

## **Documentation of Mortality Statistics and Cause of Death** **Information for MIDUS Core Samples (National and Milwaukee)**

This memo accompanies an updated mortality dataset containing 2,459 decedents from the MIDUS Core National and Milwaukee samples that were ascertained via NDI searches up to the end of 2022.

In 2021, all MIDUS Core sample, regardless of prior known decedent status, were submitted to the National Death Index (NDI) to find new decedents, confirm known decedents, and obtain cause of death information. Two NDI Plus<sup>1</sup> searches were conducted: NDI Final Data Search for years 1995 through 2019; and NDI Early Release Search for 2020. Information from 7,699 Core individuals with sufficient minimum matching criteria<sup>2</sup> were submitted to the NDI. Based on the results of the NDI search, 2,124 decedents were ascertained.

In 2023, all MIDUS Core sample were resubmitted to the NDI to obtain updated mortality information. Similar as the NDI Plus Search in 2021, two NDI searches were conducted: NDI Final Data Search for 2020 and 2021; as well as NDI Early Release Search for 2022. Information from 7,699 Core individuals with sufficient minimum matching criteria were submitted to the NDI.

The updated Core mortality dataset:

**MIDUS\_Core\_MortalityCauseData\_N2459\_20240123.sav**

This updated dataset adds 335 newly identified decedents to the 2,124 decedents in the previous mortality dataset for a total of 2,459 decedents in the MIDUS Core sample. Most of the new decedents are those who died in 2021 and 2022. ***Note that the mortality information of deaths through 2021 is considered “complete” due to the NDI Final Data Search, and the mortality information of deaths in 2022 is considered as “close to complete” due to the NDI Early Release Search.***

Note the changes in cause of death information in the current update. In the recent update, multiple cause of death information in ICD-9/10 and categories of cause of death are newly included. The simplified cause of death contains six categories, based on the leading cause of death in the U.S. among adults in recent years, are provided in the mortality data. In the current update, 27 simplified categories are included in addition to six categories of cause of death.

Each death certificate contains a single underlying cause of death and up to 20 additional multiple causes of death. The NDI provides two sets of multiple cause of death fields: entity-axis codes and record-axis codes. The entity-axis codes represent what is actually written in the death certificate by the certifier, but their main limitation is that they do not necessarily reflect the best code for a condition when considered within the context of the medical certification as a whole. Therefore, the Division of Vital Statistics created a new code set called record-axis multiple cause data from the original set of entity codes. The record-axis codes are assigned based on the codes that best describe the overall medical certification portion of the death certificate. They represent a further processing of the entity-axis codes to ensure consistency with the underlying cause data and to make them more amenable to statistical tabulation and analysis. The record-axis codes are what the MIDUS Core Mortality Data provides as multiple cause of death information. For more information about entity-axis and record-axis codes, please refer to the NDI User Guide on pages 58-61.

([https://www.cdc.gov/nchs/data/ndi/ndi\\_users\\_guide.pdf](https://www.cdc.gov/nchs/data/ndi/ndi_users_guide.pdf)).

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<sup>1</sup> Different from NDI routine searches which only provide potential decedent matches, the NDI Plus search also provides the cause of death (ICD-9/10 Codes) for most of the true match cases.

<sup>2</sup> To be eligible for an NDI search, each record must contain at least one of the following combinations of data items: (a) First and last name and SSN, (b) First and last name and month and year of birth, (c) SSN and full date of birth and sex.

The mortality dataset is a flat file containing 2,459 deceased cases, and it contains 55 variables that can be linked to other Core MIDUS datasets via the M2ID.

