# Linking Deaths in Custody Reporting Program (DCRP) and National Death Index (NDI) data: Assessing Cause of Death (COD) Data Reported to the DCRP

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**Background**

The Bureau of Justice Statistics (BJS) has collected, analyzed and reported on deaths in the U.S. correctional system annually since the passage of the Death in Custody Reporting Act (2000 DICRA, PL. 106-297) to address public concerns about the safety and humane treatment of suspects, defendants, and offenders while in contact with or under the control or supervision of criminal justice agencies. The 2000 DICRA required local jails, state prisons, and state, and local law enforcement agencies to report information on the circumstances of each death occurring while offenders were in custody or of persons in the process of arrest to the Department of Justice. The Deaths in Custody Reporting Program (DCRP) began in 2000.

In January 2013, BJS sent a batch of DCRP jail and prison death records for data years 2007 through 2010 to the National Death Index (NDI), and received a matched file within a month of initial submission. The arrest-related death portion of the DCRP was not included in the linking project, and is therefore, excluded from this paper. The goal of the NDI-DCRP matching project was three-fold:

- Determine how many DCRP records are reported to the NDI.
- Assess whether the NDI can provide cause of death (COD) for DCRP cases missing COD.
- Analyze the agreement rate between the NDI and the DCRP in regards to the final COD.

**Data sources**

The DCRP collects individual-level death records containing demographic information about the deceased (e.g. sex, age, and race), as well as their incarceration status (e.g. admission date, criminal offense, and the circumstances surrounding the death, including COD). COD is the linchpin of mortality studies, and BJS initiated the linking project because it was concerned about data reliability regarding COD.

BJS instructs DCRP respondents to report the final COD as it is reported on the autopsy report. Respondents are also asked to indicate whether the death was due to illness, AIDS-related, acute drug or alcohol intoxication, accident, suicide, homicide or other causes (table 1). With the exception of AIDS-related deaths, respondents are then asked to further specify the COD after marking the major COD sub-categories. Finalized DCRP death cases are sent to a nosologist, who assigns International Classification of Disease, 10th revision (ICD-10) codes, as established by the World Health Organization, to determine COD.

**Table 1. Changes to the Deaths in Custody Reporting Program (DCRP) cause of death survey item, 2007-2010**

| | Specify cause | | | | ICD-10 code assigned | | | |
|---|---|---|---|---|---|---|---|---|
| Cause of death category | 2007 | 2008 | 2009 | 2010 | 2007 | 2008 | 2009 | 2010 |
| Illness | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| AIDS-related | No | No | No | No | No | No | No | No |
| Alcohol/drug intoxication | No | No | Yes | Yes | No | No | No | No |
| Accidental | Yes | Yes | Yes | Yes | No | No | No | No |
| Suicide | No | Yes | Yes | Yes | No | No | No | No |
| Homicide[a] | Yes | Yes | Yes | Yes | No | No | No | No |
| Other | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AIDS-related deaths and deaths due to alcohol/drug intoxication are reported as separate manners of death on the DCRP forms. These deaths are typically a subcategory of natural and accidental deaths.

[a]Includes homicides committed by other inmates, incidental to the staff use of force, and resulting from assaults sustained prior to incarceration.

Source: Bureau of Justice Statistics, Deaths in Custody Reporting Program, 2007-2010

Because of how COD was historically reported to the DCRP (e.g. details of suicides and intoxication deaths were not collected prior to 2009, and AIDS-related deaths are binary), ICD-10 codes were only assigned to illness deaths or deaths marked as "other."

This instruction may have compromised the completeness of COD data because respondent's ability to accurately distinguish between final and underlying causes of death, as outlined by the National Center for Health Statistics (NCHS), is not known.

The roles of DCRP correctional respondents vary, but they are generally a mix of correctional line and medical staff. Annually, most jail inmates (95%) and the majority of prison inmates (65%) who die are sent out for autopsy, but securing the autopsy results requires respondents to contact coroner or medical examiners offices that are independent from jail and prison respondents.

