

Monthly

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Office of Health Research, Statistics, and Technology
National Center for Health Statistics
3700 East-West Highway
Hyattsville, Maryland 20872



VITAL STATISTICS REPORT

DHEW PUBLICATION NO.
(PHS) 80-1120
VOL. 28, NO. 11
SUPPLEMENT
FEBRUARY 29, 1980

FROM THE

NATIONAL CENTER FOR HEALTH STATISTICS

Estimates of Selected Comparability Ratios Based on Dual Coding of 1976 Death Certificates by the Eighth and Ninth Revisions of the International Classification of Diseases^a

Introduction

One of the efforts to maintain the tradition of progress in the classification of diseases has been the practice, begun in 1900, to revise about every 10 years what is now the *International Classification of Diseases* (ICD). Each of these revisions has produced some break in the comparability of cause-of-death statistics. The Ninth Revision produced many changes, including shifts of inclusion terms and titles from one category, section, or chapter to another; regroupings of diseases; new titles and sections; and modifications in coding rules. As a result there are serious breaks in comparability for a number of causes of death. Measures of this discontinuity are essential to interpretation of mortality trends. Ratios of comparability between the Eighth and Ninth Revisions have been computed for this purpose. This supplement to the *Monthly Vital Statistics Report* (MVSR) presents comparability ratios for the causes or groups of causes of death for which data are published regularly in the MVSR.

Comparability Ratios

The method followed by the United States for constructing comparability ratios for mortality data is that recommended by the International Conference for the Sixth Revision of the International List of Diseases and Causes of Death, which convened in France in 1948. The Conference recommended that deaths for the country as a whole in 1949 or in 1950 be coded according to the Detailed List of Causes of Death of the Fifth Revision, and that dual tabulations of these data be published in such a way as to indicate the changes resulting from the application of the new revision. The dual coding method to measure discontinuities in mortality data resulting from the introduction of a new revision was used in this study between the Eighth and Ninth Revisions. This makes the fourth time since the recommendation of the International Conference for the Sixth Revision that the United States has used this method.

For this study comparability ratios are based on all deaths in 1976 coded according to the Eighth Revision and a sample of these same 1976 deaths coded according to the Ninth Revision. The denominator of a ratio for any particular cause is the number of deaths in 1976 assigned to that cause in accordance with the Eighth Revision; and the numerator is the estimate of the number of deaths in 1976 assigned to the

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comparable cause in accordance with the Ninth Revision. The year 1976 was selected because it was the most recent year for which final mortality statistics according to the Eighth Revision were available at the time of this study.

The numerators for these ratios are based on two highly stratified random samples of death certificates from the National Center for Health Statistics' (NCHS) data file. They are based on 137,292 records drawn from the total file for 1976 for the main study of deaths at all ages and on an additional sample of 12,708 records drawn from the 48,265 records of infant deaths for the infant study.

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 Eighth or Ninth Revision was used. A ratio showing perfect correspondence (1.00) between the two revisions does not necessarily indicate that the cause was unaffected by changes in classification and coding procedures because the changes may compensate for each other.

Usually a ratio of less than 1.00 results from one of two situations: (1) a decrease in assignments of deaths to a cause in the Ninth Revision compared with the Eighth, resulting, for example, from the transfer of inclusion terms, or (2) the cause as described by the Ninth Revision is only a part of the Eighth Revision title with which it is compared.

Most frequently a ratio of more than 1.00 results from an increase in assignments of deaths to a cause in the Ninth Revision compared with the comparable Eighth Revision cause, or from the fact that the Ninth Revision title is broader than the Eighth Revision title with which it is compared.

One of the major objectives of the comparability study is to furnish ratios that will measure the degree of discontinuity between data tabulated by the cause lists published under the Ninth Revision and data tabulated by the most nearly comparable cause lists published under the Eighth Revision.

In this brief advance report of the findings of the comparability study, ratios are presented for the lists that are used for the provisional mortality statistics based on a 10-percent sample of deaths reported monthly. These data appear

in the *Monthly Vital Statistics Report* (MVSR) and in the annual summary of these provisional statistics. The list of selected causes for which provisional data are published in the MVSR has been expanded from the 38 causes published monthly and the 70 causes published annually under the Eighth Revision, to 72 causes under the Ninth Revision for both the monthly and annual issues. The list of selected causes of infant death was expanded from 8 to 10 causes for both the monthly and annual issues. Comparisons are made between the following lists:

<i>Ninth Revision</i>	<i>Eighth Revision</i>
1. List of 72 Selected Causes of Death for the monthly and annual issues of the <i>Monthly Vital Statistics Report</i>	1. List of 70 Selected Causes of Death for the annual issue of the <i>Monthly Vital Statistics Report</i>
2. List of 10 Selected Causes of Infant Death for the monthly and annual issues of the <i>Monthly Vital Statistics Report</i>	2. List of 8 Selected Causes of Infant Death for the monthly and annual issues of the <i>Monthly Vital Statistics Report</i>

Ninth Revision data for the List of 72 Selected Causes of Death, Eighth Revision data for the corresponding categories in the List of 70 Selected Causes of Death, and comparability ratios between the two revisions are shown in tables A and 1. Similarly, data and comparability ratios for the Ninth Revision List of 10 Selected Causes of Infant Death and the Eighth Revision List of 8 Selected Causes of Infant Death are shown in tables B and 2.

