

## Research Letter

### ASCERTAINMENT OF VITAL STATUS AMONG PEOPLE WITH CRIMINAL JUSTICE INVOLVEMENT USING DEPARTMENT OF CORRECTIONS RECORDS, THE US NATIONAL DEATH INDEX, AND SOCIAL SECURITY MASTER DEATH FILES

The increase in the rate of incarceration in the United States in recent decades (1) has drawn attention to the relationship between incarceration and health. Researchers have increasingly turned to administrative records to study the consequences of incarceration for mortality rates (2–5). Still, little is known about the performance of different methods to ascertain vital statuses of people involved in the criminal justice system. Some studies have relied on records of deaths among people in custody from departments of corrections (DOC) (6, 7), whereas others have linked records of participants with mortality registries, such as the National Death Index (NDI) and the Social Security Death Master File (SSDMF) (8–11).

DOC death records are commonly used in national prison mortality surveillance (6, 7), but these records only identify deaths that occur among people in custody (e.g., prison, jail) or under supervision (e.g., parole, probation). To assess long-term mortality rates, identifiers can be linked with the NDI or records derived from the SSDMF. The NDI is a comprehensive database amassed from state death certificates that has traditionally been shown to yield more matches than other sources, but it charges users to search records, has an approval and reporting delay, and is restricted to use for medical and health research (12–15). In 2015, an early release program improved the timeliness of NDI data (16). The SSDMF is more rapidly updated and available, either for a subscription fee through the National Technical Informational Service (17), or for free through secondary websites (18). However, the SSDMF only records deaths of people with social security numbers (SSNs), and since 2011, the public SSDMF no longer contains protected state death records. This means that records of more than 4 million deaths that occurred before 2011 have been removed and data on approximately 1 million fewer deaths have been added per year since 2011 (19–21).

Use of data from the NDI and SSDMF may result in differential ascertainment in populations overrepresented in the criminal justice system, such as people who are young, black, or Latino (1, 14, 22–26). Thus, it is important to estimate the relative utility of vital status data sources by criminal justice and demographic subgroups. We compared the completeness of vital status data obtained from the DOC, NDI, and SSDMF among individuals convicted of felonies.

## METHODS

We conducted a longitudinal cohort study using data from a US Midwestern state correctional system that had jurisdiction over state prisons, felony probation, and parole. The cohort included 145,718 individuals sentenced for

felonies in the state from January 1, 2003, to December 31, 2006 and excluded those who were re-sentenced for probation violations or re-sentenced for prior felony convictions. Deaths through December 31, 2012, were ascertained from DOC records and by linking identifiers obtained from the DOC with the NDI (Web Appendix 1, available at <http://aje.oxfordjournals.org/>) and accessing publicly available SSDMF data through a secondary website (<http://ssdmf.info/>; see Web Appendix 2 for details) (12). In the DOC data, 1.21% of records were missing any SSN, 89.51% had a single SSN, and 9.27% had more than 1 SSN. We calculated unadjusted mortality rates from each source, using rate ratios and McNemar's test to assess differences across sources.

Because DOC records only include deaths of individuals who were under DOC custody or supervision, we restricted the length of the observation period when comparing sources. We report results from 3 observation periods: the first captures all deaths through December 31, 2012; the second is censored after the date of last DOC contact with the individual; and the third is censored after the individual's last release from prison (see Web Appendix 3 for methodology details).

## RESULTS

Table 1 shows the numbers of deaths and crude mortality rates from each data source and observation period, along with comparisons across data sources. The NDI recorded more deaths than did either the DOC or the SSDMF in all observation periods (Web Figure 1), and the discrepancies between the NDI mortality rate and those from other sources were especially pronounced among nonwhites and younger people (see Web Appendix 4 and Web Tables 1 and 2 for details of second and third observation periods). The DOC recorded fewer deaths in the first observation period than did either the NDI (for NDI vs. DOC, rate ratio (RR) = 1.70) or the SSDMF (for SSDMF vs. DOC, RR = 1.29), but the gap between DOC and NDI mortality rates narrowed when the observation period was restricted to time until last DOC contact (for NDI vs. DOC, RR = 1.17) or time until last release from prison (for NDI vs. DOC, RR = 1.06). Although the discrepancy between the NDI and DOC mortality rates was relatively small between the date of the sentence until the last release from prison, the differences were statistically significant in all time periods because of the sample size. Whereas the NDI and DOC mortality rate estimates converged as the observation period grew more restrictive, the SSDMF mortality rate diverged from the other sources in all periods (Web Table 3). The SSDMF recorded