The NDI is a national database of filed death certificates, and it is considered a full enumeration of known deaths in the United States (Fillenbaum et al., 2009). The NDI captures information on final ("immediate") COD, as well as any underlying causes. The NDI, like the DCRP, codifies COD through ICD-10 codes, but allows up to 14 ICD-10 codes per death. NDI indexes deaths in the 50 states, the District of Columbia, the Virgin Islands, and Puerto Rico (NCHS, 2013). Matches involving known decedents also increases the likelihood that matches are "true" matches. The NDI has been used to study mortality in correctional populations by assessing post-release mortality for former prisoners, but this project was the first time DCRP records had been matched to deaths reported to the NDI (Binswanger et al., 2007; Binswanger et al., 2013; Binswanger et al., 2011).

**Reason for the match**

The NDI can identify both persons whose death status is unknown and those whose death status is confirmed. The goal of the match was three-fold:

- to assess to what degree COD as reported to the DCRP agreed with COD as reported to the NDI
- to assess the quality of the matches
- to potentially resolve DCRP cases that were missing COD.

Annually, less than 3% of jail or prison deaths in the DCRP are missing the COD variable. But in 2008, nearly a quarter (21%) of jail DCRP records were missing COD (Noonan et al., 2015). During data year 2008, BJS selected a new data collection agent to run the project, and the transition truncated the data collection period by 5 months as the old cooperative agreement was closed out and the new contract was completed. BJS considered, but ultimately rejected, following up with respondents because of costs concerns and the inevitable burden associated with attempting to get final COD for 203 jail deaths. Initially, BJS considered imputing COD for the missing cases, but ultimately abandoned the idea after preliminary work could not accurately predict COD for cases where COD was known (Carson and Noonan, 2012). Even the best model could only predict at an accuracy rate of less than 0.3.

After the unsuccessful imputation analysis, BJS began to explore alternate options for resolving these cases and settled on sending the DCRP data through the NDI for matching. BJS selected data years 2007 through 2010 to be able to assess the match for years before and after 2008 when data was incomplete. Prisoner death data was also sent for matching because it would allow BJS to assess any differences in reporting and match quality by correctional populations, i.e. whether one correctional population's DCRP correlated better or worse with the NDI's death data.

An additional concern regarding DCRP data was that by instructing respondents to only report the final COD, as determined by a medical examiner or other medicolegal investigation, the quality of COD information was inherently limited. Although nosologists can assign up to five ICD-10 codes for deaths reported to the DCRP, the median number assigned to DCRP deaths for data years 2007-2010 was 1.06 (table 2). Heart disease had the largest median number of ICD-10 codes assigned (1.5) and AIDS-related deaths (.49) had the fewest[1]. While this approach is effective for record and report final COD, it significantly limits the ability to report on underlying factors that contributed to the death.

Underlying COD is the disease or injury that triggered the chain of events leading directly to death, or the circumstances surrounding the event which produced the fatal injury (U.S. Health and Human Services, 2004). In addition to the previously stated issues that culminated in the NDI matching project (e.g. missing data, the opportunity to enhance DCRP data with underlying COD information that is captured via the NDI was a strong motivating factor.

Although the DCRP does not capture all desired data elements (e.g. social security number, maiden name, and state of birth) for an NDI match, it does collect the first and last name of the deceased, their date of birth, sex, race, Hispanic-origin, and date of death. Together, these data elements were sufficient to match DCRP records to records in the NDI.

[1] Despite not having a data field devoted to listing associated CODs for AIDS deaths, respondents will sometimes record additional death information in the "other-specify" or the "notes" fields. Nosologists will consider these fields in addition to the COD fields in order to incorporate all relevant information in the assignment of ICD-10 codes.

