State Department of Corrections, as Compared with Other State Residents, Adjusted for Age, Sex, and Race.

Over a mean follow-up period of 1.9±3.1 years, 443 persons included in the analysis died. Of these, 253 persons died within 1 year after release from prison. Of deaths reported according to state, 379 occurred in Washington, 17 in Oregon, 17 in California, 4 in Texas, 3 in Idaho, and the remainder elsewhere. Overall, the mortality rate among released inmates (Figure 1) was 777 deaths from all causes per 100,000 person-years (95% CI, 707 to 852). In contrast, the calculated mortality rate for Washington State residents of the same age, sex, and race as the former inmates was 223 deaths per 100,000 person-years. The mortality rate among former inmates was 3.5 times (95% CI, 3.2 to 3.8) that among state residents of the same age, sex, and race (Table 2). The attributable-risk percentage was 71%, amounting to 316 excess deaths.

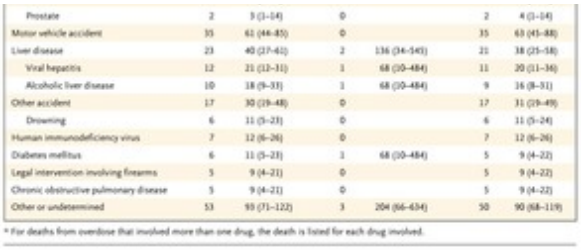
During the first 2 weeks after release, the rate of death from all causes among former inmates was 2589 per 100,000 person-years (95% CI, 1884 to 3558). The adjusted relative risk of death within the first 2 weeks after release was 12.7 times that among other state residents (95% CI, 9.2 to 17.4). If the mortality rate among former inmates were the same as that among other state residents of the same age, sex, and race, only 3 of the 38 deaths occurring within the first 2 weeks after release would have been expected. The mortality rate within the first week after release was even higher: 3661 per 100,000 person-years (95% CI, 2511 to 5399).

The adjusted relative risk of death among former inmates, as compared with other state residents, was significantly higher among women than among men (P=0.002) (Table 2). The relative risk of death among released inmates, as compared with other state residents, also varied according to age (P<0.001) and race (P=0.008).

Table 3.

Table 3. Leading Causes of Death after Release from Prison.

Cause	Overall		Within 2 Weeks after Release		More than 2 Weeks after Release	
	no. of deaths	no./100,000 person-years (95% CI)	no. of deaths	no./100,000 person-years (95% CI)	no. of deaths	no./100,000 person-years (95% CI)
All causes	443	777 (707–852)	38	2589 (1884–3558)	405	729 (661–801)
Overdose*	103	181 (149–219)	27	1840 (1213–2677)	76	137 (109–171)
Cocaine	50	87 (66–116)	15	1021 (616–1695)	35	63 (45–88)
Psychostimulants	19	33 (21–52)	5	341 (142–818)	14	25 (13–42)
Heroin	18	32 (20–50)	6	409 (184–91)	12	21 (14–40)
Methadone	18	32 (20–50)	5	341 (142–818)	13	23 (14–40)
Other opioids	13	23 (13–40)	5	341 (142–818)	8	14 (7–29)
Other narcotics	41	72 (53–98)	11	749 (415–1353)	30	54 (38–77)
Alcohol	20	30 (19–48)	3	204 (66–634)	14	25 (15–42)
Antidepressants (tricyclic or tetracyclic)	13	23 (13–39)	6	409 (184–910)	7	12 (6–26)
Multiple drugs	27	47 (32–6)	11	749 (415–1353)	16	29 (18–47)
Cardiovascular disease	56	98 (76–128)	1	68 (10–484)	55	99 (76–129)
Atherosclerotic heart disease	13	23 (13–29)	0		13	23 (14–40)
Acute myocardial infarction	10	18 (9–33)	0		10	18 (10–36)
Cerebrovascular disease	9	16 (8–30)	0		9	16 (8–31)
Hypertensive diseases	9	16 (8–30)	1	68 (10–437)	8	14 (7–29)
Endocarditis	2	4 (1–14)	0		2	4 (1–14)
Homicide	54	95 (73–124)	2	136 (34–545)	52	94 (71–123)
Handgun or other firearm involved	36	63 (46–87)	2	136 (34–545)	34	61 (44–86)
Suicide	40	70 (51–96)	2	136 (34–545)	38	69 (50–94)
Handgun or other firearm involved	10	18 (9–33)	1	68 (10–484)	9	16 (8–31)
Cancer	39	68 (50–94)	0		39	70 (51–96)
Lung or bronchial	19	33 (21–52)	0		19	34 (22–54)
Pancreatic	4	7 (3–19)	0		4	7 (3–19)
Liver	3	5 (2–16)	0		3	5 (2–17)