More detailed studies are planned in which ratios for the Ninth Revision List of 282 Causes of Death will be presented for the total population and for each of the four color-sex groups. Studies in preparation will also present ratios for the List of 72 Selected Causes of Death by sex, color, and age (10-year age groups) and for the List of 61 Selected Causes of Infant Death by color.

Major Features and Changes in the Classification

In the Ninth Revision, as in the Eighth Revision, the Classification is arranged in 17

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Table A. COMPARABLE CATEGORY NUMBERS FOR 72 SELECTED CAUSES OF DEATH ACCORDING TO THE NINTH AND EIGHTH REVISIONS, AND SIZE OF SAMPLE FOR SELECTED CAUSES BY THE EIGHTH REVISION: UNITED STATES

[Eighth Revision category numbers are from the List of 70 Selected Causes of Death used during 1968-78 for the Annual Summary]

Cause of death according to the Ninth Revision of the International Classification of Diseases, 1975	Category numbers according to the Ninth Revision (1)	Category numbers according to the Eighth Revision (2)	Number of deaths in 1976 (final count), by the Eighth Revision ¹ (3)	Number of deaths in 1976 in the sample ¹ (4)
All causes.....	...	...	1,909,440	137,292
Shigellosis and amebiasis.....	004,006	004,006	55	55
Certain other intestinal infections.....	007-009	008,009	1,939	643
Tuberculosis.....	010-018	010-019	3,130	1,322
Tuberculosis of respiratory system.....	010-012	010-012	2,419	688
Other tuberculosis.....	013-018	013-019	711	634
Whooping cough.....	033	033	7	7
Streptococcal sore throat, scarlatina, and erysipelas.....	034-035	034	14	14
Meningococcal infection.....	036	036	330	330
Septicemia.....	038	038	6,401	874
Acute poliomyelitis.....	045	040-043	16	16
Measles.....	055	055	12	12
Viral hepatitis.....	070	070	567	365
Syphilis.....	090-097	090-097	225	225
All other infectious and parasitic diseases.....	001-003,005,020-032, 037,039-041,046 054, 056-066,071-088,098- 139	Remainder of 000-136	3,857	2,053
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues.....	140-208	140-209	377,312	28,103
Malignant neoplasms of lip, oral cavity, and pharynx.....	140-149	140-149	8,114	2,050
Malignant neoplasms of digestive organs and peritoneum.....	150-159	150-159	101,729	9,575
Malignant neoplasms of respiratory and intrathoracic organs.....	160-165	160-163	91,131	2,172
Malignant neoplasm of breast.....	174-175	174	33,403	679
Malignant neoplasms of genital organs.....	179-187	180-187	44,461	2,483
Malignant neoplasms of urinary organs.....	188-189	188,189	16,980	1,590
Malignant neoplasms of all other and unspecified sites.....	170-173,190-199	170-173,190-199	45,975	4,241
Leukemia.....	204-208	204-207	15,056	2,404
Other malignant neoplasms of lymphatic and hematopoietic tissues.....	200-203	200-203,208,209	20,463	2,909
Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature.....	210-239	210-239	4,719	2,056
Diabetes mellitus.....	250	250	34,508	1,009
Nutritional deficiencies.....	260-269	260-269	2,619	675
Anemias.....	280-285	280-285	3,182	1,689
Meningitis.....	320-322	320	1,589	607
Major cardiovascular diseases.....	390-448	390-448	974,429	30,433
Diseases of heart.....	390-398,402,404-429	390-398,402,404, 410-429	723,878	15,455
Rheumatic fever and rheumatic heart disease.....	390-398	390-398	13,110	2,544
Hypertensive heart disease.....	402	402	6,670	915
Hypertensive heart and renal disease.....	404	404	4,020	745
Ischemic heart disease.....	410-414	410-413	646,073	7,228
Acute myocardial infarction.....	410	410	319,477	2,041
Other acute and subacute forms of ischemic heart disease.....	411	411	4,028	962
Angina pectoris.....	413	413	186	186
Old myocardial infarction and other forms of chronic ischemic heart disease.....	412,414	412	322,382	4,039
Other diseases of endocardium.....	424	424,428	4,195	1,352
All other forms of heart disease.....	415-423,425-429	420-423,425-427,429	49,810	2,671
Hypertension with or without renal disease.....	401,403	400,401,403	6,130	1,825
Cerebrovascular diseases.....	430-438	430-438	188,623	9,838
Intracerebral and other intracranial hemorrhage.....	431-432	431	24,845	1,837
Cerebral thrombosis and unspecified occlusion of cerebral arteries.....	434,0,434,9	433	44,803	1,729
Cerebral embolism.....	434,1	434	826	419
All other and late effects of cerebrovascular diseases.....	430,433,435-438	430,432,435-438	118,149	5,853
Atherosclerosis.....	440	440	29,366	946
Other diseases of arteries, arterioles, and capillaries.....	441-448	441-448	26,432	2,369
Acute bronchitis and bronchiolitis.....	466	466	854	420
Pneumonia and influenza.....	480-487	470-474,480-486	61,866	4,377
Pneumonia.....	480-486	480-486	53,989	3,664
Influenza.....	487	470-474	7,877	713
Chronic obstructive pulmonary diseases and allied conditions.....	490-496	490-493	24,410	2,444
Bronchitis, chronic and unspecified.....	490-491	490,491	4,639	971
Emphysema.....	492	492	17,796	843
Asthma.....	493	493	1,975	630
Other chronic obstructive pulmonary diseases and allied conditions.....	494-496	... 2	2...	2...
Ulcer of stomach and duodenum.....	531-533	531-533	6,428	1,689
Appendicitis.....	540-543	540-543	752	442
Hernia of abdominal cavity and intestinal obstruction without mention of hernia.....	550-553,560	550-553,560	5,919	796
Chronic liver disease and cirrhosis.....	571	571	31,453	2,639
Cholelithiasis and other disorders of gallbladder.....	574-575	574,575	2,956	677
Nephritis, nephrotic syndrome, and nephrosis.....	580-589	580-584	8,541	1,788
Acute glomerulonephritis and nephrotic syndrome.....	580-581	580,581	1,759	890
Chronic glomerulonephritis, nephritis and nephropathy, not specified as acute or chronic, and renal sclerosis, unspecified.....	582-583,587	582-584	6,782	898
Renal failure, disorders resulting from impaired renal function, and small kidney of unknown cause.....	584-586,588-589	582-584	6,782	898
Infections of kidney.....	590	590	4,017	743
Hyperplasia of prostate.....	600	600	1,077	339