The focal variables are:

- DECEASED indicates decedent status.
- DOD\_M and DOD\_Y indicate the month and year of death.
- UNDERCOD\_ICD9 and UNDERCOD\_ICD10 contain underlying cause of death based on ICD (International Classification of Diseases) codes. For convenience to researchers the MIDUS Admin Core appended descriptive labels to each ICD code using source material provided by NDI. In these two variables, the ICD codes represent the underlying cause of death, which is defined as “(a) the disease or injury which initiated the train of events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury” (World Health Organization; Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, based on the recommendations of the Ninth Revision Conference, 1975; Geneva; 1977). For more information about how NDI Plus provides cause of death information, see NDI user guide.
  - Because the MIDUS Core study began in 1995 and includes deaths from that year onward, the Core mortality dataset contains two sets of ICD codes:
    - UNDERCOD\_ICD9. This variable contains the 9<sup>th</sup> revision (ICD-9) of the ICD codes and are used by NDI to classify deaths that occurred from 1979 through 1998. Further information on ICD-9 is available from:  
<https://www.cdc.gov/nchs/icd/icd9.htm>
    - UNDERCOD\_ICD10. This variable contains the 10<sup>th</sup> revision (ICD-10) of the ICD codes and are used by NDI to classify deaths occurring in 1999 and afterwards. Further information on ICD-10 is also available from:  
<https://www.cdc.gov/nchs/icd/icd10.htm>
    - For more information about the differences between ICD-9 and ICD-10 codes, see **Table 1** below.
- NUM\_MULTICOD denotes the total number of multiple cause of death available for the decedent.
- MULTICOD\_1\_ICD9 thru MULTICOD\_7\_ICD9 contain multiple cause of death information for decedents who died prior to 1998. The file does not have MULTICOD\_8\_ICD9 thru MULTICOD\_12\_ICD9 because all deaths in those columns occurred in 1999 or afterwards.
- MULTICOD\_1\_ICD10 thru MULTICOD\_12\_ICD10 contain multiple cause of death information for decedents who died in 1999 or afterwards.
- UNDERCOD\_C27, and MULTICOD\_1\_C27 thru MULTICOD\_12\_C27 contain 27 categories of underlying and multiple cause of death information. The original ICD codes were recoded into 27 categories based on the leading cause of death in the U.S. among adults in recent years: 1) Cancer, 2) Heart disease, 3) CLRD, 4) Cerebrovascular disease, 5) Alzheimer's disease, 6) Diabetes, 7) Other accidents (e.g., car accidents etc.), 8) Influenza and Pneumonia, 9) Kidney disease, 10) Septicemia, 11) Parkinson's disease, 12) Drug induced causes, 13) Hypertension, 14) Chronic liver disease, 15) Covid-19, 16) Intentional self-harm, 17) Alcohol induced causes, 18) Aortic aneurysm and dissection, 19) Assault, 20) Cholelithiasis, 21) HIV disease, 22) Complications of medical and surgical care, 23) Congenital malformations, 24) Legal intervention, 25) Tuberculosis, 26) Pregnancy, childbirth and the puerperium, and 27) Other disease.

- UNDERCOD\_C6, and MULTICOD\_1\_C6 thru MULTICOD\_12\_C6 contain categorized version of underlying and multiple cause of death information. The original ICD codes were recoded into six categories based on the leading cause of death in the U.S. among adults in recent years: 1) Heart disease, 2) Cancer, 3) CLRD, 4) Diabetes, 5) COVID-19, and 6) Other disease. The specific ICD-9 and ICD-10 codes that were used to create the categorized version of cause of death variables are shown in **Table 2** and **Table 3** below.

**Table 1.** Key differences between ICD-9-CM and ICD-10-CM and ICD-10-PCS code sets<sup>3</sup>

Differences Between ICD-9-CM and ICD-10 Code Sets		
	ICD-9-CM	ICD-10 code sets
Procedure	3,824 codes	71,924 codes
Diagnosis	14,025 codes	69,823 codes
ICD-10 Code Structure Changes (selected details)		
	Old	New
Diagnosis Structure	ICD-9-CM	ICD-10-CM
	<ul style="list-style-type: none"> <li>• 3-5 characters</li> <li>• First character is numeric or alpha</li> <li>• Characters 2-5 are numeric</li> </ul>	<ul style="list-style-type: none"> <li>• 3-7 characters</li> <li>• Character 1 is alpha</li> <li>• Character 2 is numeric</li> <li>• Characters 3 – 7 can be alpha or numeric</li> </ul>
Procedure Structure	ICD-9-CM	ICD-10-PCS
	<ul style="list-style-type: none"> <li>• 3-4 characters</li> <li>• All characters are numeric</li> <li>• All codes have at least 3 characters</li> </ul>	<ul style="list-style-type: none"> <li>• ICD-10-PCS has 7 characters</li> <li>• Each can be either alpha or numeric</li> <li>• Numbers 0-9; letters A-H, J-N, P-Z</li> </ul>