**Table 2. Mean Number of ICD Codes Available in Deaths in Custody Reporting Program and the National Death Index, 2007-2010**

| | DCRP | | NDI | |
|---|---|---|---|---|
| | Mean | Standard deviation | Mean | Standard Deviation |
| **All** | 1.06 | 0.95 | 2.69 | 1.63 |
| **Facility type** | | | | |
| Prison | 1.17 | 0.93 | 2.74 | 1.69 |
| Jail | 0.68 | 0.95 | 2.54 | 1.40 |
| **Year** | | | | |
| 2007 | 1.00 | 0.93 | 2.67 | 1.60 |
| 2008 | 1.01 | 0.93 | 2.68 | 1.61 |
| 2009 | 1.10 | 0.96 | 2.74 | 1.68 |
| 2010 | 1.15 | 0.99 | 2.69 | 1.66 |
| **Cause of death** | | | | |
| Heart disease | 1.50 | 0.90 | 2.72 | 1.62 |
| AIDS | 0.49 | 1.14 | 2.18 | 1.58 |
| Cancer | 1.35 | 0.78 | 2.34 | 1.60 |
| Liver disease | 1.57 | 0.93 | 2.76 | 1.64 |
| Respiratory disease | 1.34 | 0.72 | 2.80 | 1.64 |
| Other illness[a] | 1.07 | 0.84 | 3.00 | 1.81 |
| Suicide | - | - | 2.34 | 0.86 |
| Homicide[b] | - | - | 3.17 | 1.47 |
| Drug/alcohol intoxication | - | - | 3.65 | 1.49 |
| Accident | - | - | 3.60 | 1.78 |
| Other | - | - | 3.62 | 1.69 |

Note. The mean number of ICD codes in DCRP is calculated by DCRP cause of death category. The mean number of ICD codes in DCRP is not displayed for unnatural deaths including suicides, homicides, drug/alcohol intoxication, and accidents, and other COD deaths because the DCRP did not assign ICD codes to such deaths.

[a]Includes illnesses such as cerebrovascular disease, diabetes and other nonleading natural causes of death.

[b]Includes homicides committed by other inmates, incidental to the staff use of force, and resulting from assaults sustained prior to incarceration.

Sources: Bureau of Justice Statistics, Deaths in Custody Reporting Program, 2007-2010. National Center for Health Statistics, National Death Index, 2007-2010.

**Matching**

The DCRP files were submitted for matching in January of 2013, and, at that time, 2010 was the most recent DCRP data year that was publicly available. The lower bound, 2007, was chosen because of the previous discussed issues with jail data for 2008. BJS chose the NDI over other sources (e.g. the Death Master File) because is it considered the gold standards for U.S. mortality. NDI was also chosen because one of the goals of the match was to resolve cases missing COD and the batch was made of known decedents (Hermansen et al., 2009). Known decedent searches cost $5 per record, but it was more cost-efficient for the DCRP project because of the relatively small number of records.

At the time of the matching project, the NDI, like the DCRP, did not close out the analysis file until all death records have been filed, a process that can take nearly two years. The NDI has since adopted an early release program, but it was implemented after the match was undertaken (U.S. Department of Health and Human Services, 2013).

After receiving the matched NDI-DCRP file from the NDI, BJS sent it to the University of Colorado-Denver (UCD) for further processing. Dr. Ingrid Binswanger, who was a BJS visiting fellow at the time of the match and was on the faculty at UDC's medical school, undertook the initial analysis of the matching project because she had prior experience with both NDI and DCRP data.

The Colorado Multiple Institutional Review Board deemed the study IRB exempt because the records in question involved dead subjects; however, because the records did contain sensitive information, including names, birth dates, and death dates, a HIPAA-compliant process (Colorado Clinical & Translational Science Institute) was used to securely transmit data between BJS and UCD.