**Table 1.** Characteristics of the Study Cohort With a Felony Conviction in a US State and Comparison of Number of Deaths Ascertained by Source, 2003–2012

Observation Period	No.	DOC		NDI		SSDMF		Comparison Rate Ratios		
		No. of Deaths	Crude Mortality Rate <sup>a</sup>	No. of Deaths	Crude Mortality Rate <sup>a</sup>	No. of Deaths	Crude Mortality Rate <sup>a</sup>	NDI/DOC	NDI/SSDMF	SSDMF/DOC
Date of sentence through December 31, 2012	145,718	2,446	4.04	7,894	6.87	5,974	5.19	1.70 <sup>b</sup>	1.32 <sup>b</sup>	1.29 <sup>b</sup>
Race										
Black	59,735	898	3.25	3,027	6.39	2,036	4.29	1.97 <sup>b</sup>	1.49 <sup>b</sup>	1.32 <sup>b</sup>
White	84,650	1,539	4.74	4,826	7.26	3,913	5.88	1.53 <sup>b</sup>	1.23 <sup>b</sup>	1.24 <sup>b</sup>
Other	1,333	9	2.04	41	3.85	25	2.34	1.88 <sup>b</sup>	1.64 <sup>b</sup>	1.15 <sup>b</sup>
Sex										
Male	120,878	2,112	4.03	6,587	6.89	4,972	5.20	1.71 <sup>b</sup>	1.33 <sup>b</sup>	1.29 <sup>b</sup>
Female	24,840	334	4.12	1,307	6.73	1,002	5.14	1.63 <sup>b</sup>	1.31 <sup>b</sup>	1.25 <sup>b</sup>
Age at study entry, years										
<25	50,248	532	2.43	1,410	3.52	887	2.21	1.45 <sup>b</sup>	1.59 <sup>b</sup>	0.91 <sup>b</sup>
25–34	41,368	531	2.98	1,444	4.37	1,048	3.18	1.47 <sup>b</sup>	1.38 <sup>b</sup>	1.07 <sup>b</sup>
35–44	32,534	582	4.32	1,893	7.35	1,487	5.78	1.70 <sup>b</sup>	1.27 <sup>b</sup>	1.34 <sup>b</sup>
45–54	17,124	567	9.36	2,149	16.62	1,701	13.16	1.78 <sup>b</sup>	1.26 <sup>b</sup>	1.41 <sup>b</sup>
≥55	4,444	234	17.63	998	31.66	851	26.66	1.80 <sup>b</sup>	1.19 <sup>b</sup>	1.51 <sup>b</sup>
Sentence type										
Prison	27,713	722	4.29	1,269	5.65	934	4.20	1.32 <sup>b</sup>	1.35 <sup>b</sup>	0.98 <sup>b</sup>
Probation	51,216	675	3.73	2,719	6.79	2,051	5.09	1.82 <sup>b</sup>	1.33 <sup>b</sup>	1.37 <sup>b</sup>
Jail	11,095	125	3.42	772	8.86	574	6.60	2.59 <sup>b</sup>	1.34 <sup>b</sup>	1.93 <sup>b</sup>
Jail with probation	55,006	921	4.22	3,096	7.16	2,387	5.50	1.70 <sup>b</sup>	1.30 <sup>b</sup>	1.30 <sup>b</sup>
Fines and/or community service	688	3	2.79	38	7.28	28	5.36	2.61 <sup>b</sup>	1.36 <sup>b</sup>	1.92 <sup>c</sup>
Date of sentence through last DOC contact	145,718	2,446	4.04	2,870	4.74	2,119	3.50	1.17 <sup>b</sup>	1.35 <sup>b</sup>	0.87 <sup>b</sup>
Date of sentence through last prison release	50,674	275	1.56	290	1.65	215	1.22	1.06 <sup>d</sup>	1.35 <sup>b</sup>	0.78 <sup>b</sup>

Abbreviations: DOC, Department of Corrections database; NDI, National Death Index; SSDMF, Social Security Death Master File.