**Table 2.** ICD-9 and ICD-10 Codes Used to Create Six Categories of Cause of Death Variables

Cause of Death Group	ICD-9 Code	ICD-10 Code
Heart Disease	390-398, 402, 404, 410-424, 425.0-425.4, 425.6-425.9, 426-429	I00-I09, I11, I13, I20-I41, I42.0-I42.5, I42.7-I42.9, I44-I51
Cancer	140-208	C00-C97
CLRD	490-494, 496	J40-J47
Diabetes	250	E10-E14
Covid-19	n/a	U07.1

<sup>3</sup> Source: CDC website [https://www.cdc.gov/nchs/icd/icd10cm\\_pcs\\_background.htm](https://www.cdc.gov/nchs/icd/icd10cm_pcs_background.htm)

**Table 3.** ICD-9 and ICD-10 Codes Used to Create 27 Categories of Cause of Death Variables

Cause of Death Group	ICD-9 Code	ICD-10 Code
Cancer	140-208	C00-C97
Heart Disease	390-398, 402, 404, 410-424, 425.0-425.4, 425.6-425.9, 426-429	I00-I09, I11, I13, I20-I41, I42.0-I42.5, I42.7-I42.9, I44-I51
CLRD	490-494, 496	J40-J47
Cerebrovascular Diseases (stroke-caused deaths)	430-434, 436-438	I60-I69
Alzheimer's Disease	331.0	G30
Diabetes	250	E10-E14
Other accidents (e.g., car accidents, falls, etc.)	E800-E848, E880-E928, E929.0, E929.1, E929.3-E929.5, E929.8, E929.9	V01-V99, W00-W99, X00-X39, X46-X59, Y85-Y86
Influenza and Pneumonia	480-487	J09-J18
Kidney disease (Nephritis, nephrotic syndrome and nephrosis)	580-589	N00-N07, N17-N19, N25-N28
Septicemia	038	A40-A41
Parkinson's disease	332	G20-G21
Drug induced causes	292, 304, 305.2-305.9, E850-E858, E935, E937, E939, E950.0-E950.5, E962.0, E980.0-E980.5	F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F17.0, F17.3-F17.5, F17.7-F17.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9, X40-X44, X60-X64, X85, Y10-Y14, Y45, Y47, Y49
Essential hypertension and hypertensive renal disease (hypertension)	401, 403	I10, I12, I15, I16
Chronic liver disease and cirrhosis	571.4-571.9	K73-K74
COVID-19	n/a	U07.1
Intentional self-harm (suicide)	E950-E959	U03, X60-X84, Y87.0
Alcohol induced causes	291, 303, 305.0, 357.5, 425.5, 535.3, 571.0-571.3, 790.3, E860	E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K85.2, K86.0, R78.0, X45, X65, Y15
Aortic aneurysm and dissection	441	I71
Assault (homicide)	E960-E969	U01-U02, X85-X99, Y00-Y09, Y87.1

Cholelithiasis and other disorders of gallbladder	574-575	K80-K82
Human immunodeficiency virus (HIV) disease	042-044	B20-B24
Complications of medical and surgical care	E870-E879, E930-E949	Y40-Y84, Y88
Congenital malformations, deformations and chromosomal abnormalities	740-759	Q00-Q99
Legal intervention	E970-E978	Y35, Y89.0
Tuberculosis	010-018	A16-A19
Pregnancy, childbirth and the puerperium	630-676	O00-O99