BJS submitted a data files file formatted to NDI standards containing 17,389 DCRP records (3,904 jail death records and 13,485 prison death records) to NDI for matching. The DCRP files included the name, date of birth, date of death, date of admission to the facility, sex, race, Hispanic origin, and state of residence of the inmates. Due to an oversight on the part of BJS, a unique identifier was not created at the outset of the match. UCD created a unique ID variable, using a combination of birth and death date in order to link the matched dataset back to the original DCRP dataset. Eighteen records were eventually dropped from the analysis because of problems associated with date of birth, which precluded the creation of an ID variable. An ID variable that accounted for names was considered, but ultimately rejected for not being unique enough.

To compare the death information obtained from the NDI to the DCRP data, it was necessary to first have a cohort of uniquely identifiable subjects where each subject had both DCRP data and a possible match in the NDI. There were 17,364 such subjects. Each record sent to the NDI was in the DCRP records; there were 6 DCRP records that were not in the analysis dataset sent to the NDI (due to our removing some records when creating the ID variable). Ultimately, there was a final cohort of 17,358 DCRP subjects that was used in all data comparisons.

The initial, combined match identified 37,897 potential matches for the 17,254 unique individuals. There are several ways to assess the quality of the match, such as the status code, exact match, and probabilistic scores. The NDI status code is typically used if the death status of the individuals is in question, but it can be used for known deaths. The status code indicates whether an individual is assumed to be alive (status code=0) or assumed to be dead (status code=1). In the case of our match, 87% (15,212) of the records had a status code of 1, meaning they are presumed dead by the NDI. It is not surprising that 13% had a questionable status, because the DCRP does not have all elements required by the NDI for a match. Also, due to the relative caution the NDI employs when determining match criteria, some true deaths were falsely assigned zeroes.

The criteria for an exact match is stricter than status codes criteria in that all items provide by the test dataset (e.g. the DCRP jail and prison files, must exactly match the case in the NDI). Unsurprisingly, the stricter criteria led to a lower match; 71% of DCRP records (12,200) had an exact match of 1.

Given that all subjects were known to be dead, the subjects were missing social security numbers, and there were multiple potential matches from a batch of cases, the highest probabilistic matching score was also utilized to produce a file that had one NDI match per DCRP case.

Per NCHS, the probabilistic score is "the sum of the weights assigned to each of the identifying data items used in the NDI record match, where the weights reflect the degree of agreement between the information on the submission record and the NDI death record" (U.S. Department of Health and Human Services, 2013).

Ultimately, a combination of status code, exact match, and probabilistic scores reduced the multiple potential matches for a single record to a one DCRP death to one NDI matching record model. Because of the nature of the project, we were interested in not only finding a matching record in the NDI, but the matched NDI record had to have usable COD information.

**Results**

Of the 16,270 matched DCRP cases, 14,221 (87%) had a status code of 1 and 11,553 had an exact match. Despite missing desired NDI matching criteria, most DCRP cases (93.7%) had a match in the NDI. The match rate was better than expected because data quality of names among prisoners is known to be problematic. In addition to missing maiden names for female inmates, a more significant concern is that it is not uncommon for inmates to change their name, and BJS did not generate alias for the names of decedents. Despite the name issue, the match rate was not significantly lower than other NDI death matching studies (Boyle & Decoufle, 1990, Acquavella et al., 1986).

A total of 1,093 records could not be matched, meaning no matches were found for these records in the NDI. An additional 335 (1.9%) records were missing COD in both the DCRP and the NDI. An analysis of the unmatched records revealed no discernable pattern that would explain the mismatch that emerged. Prisons, which account for a majority of DCRP records, accounted for 779 (about 70%) of the unmatched cases. No single year between 2007 and 2010 could account for the unmatched cases, so the issue was not isolated to a single year. Four states—California, Florida, Georgia and Texas—accounted for about 31% of unmatched cases, but these states hold more than a quarter (31%) of the entire U.S. incarcerated population (Kaeble et al., 2015). It appears as if the unmatched cases occurred at random.

Prisons had a slightly higher (94%) match rate than jails (92%), and the match rate increased incrementally each year, from 93% in 2007 to 94% in 2010 (table 3). Once a match was found in the NDI, the second largest concern was whether the NDI could provide a valid COD for DCRP cases missing COD. The NDI was able to provide a valid COD for 93% of cases missing COD information.

