



Colorado Department
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BRIEF

HEALTH STATISTICS SECTION

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New International Classification of Diseases (ICD-10): The History and Impact

The *International Classification of Diseases (ICD)* is a system developed collaboratively between the World Health Organization (WHO) and 10 international centers so that the medical terms reported by physicians, medical examiners, and coroners on death certificates can be grouped together for statistical purposes. The purpose of the ICD and of WHO sponsorship is to promote international comparability in the collection, classification, processing, and presentation of mortality statistics. Revisions of the ICD are implemented periodically so that the classification reflects advances in medical science. Since 1900, the ICD has been modified about once every 10 years, except for the 20-year interval between the last two revisions, ICD-9 and ICD-10. Effective with deaths occurring in 1999, the United States replaced ICD-9, in use for deaths from 1979 to 1998, with ICD-10. Publications showing mortality data coded under ICD-10 will differ substantially from those under ICD-9 because of changes in coding rules, changes in category names and ICD numbers, and changes in the tabulation lists used to group mortality data. This report will briefly review the history of ICD, highlight major changes in ICD-10, and discuss the statistical impact the revision will have on mortality analysis.

History

The history of the International Classification of Diseases extends back to the late 19th century, when the need for standardizing classification concepts and terminology was recognized by the medical community in Europe. Since 1900, the ICD for mortality has been modified about once every ten years, except for the 20-year interval between the ICD-9 and ICD-10, as shown in Table 1.

Table 1. ICD Implementation in the United States

Designation	Years in Effect
ICD-1	1900-1909
ICD-2	1910-1920
ICD-3	1921-1929
ICD-4	1930-1938
ICD-5	1939-1948
ICD-6	1949-1957
ICD-7	1958-1967
ICDA-8 (adapted*)	1968-1978
ICD-9	1979-1998
ICD-10	1999-

*See first paragraph, next page for explanation of adapted revision.

The rationale for the periodic revisions has been to reflect advances in medical science and changes in diagnostic terminology. Generally, the United States accepted the WHO versions, except the Eighth Revision, when the U.S. disagreed with some part of the classification system, particularly some categories in the diseases of the circulatory system. As a consequence, the U.S. produced its own version of the ICD called ICDA-8.

Use of the ICD

In addition to being a classification system for causes of death, the ICD serves a number of other purposes for mortality. The ICD:

- Includes coding rules for causes of death. These rules allow a coder to identify the single condition, the “underlying cause of death”, on the death certificate that is considered most informative from a public health point of view.
- Standardizes definitions such as “underlying cause of death,” “live birth,” “maternal death,” and many others.
- Includes tabulation lists which recommend the cause-of-death groupings that countries should use to present mortality data that can be compared among countries.
- Prescribes the format of the medical certification of death, which is reflected in a two-part medical certification of death that is part of every death certificate in the U.S.
- Includes regulations regarding the compilation and publication of statistics on diseases and causes of death, which require member states to use the ICD for compiling mortality and morbidity statistics.

Comparing ICD-10 to ICD-9

Each successive revision has a similar core to the previous revision. However, ICD-10 differs from ICD-9 in these respects. ICD-10:

- Is far more detailed than ICD-9 with about 8,000 categories compared with 4,000 categories.

- Transfers conditions among the classifications. For example, hemorrhage has been moved from the “circulatory” chapter to the “symptoms and signs” chapter.
- Uses 4-digit alpha-numeric codes instead of the 4-digit numeric codes used in ICD-9.
- Changes some coding rules. For example, the rules for coding “pneumonia and influenza,” “maternal conditions,” and “error and accidents in medical care” have been changed.
- Provides new tabulation lists (e.g. the U.S. ICD-10 113 causes list replaces the U.S. ICD-9 72 causes list).

The leading causes of death are determined using a specific tabulation list and rules for ranking. In ICD-10, the 113 causes list is used for ranking all deaths except infant deaths, which are ranked separately on a list of 130 causes. ICD-10 also provides a list of 39 selected causes of death, which is used to show mortality data for geographic areas, a list of 124 selected causes of fetal death, and a list of motor vehicle accident deaths.

Statistical Impact and Comparability

Revision of the ICD creates major discontinuities in mortality trend data. The extent of the discontinuity has been measured by a “comparability ratio.” The National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention coded the national mortality file for 1996 once using the ICD-9 and again using the revision (ICD-10). The comparability ratio is the ratio of the mortality rate for a particular cause coded by ICD-10 to the rate for the same cause coded by ICD-9. A comparability ratio of 1.00 indicates that the same number of deaths was assigned to a particular cause or combination of causes whether the ICD-9 or ICD-10 was used. However, a ratio showing perfect correspondence (with comparability ratio of 1.00) between the two revisions does not necessarily mean that the cause was unaffected by changes in classification and coding procedures. The cases assigned to a given classification may differ between the two systems.