Prostate	2	3 (1–14)	0		2	4 (1–14)
Motor vehicle accident	35	61 (44–85)	0		35	61 (45–88)
Liver disease	23	40 (27–61)	2	136 (34–545)	21	38 (25–58)
Viral hepatitis	12	21 (12–31)	1	68 (10–484)	11	20 (11–36)
Alcoholic liver disease	10	18 (9–33)	1	68 (10–484)	9	16 (8–31)
Other accident	17	30 (19–48)	0		17	31 (19–49)
Drowning	6	11 (5–23)	0		6	11 (5–24)
Human immunodeficiency virus	7	12 (6–26)	0		7	12 (6–26)
Diabetes mellitus	6	11 (5–23)	1	68 (10–484)	5	9 (4–22)
Legal intervention involving firearms	5	9 (4–21)	0		5	9 (4–22)
Chronic obstructive pulmonary disease	5	9 (4–21)	0		5	9 (4–22)
Other or undetermined	53	93 (71–122)	3	204 (66–634)	50	90 (68–119)

* For deaths from overdose that involved more than one drug, the death is listed for each drug involved.

Leading Causes of Death after Release from Prison.

The leading cause of death among former inmates was drug overdose (103 deaths) (Table 3), representing nearly a quarter of all deaths. Of the 38 deaths occurring within 2 weeks after release, 27 were from overdoses. Within the first 2 weeks after release, the rate of death from overdose was 1840 per 100,000 person-years (95% CI, 1213 to 2677). The adjusted relative risk of death from overdose was 129 (95% CI, 89 to 186) among released inmates within 2 weeks after release, as compared with other state residents. Cocaine was involved in the largest number of deaths from overdose (50), followed by deaths involving use of psychostimulants, including methamphetamine (19), heroin (18), and methadone (18). Of deaths from overdose, 27 involved more than one substance (cocaine, psychostimulants, heroin, methadone, benzodiazepines, tricyclic antidepressants, or alcohol). Of 17 deaths from overdose of antidepressants, 13 involved tricyclic antidepressants.

Table 4.

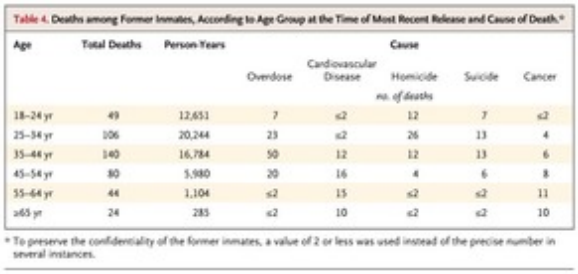


Table 4. Deaths among Former Inmates, According to Age Group at the Time of Most Recent Release and Cause of Death.*

Age	Total Deaths	Person-Years	Cause				
			Overdose	Cardiovascular Disease	Homicide	Suicide	Cancer
			no. of deaths				
18–24 yr	49	12,651	7	≤2	12	7	≤2
25–34 yr	106	20,244	23	≤2	26	13	4
35–44 yr	140	16,784	50	12	12	13	6
45–54 yr	80	5,980	20	16	4	6	8
55–64 yr	44	1,104	≤2	15	≤2	≤2	11
≥65 yr	24	285	≤2	10	≤2	≤2	10

* To preserve the confidentiality of the former inmates, a value of 2 or less was used instead of the precise number in several instances.

Deaths among Former Inmates, According to Age Group at the Time of Most Recent Release and Cause of Death.

The second leading cause of death was cardiovascular disease (56 deaths); of these deaths, 10 were caused by acute myocardial infarctions and 3 involved cocaine use. Homicide was the cause of the third highest absolute number of deaths (54) and the second highest number of excess deaths. Suicide, cancer, and motor vehicle accidents were also important causes of death. Deaths from cancer of the lung or bronchus represented nearly half of all deaths from cancer. Deaths from overdose, homicide, and suicide were more common among persons younger than 45 years, whereas deaths from cardiovascular disease and cancer were more common among those 45 years

of age or older (Table 4). Firearms were involved in 54 deaths, including 36 homicides, 10 suicides, 5 legal interventions, and 1 accident.

Table 5.

Table 5. Mortality Rates among Former Inmates of Washington State Prisons and Crude Mortality Rates among Current Prison Inmates during the Study Period.

Cause of Death	Former Inmates	Current Inmates
	no. of deaths/100,000 person-years	
All causes	777	201
Cardiovascular disease	98	68
Atherosclerotic heart disease	23	26
Acute myocardial infarction	18	10
Cerebrovascular disease	16	7
Hypertensive diseases	16	3
Cancer	68	42
Bronchial and tracheal	33	20
Pancreatic	7	6
Liver	5	4
Colon	0	3
Liver disease	40	23
Suicide	70	16
Chronic obstructive pulmonary disease	9	9
Homicide	95	6
Human immunodeficiency virus	12	3
Diabetes mellitus	11	3
Legal intervention involving firearms	9	3
Overdose	181	1
Motor vehicle accidents	61	1
Other accidents	30	1
Other causes	93	25

Mortality Rates among Former Inmates of Washington State Prisons and Crude Mortality Rates among Current Prison Inmates during the Study Period.