**Table 3. Overview of DCRP records finding a match in the NDI by selected inmate and correctional population characteristics, 2007-2010**

| | Total | NDI matched record |
|---|---|---|
| | 17,364 | 93.7 % |
| **Facility type** | | |
| Prison | 13,470 | 94.2 % |
| Jail | 3,894 | 91.9 |
| **Year** | | |
| 2007 | 4,483 | 92.7 % |
| 2008 | 4,402 | 93.3 |
| 2009 | 4,360 | 94.7 |
| 2010 | 4,119 | 94.2 |
| **Sex** | | |
| Male | 16,327 | 93.9 % |
| Female | 1,037 | 90.3 |
| **DCRP ICD-10 Codes[a]** | | |
| 0 | 4,472 | 92.5 % |
| 1 | 9,320 | 93.9 |
| 2 | 2,297 | 94.9 |
| 3 | 737 | 93.2 |
| 4 | 349 | 96.6 |
| 5 | 189 | 95.2 |

[a]Total number of ICD-10 codes assigned to DCRP death records.
Sources: Bureau of Justice Statistics, Deaths in Custody Reporting Program, 2007-2010. National Center for Health Statistics, National Death Index, 2007-2010.

More than half of jail deaths (55%) and about one-fifth of prison deaths (17%) were missing a valid ICD-10. In the majority of cases (92.5%), the NDI had a record for the DCRP cases missing COD. Under the DCRP model, ICD-10 codes are only assigned to illness deaths unrelated to AIDS or deaths listed as "other." This means about half of DCRP jail deaths and less than one-tenth of DCRP prison deaths are missing ICD-10 codes, by design. It does not mean that they are missing a valid COD. While the DCRP collects and reports on deaths due to AIDS, suicide, homicide, and accidents (including intoxication deaths), it cannot provide the level of detail the NDI can provide.

DCRP cases with at least one valid ICD-10 code (54% of cases) varied by correctional populations. Six percent of the entire DCRP-NDI matched cohort was missing ICD-10 codes, meaning that both the DCRP and the NDI were missing ICD-10 codes for the death record. Most (83%) prison DCRP cases had a valid ICD-10 code and nearly half (45%) of jail DCRP cases had valid a valid ICD-10 code. The disparity among correctional populations is not surprising given that most prisoners (89%) die of natural causes, so they would be more likely to be assigned at least one ICD-10 code by DCRP project nosologist, whereas about half (52%) of jail inmates die of natural cause.

Overall, there is good agreement in final COD in the matched NDI-DCRP cases. Based on an analysis of DCRP-NDI matched cases where both the DCRP and NDI record had a known COD (n=15,963), the agreement rate among the leading COD in correctional populations was good. For instance, the DCRP reported that 22% of inmate deaths were due to cancer between 2007 and 2010, and the NDI reported that 23% of those same deaths were due to cancer (table 4). The DCRP reported 25% of deaths were due to heart disease, and the NDI reported 22% of the matched deaths were due to heart disease. This trend held for nearly all causes of death—both natural and unnatural alike—

with one exception: the "all other illness category." Nearly a quarter of DCRP deaths (23%) in the NDI were reported as "all other illnesses," whereas the DCRP reported 18% of the deaths could be classified as "all other illnesses." This category is a catch-all for deaths that are not a leading cause (e.g. heart disease, AIDS, cancer, liver disease, or respiratory illness).