<sup>a</sup> Unadjusted mortality rates calculated as (no. of deaths/person-years × 1,000); not adjusted for age or other demographic characteristics.

<sup>b</sup>  $P < 0.001$  for McNemar test for equivalence of proportions from related/paired samples.

<sup>c</sup>  $P < 0.01$  for McNemar test for equivalence of proportions from related/paired samples.

<sup>d</sup>  $P < 0.05$  for McNemar test for equivalence of proportions from related/paired samples.

fewer deaths than did the other data sources except in the first observation period (through December 31, 2012), when the DOC rate was lowest because of its lack of coverage.

## DISCUSSION

We compared 3 sources of death records—NDI, SSDMF, and DOC—for people convicted of felonies, a large and underrepresented population in health research. The NDI recorded more deaths than did any other source in all observation periods. During DOC custody or supervision, mortality rates derived from the SSDMF data were lower than those derived from the DOC and NDI data. In analyses in which we examined subgroups defined by race, age, sex, and sentence type, differences in vital statuses across data sources were most pronounced for nonwhites and younger people.

Discrepancies in mortality rates across data sources can arise for multiple reasons, including errors in identifiers (e.g., false aliases and SSNs) resulting in false positives and false negatives, linkage errors, and biases specific to the data source (20, 27). DOC records are not prone to the error produced by linking records across data sources, but coverage is limited to deaths that occurred when people were in DOC custody or under its supervision. Moreover, our DOC records did not contain data on cause of death, which limits their utility for research. Although errors in linkage are a concern with data from NDI, it returns information on all potential matches, including matches for multiple aliases (at no additional cost); it is also thought to have the most comprehensive collection of death records (13, 28). In addition, the NDI provides data on cause of death (at an additional cost). The main drawbacks of the NDI are its relatively high cost and the time it takes to approve user applications and perform matches.

Both the NDI and SSDMF may miss some deaths of individuals who do not have SSNs, who immigrated to the United States, or who returned to their country of origin at the end of life (15, 23, 25, 29, 30). Such issues may be of particular concern among individuals involved in the criminal justice system because they may bias death rates downwards. However, a linkage between the National Longitudinal Mortality Study and the NDI did not show an appreciable bias resulting from missing SSNs in relative rates of death across groups divided by Hispanic and non-Hispanic ethnicity (31). The SSDMF under-reports deaths of individuals who have not qualified for Social Security benefits by working for at least 10 years, which could explain why mortality rates were lower in the SSDMF for people of black race and individuals younger than 25 years of age. The SSDMF offers public subscription access and can currently be accessed through secondary public websites, but since 2011, some deaths have been redacted, making it much less useful to researchers (19–21). The SSDMF also does not provide data on causes of death. Thus, we feel more confident in recommending the NDI than the SSDMF. Based on the population, setting, and observation period, investigators can select the source(s) best suited to their purpose and constraints.

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- Ingrid A. Binswanger<sup>1,2</sup>, Jeffrey D. Morenoff<sup>3,4</sup>, Charley A. Chilcote<sup>4,5</sup>, and David J. Harding<sup>6,7</sup>  
(e-mail: Ingrid.a.binswanger@kp.org)
- <sup>1</sup> Institute for Health Research, Kaiser Permanente Colorado, Denver, CO  
<sup>2</sup> Division of General Internal Medicine, Department of Medicine, University of Colorado School of Medicine, Aurora, CO  
<sup>3</sup> Department of Sociology, University of Michigan, Ann Arbor, MI  
<sup>4</sup> Institute for Social Research-Populations Studies Center, University of Michigan, Ann Arbor, MI  
<sup>5</sup> Risk, Classification and Program Evaluation, Michigan Department of Corrections, Lansing, MI  
<sup>6</sup> Department of Sociology, University of California, Berkeley, Berkeley, CA  
<sup>7</sup> Berkeley Population Center, University of California, Berkeley, Berkeley, CA
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