One hundred thirty-nine inmates died while in prison during an estimated 69,230 person-years from July 1999 through December 2003. The overall mortality rate during incarceration was 201 deaths per 100,000 person-years (Table 5). Among inmates, deaths from drug overdose occurred at a rate of 1.2, homicide at a rate of 5.0, and motor vehicle accidents at a rate of 1.2 deaths per 100,000 person-years, considerably less than the mortality rates for these causes after release. For nearly all causes of death, the rates among former inmates were substantially higher than those among inmates.

Discussion

During the first 2 weeks after release from the Washington State Department of Corrections, the risk of death among former inmates was 12.7 times that among Washington State residents of the

same age, sex, and race. The sharply elevated risk immediately after release suggests that the reentry process contributes to excess mortality in this population.

Overall, we observed an increase by a factor of 3.5 in the risk of death among former inmates. Mortality rates did not return to the baseline of the general population of the same age, sex, and race even several weeks after release. Factors such as level of education, employment status, level of income, neighborhood of residence, and health insurance status may account in part for the difference between the mortality rates among former inmates and those among other state residents of the same age, sex, and race. National estimates suggest that state prison inmates have a lower level of education than does the general population.[19] However, socioeconomic differences between former inmates and the general population are unlikely to account for all the observed variation in the relative risk of death during the 8 weeks after release from prison.

Our estimates for the study period showed that the risk of death was sharply higher after release than during incarceration, perhaps because there are fewer overdoses, homicides, or motor vehicle accidents during incarceration. In-prison mortality rates reported by the U.S. Bureau of Justice Statistics for 2001 and 2002 (244 deaths per 100,000 prisoners in state correctional facilities; 192 deaths per 100,000 Washington State prisoners) were also considerably lower than those among former inmates.[20]

Our comparisons were limited by the lack of specificity of the data in CDC WONDER on racial groups other than black or white, which may account for some of the interaction observed according to race. We may not have identified all deaths among former inmates, including deaths occurring outside the United States. Data on the Social Security numbers and names of former inmates may be more likely to be incorrect than data on other members of the population, but the personal identifiers of former inmates were likely to be as accurate as possible since these were provided by the criminal justice system. Ascertainment of known deaths may be better for men than for women and for whites than for blacks and persons of other races,[21] but the NDI is currently the best available source for identifying deaths in the United States.[21,22] Many types of personal identifiers and all known aliases for linkage improved our ability to ascertain deaths correctly.

We have identified important risks that former inmates must confront: drug overdose, cardiovascular disease, homicide, and suicide. A period of relative abstinence during incarceration may have led to diminished physiological tolerance to drugs, increasing the risk of overdose. The excess risk of homicide suggests that former inmates were exposed to considerable personal risk from violence. Firearms were involved in many deaths in this population after release. The risk of death from cardiovascular disease and lung cancer may be related to the high prevalence of

tobacco use in populations in correctional institutions.[23,24] A high prevalence of underlying mental illness and the psychological stress of reentry may have contributed to the excess risk of suicide. Persons with mental illness may have particular difficulty obtaining care and medications from community providers after the medications provided by prisons run out. Improved transitional planning for inmates with mental illness may help to reduce this risk.

We could not verify data from the Department of Corrections, nor could we be certain that deaths did not occur when an inmate was incarcerated in another correctional system within Washington State or elsewhere. Classification of the causes of death was subject to the limitations imposed by the use of data recorded in the NDI from death certificates. For instance, some suicides may have been misclassified as drug overdoses and some drug overdoses may have been misclassified as cardiovascular deaths. However, many suspected overdoses, suicides, and accidental deaths would have been coroners' cases and undergone investigation with toxicologic testing and autopsy, making our data at least as accurate as most standard reports on the cause of death provided by treating physicians.

Our study was based in a prison system in a single state in the United States, so we cannot be certain that the findings are generalizable to other correctional systems, states, or countries. U.S. prisons reported more than 600,000 releases in 2002.[25] In addition, jails in which persons awaiting trial or serving short-term sentences for misdemeanors are detained had approximately 10 million releases in 1997 (7.2 million unique persons).[26] If former jail inmates have an elevated risk of death similar to that of former inmates of Washington State prisons, the effect of the excess risk of death after release could be substantial.

Because a disproportionate number of black and Hispanic men interact with the criminal justice system, decreasing the risk of death after release may decrease disparities in health outcomes in this population overall. The age distribution in the categories of leading causes of death suggests that specific interventions might be targeted according to age. Interventions aimed at decreasing the risk of death could include planning for the transition from prison to the community, including use of halfway houses, work-release programs, drug-treatment programs, education about susceptibility to overdose after relative abstinence during incarceration, and preventive care to modify cardiac risk factors. Possible interventions after release include providing intensive case management during the period immediately following release and improving access to and continuity of medical and mental health care. In addition to possible reductions in mortality after release, there might be secondary benefits for society from such interventions, in the form of increased public safety.

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