**Table 4. Percent of Inmate Deaths Reported to the DCRP with a match in the NDI by COD , 2007-2010**

| Cause of Death | Overall | |
|---|---|---|
| | DCRP | NDI |
| Illness | 81.8 % | 82.8 % |
| Heart Disease | 24.5 | 22.3 % |
| AIDS/HIV-related | 3 % | 3.7 % |
| Cancer | 21.8 % | 23.2 % |
| Liver Diseases | 8.1 % | 5.1 % |
| Respiratory Diseases | 5.9 % | 5.1 % |
| All Other[a] | 18.5 % | 23.3 % |
| Suicide | 11.4 % | 10.9 % |
| Homicide[b] | 1.8 % | 1.9 % |
| Drug/Alcohol Intoxication | 2.5 % | 2.3 % |
| Accident | 1.1 % | 1.6 % |
| Other/Unknown | 1.4 % | 0.7 % |

Note: Includes only records with a known cause of death in both the DCRP and the NDI.

[a]Includes illnesses such as cerebrovascular disease, diabetes and other nonleading natural causes of death.

[b]Includes homicides committed by other inmates, incidental to the staff use of force, and resulting from assaults sustained prior to incarceration.

Sources: Deaths in Custody Reporting Program, Bureau of Justice Statistics; National Center for Health Statistics, National Death Index

The agreement rate for leading causes did not vary by correctional population. The leading COD in jails is suicides, and it was reported as the final COD in nearly equal portions to the DCRP (31%) and the NDI (30%) (table 5). There was also good agreement between the second leading COD in jails, with 23% of DCRP jail deaths reporting heart disease as the final cause and of equal portion of matched NDI jail cases reporting the same. As with the entire DCRP cohort, there was some disagreement among "all other illnesses." The DCRP reported that 17% of jail deaths were due to "all other illnesses," whereas the NDI found that 21% of the matched jail deaths were due to "all other illnesses." The same pattern did not extend to liver disease, as both the DCRP and the matched NDI cases reported about 3% of jail inmate deaths were due to liver disease.

**Table 5. Percent of Local Jail Inmate Deaths Reported to the DCRP with a match in the NDI by COD , 2007-2010**

| Cause of Death | Overall | |
|---|---|---|
| | DCRP | NDI |
| Illness | 55.2 % | 59.3 % |
| Heart Disease | 23.3 % | 23.4 % |
| AIDS/HIV-related | 3.4 % | 3.3 % |
| Cancer | 4 % | 5 % |
| Liver Diseases | 3.7 % | 3.3 % |
| Respiratory Diseases | 3.6 % | 3.5 % |
| All Other[a] | 17.3 % | 20.8 % |
| Suicide | 31 % | 29.6 % |
| Homicide[b] | 2 % | 1.9 % |
| Intoxication | 6.5 % | 5.5 % |
| Accident | 2.1 % | 2.7 % |
| Other/Unknown | 3.2 % | 1.1 % |

Note: Includes only records with a known cause of death in both the DCRP and the NDI.
[a]Includes illnesses such as cerebrovascular disease, diabetes and other nonleading natural causes of death.
[b]Includes homicides committed by other inmates, incidental to the staff use of force, and resulting from assaults sustained prior to incarceration.
Sources: Deaths in Custody Reporting Program, Bureau of Justice Statistics; National Center for Health Statistics, National Death Index

The agreement rate between deaths reported to the DCRP and deaths with a match in the NDI was also good among prisoner deaths (table 6). This was particularly true of the top two causes of death among prisoners: cancer (27% of deaths per the DCRP, 28% of deaths in the matched NDI cases) and heart disease (25% of DCRP cases and 22% of matched NDI cases). Like with jails, “all other deaths” had the poorest match rate (19% in the NDI, 24% in the matched NDI cases). Liver diseases also had a less accurate match rate, with 9% of DCRP death being reported as liver disease and 6% of matched NDI cases reporting the same.