Usually a ratio of less than 1.00 results from one of two situations: (1) a decrease in assignments of death to a cause in the ICD-10 compared with the ICD-9 or (2) the cause as described by the ICD-10 is only a part of the ICD-9 title with which it is compared. On the other hand, a ratio of more than 1.00 most frequently results from an increase in assignments of deaths to a cause in the ICD-10 compared with the comparable ICD-9 cause, or from the fact that the ICD-10 title is much broader than the ICD-9 title with which it is compared.

Table 2 shows the comparability ratios for leading causes of death using the entire national mortality file of 1996 in the United States. The results indicate that there will be some significant discontinuities in cause-of-death trends from ICD-9 to ICD-10. We anticipate that the switching from ICD-9 to ICD-10 will result in a 30 percent artificial decrease in deaths caused by pneumonia and influenza and a 55 percent artificial increase in deaths caused by Alzheimer's disease. However, major chronic diseases (such as heart disease, malignant neoplasms, cerebrovascular diseases, diabetes, atherosclerosis, chronic liver diseases and cirrhosis) and injuries (such as unintentional injuries, suicide, and homicide) show little change with comparability ratios equal or close to 1.00.

The first release of data using the ICD-10 from NCHS will be the upcoming report on 1999 preliminary death statistics. ICD-10 has been implemented in Colorado for the mortality analysis in *Colorado Vital Statistics, 1999*, which will be released in the Spring, 2001.

Two issues arise in the analysis of mortality data across the boundary of ICD revisions: data analysis/presentation and statistical tests to ascertain whether the change in mortality between the last years of the older revision and the first years of the new revision is a statistically significant change.

As it relates to mortality data analysis and presentation by cause of death, NCHS has published several documents about ICD-10 and its implementation. The Center will also publish death rates for ICD-10 using the tabulation list of 113 selected causes of death, and the list of 130 selected causes of infant death. The Health Statistics and Vital Records Division at the Colorado Department of Public Health and Environment, which is responsible for processing mortality data and publishing the annual report *Colorado Vital Statistics*, follows guidelines from NCHS.

Table 2. Comparability Ratios for 15 Leading Causes of Death

CAUSE OF DEATH	ICD-10 CODES	ICD-9 CODES	COMPARABILITY RATIO	STANDARD ERROR
Heart disease	I00-I09,I11,I13,I20-I51	390-398,402,404,410-429	0.99	0.0002
Malignant neoplasms	C00-C97	140-208	1.01	0.0002
Chronic lower respiratory diseases	J40-J47	490-494,496	1.05	0.0009
Cerebrovascular diseases	I60-I69	430-434,436-438	1.06	0.0050
Unintentional injuries	V01-X59,Y85-Y86	E800-E869,E880-E929	1.03	0.0014
Pneumonia and influenza	J10-J18	480-487	0.70	0.0018
Suicide	X60-X84,Y87.0	E950-E959	1.00	0.0005
Diabetes mellitus	E10-E14	250	1.01	0.0011
Atherosclerosis	I70	440	0.96	0.0025
Alzheimer's disease	G30	331.0	1.55	0.0071
Chronic liver disease and cirrhosis	K70,K73-K74	571	1.04	0.0027
Nephritis,nephrotic syndrome&nephrosis	N00-N07,N17-N19,N25-N27	580-589	1.23	0.0044
Septicemia	A40-A41	038	1.19	0.0042
Homicide	X85-Y09,Y87.1	E960-E969	1.00	0.0006
HIV disease	B20-B24	042-044	1.06	0.0018

The second issue is more complicated. Statistical tests must be used to determine whether the change in death rates between 1998 and 1999 was statistically significant given that the coding system changed. Comparisons and the statistical tests must take into account that the key difference is the comparability ratio and its standard error. NCHS has published formulas for statistical tests of trend or difference that do include the comparability ratio and its standard error.

Conclusions

Introduction of the ICD-10 will have a crucial impact on the analysis and presentation of mortality data by cause of death. Because the coding rules and the standard cause-of-

death lists are different, there will be discontinuous trends for some causes of death. Mortality data users should be aware of those changes and are encouraged to contact NCHS or the Health Statistics Section at the Colorado Department of Public Health and Environment (303-692-2160) for assistance. To ensure that the public health community is well informed about the ICD, NCHS has posted information about the new coding on the Internet at: www.cdc.gov/nchs/about/major/dvs/icd10des.htm.

Assistance can also be obtained by contacting the NCHS Data Dissemination Branch at : 6525 Belcrest Road, Room 1064, Hyattsville, MD 20782-2003 (phone: 301-458-4636; fax: 301-458-4027).

References:

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