

## **NHANES I Epidemiologic Follow-up Survey (NHEFS) Calibration sample for NDI matching methodology**

The determination of vital status for NCHS survey participants is conducted primarily through record linkage to the National Death Index (NDI), utilizing probabilistic approaches that classify and assign scores to potential match records based upon whether there is agreement, disagreement, or no basis for comparison for each of the identifying data elements used in the record selection and matching process<sup>1</sup>. Yet, matching records, from two independent files on the basis of a set of identifiers that may be missing, incomplete, or subject to errors, will yield a set of true matches and non-matches as well as a set of false matches and non-matches. For this reason, NCHS undertook a calibration study to determine which NDI record matches to consider true matches and which to consider false matches.

The calibration study was based upon the NHANES I Epidemiologic Follow-up survey (NHEFS). NHEFS is a longitudinal study conducted from 1971-1992, with a high participation rate and highly complete and verified identification data. The study sample includes participants, for whom active follow-up was conducted beginning January 1979<sup>2</sup> and vital status was known through either the date of death or a final interview date. The NHEFS calibration sample (N = 12,699) was submitted to the NDI database to search for potential match records (a match to a NDI record was possible for 3,454 deaths<sup>3</sup>). In the NDI record selection process, all potential matches are classified (Class 1 to Class 5) and scored. All Class 5 matches were considered false matches (presumed alive) and were eliminated from further consideration. The remaining pool of potential matches was ranked first on Class (from 1 to 4) and then within Class by highest score. The NDI match with the highest score within the best Class was selected as the single best record match. Based upon knowing the true vital status for the NHEFS calibration sample, all Class 1 matches were considered true matches (presumed dead) and recommended cut-off scores for Classes 2 (score  $\geq 47$ ), Class 3 (score  $\geq 45$ ), and Class 4 (score  $\geq 40$ ) were determined in order to jointly maximize the proportion of records with correct death record matches and minimize the number of records incorrectly matched, with an emphasis on minimizing false positive matches ([Table 1](#)).

Among the 3,454 NHEFS decedents, 3,380 had a NDI record selected as a potential match. Among these NDI potential matches for the NHEFS decedents, 3,375 had the correct NDI record selected. Based upon the Class and score cut-off criteria for “true matches”, there 3,322 NHEFS decedents with NDI record matches being considered true matches and correctly assigned as deceased, whereas 53 were considered false matches and incorrectly assigned a vital status as alive. Additionally, there were 79 NHEFS decedents who did not have a true match to a NDI record, with 74 of them being decedents who did not return a NDI record and were incorrectly assigned a vital status of alive. Among NHEFS non-decedents, 49 returned a NDI record that was selected as a true match and were incorrectly assigned a vital status of deceased ([Figure 1](#)).

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<sup>1</sup> For a complete list of the identifying information used for NDI matching, please refer to the [NDI](#)

<sup>2</sup> The NDI was established in 1979. Persons in the NHEFS sample who died before 1979 were not considered in this study.

<sup>3</sup> Four deaths occurred outside the United States and thus are not included in the NDI database.

In sum, across the Classes 1 to 4, 96.1% of NHEFS decedents were correctly classified as deceased and matched to the correct death certificate and 99.4% of non-decedents were correctly classified as alive, with an overall 98.5% of NHEFS respondents correctly classified.

**Table 1:** NCHS recommended cut-off scores and NHEFS subjects correctly classified.

| Within Class | Cut-off Score | NHEFS decedents (N) | Matched decedents (N) | Correctly matched as dead (%) | Correctly matched overall (%) |
|--------------|---------------|---------------------|-----------------------|-------------------------------|-------------------------------|
| 2            | ≥ 47          | 532                 | 524                   | 98.5                          | 98.0                          |
| 3            | ≥ 45          | 510                 | 483                   | 94.7                          | 89.7                          |
| 4            | ≥ 40          | 38                  | 23                    | 60.5                          | 98.6                          |

**Figure 1.** Results of the NDI record match process for the NHEFS calibration sample using the NCHS recommended classes and cut-off scores