**Table 6. Percent of State Prison Inmate Deaths Reported to the DCRP with a match in the NDI by COD , 2007-2010**

| Cause of Death | Overall | |
|---|---|---|
| | DCRP | NDI |
| Illness | 88.9 % | 89 % |
| Heart Disease | 24.9 % | 22 % |
| AIDS/HIV-related | 2.8 % | 3.9 % |
| Cancer | 26.6 % | 28 % |
| Liver Diseases | 9.3 % | 5.6 % |
| Respiratory Diseases | 6.5 % | 5.6 % |
| All Other[a] | 18.8 % | 24 % |
| Suicide | 6.1 % | 5.9 % |
| Homicide[b] | 1.7 % | 1.8 % |
| Drug/Alcohol Intoxication | 1.4 % | 1.4 % |
| Accident | 0.9 % | 1.3 % |
| Other/Unknown | 1 % | 0.6 % |

Note: Includes only records with a known cause of death in both the DCRP and the NDI.

[a]Includes illnesses such as cerebrovascular disease, diabetes and other nonleading natural causes of death.

[b]Includes homicides committed by other inmates, incidental to the staff use of force, and resulting from assaults sustained prior to incarceration.

Sources: Deaths in Custody Reporting Program, Bureau of Justice Statistics; National Center for Health Statistics, National Death Index

**Discussion**

The project was successful in that it accomplished all goals that it set out to accomplished:

- Nearly all DCRP records found a matching record in the NDI.
- The NDI was able to provide COD for DCRP cases that were missing that data.
- There was general agreement between DCRP and matched deaths in the NDI regarding COD.

The NDI did not provide any additional information in 5,523 (32%) of the matched cases. The match rate was better for prisons (36% of matched prison deaths) than jails (18% of matched jail deaths). In the remainder of the cases, the NDI provided COD (24%)—this was driven by DCRP cases that do not traditionally receive ICD-10 codes, e.g. AIDS-related deaths and unnatural deaths. Among the reported DCRP leading causes (e.g. heart disease, cancer, suicide, etc.), there is good agreement. Specifically, 89% of cancer deaths in DCRP were also cancer deaths per the NDI.

In 19% of matched NDI-DCRP cases, the disease groups differed. For example, the DCRP recorded a matched death as liver disease (K76) whereas the NDI recorded the same case as being due to hepatitis C (B17). In 16% of matched NDI-DCRP cases, NDI provided a different disease category (e.g. the two-digit number didn't correspond). For example, the DCRP recorded a matched death as being cancer, unspecified (C97) whereas the NDI recorded the same death as being lung cancer (C34).

Despite missing social security numbers, the known difficulties associated with inmate names, and the complications regarding the lack of a unique ID variable, 94% of deaths reported to the DCRP between data years 2007 and 2010 had a matching record in the NDI. In all likelihood, that match rate would increase if an alias analysis were done to account for nicknames—and if a unique identifier was generated prior to submission. Another contributing factor to the cohort of unmatched cases is related to protocols regarding when the NDI closes their data files and when the DCRP closes their data files. Once the NDI closes their data file for the year, they do not accept updates or late submissions (M. Warner, personal communication, August 2015). The DCRP, on the other hand, has

an always-on approach, and can and has accepted death records years after the fact. If the death record was significantly delayed in being submitted to the DCRP, the same may have been true of the record's submission to the NDI.

The NDI was also able to provide additional information to DCRP for most death cases that were missing COD data. BJS understood that some level of missing data likely would not be resolved, despite the match, because like the DCRP, the NDI has some level of missing data annually. The issue for BJS was that for jail deaths in data year 2008, the level of missing data (22%) was so extensive that it prevented BJS from doing trend analysis that included 2008. Most of the missing cases were able to be resolved through the NDI match. The NDI match offered a low-cost solution to resolving cases that would not have been able to have been resolved without significant cost to the project or burden to respondents.

There was also general agreement in COD as reporting to the DCRP and that matching NDI record. The leading causes in the incarcerated population is the same in the DCRP and the NDI overall. The pattern held when looking at jails and prisons both together and independently. Both the DCRP and the NDI agreed that half of jail inmates died from suicide and heart disease and half of prisoners died as a result of cancer and heart disease. Significantly, unnatural deaths such as accidents, homicides, suicides, and intoxication were in good agreement in both sources.

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