See footnotes at end of table.

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Table A. COMPARABLE CATEGORY NUMBERS FOR 72 SELECTED CAUSES OF DEATH ACCORDING TO THE NINTH AND EIGHTH REVISIONS, AND SIZE OF SAMPLE FOR SELECTED CAUSES BY THE EIGHTH REVISION: UNITED STATES—Con.

[Eighth Revision category numbers are from the List of 70 Selected Causes of Death used during 1968-78 for the Annual Summary]

Cause of death according to the Ninth Revision of the International Classification of Diseases, 1975	Category numbers according to the Ninth Revision (1)	Category numbers according to the Eighth Revision (2)	Numbers of deaths in 1976 (final count), by the Eighth Revision ¹ (3)	Number of deaths in 1976 in the sample ¹ (4)
Complications of pregnancy, childbirth, and the puerperium.....	630-676	630-678	390	390
Pregnancy with abortive outcome.....	630-638	640-645	16	16
Other complications of pregnancy, childbirth and the puerperium.....	640-676	630-639,650-678	374	374
Congenital anomalies.....	740-759	740-759	13,002	3,057
Certain conditions originating in the perinatal period.....	760-779	760-769,2,769.4-772,774-778	24,809	1,015
Birth trauma, intrauterine hypoxia, birth asphyxia, and respiratory distress syndrome.....	767-769	764-768,772,776	13,432	---
Other conditions originating in the perinatal period.....	760-766,770-779	Remainder of 760-778	11,377	---
Symptoms, signs, and ill-defined conditions.....	780-799	780-796	30,802	1,558
All other diseases.....	Residual	Residual	125,340	21,635
Accidents and adverse effects.....	E800-E949	E800-E949	100,761	15,922
Motor vehicle accidents.....	E810-E825	E810-E823	47,038	5,002
All other accidents and adverse effects.....	E800-E807, E826-E949	E800-E807, E825-E949	53,723	10,920
Suicide.....	E950-E959	E950-E959	26,832	3,229
Homicide and legal intervention.....	E960-E978	E960-E978	19,554	2,764
All other external causes.....	E980-E999	E980-E999	4,766	880

¹Inasmuch as it was necessary to use more than once some of the Eighth Revision titles in the List of 70 Selected Causes of Death for the Annual Summary as the most nearly comparable titles for the Ninth Revision List of 72 Selected Causes, the figures in this column do not add up to the total.

²Chronic obstructive lung disease without mention of asthma, bronchitis, or emphysema (No. *519.3), introduced by NCHS to be used with the Eighth Revision, is comparable to Other chronic obstructive pulmonary diseases and allied conditions (ICD Nos. 494-496) of the Ninth Revision. The comparability ratio for this set of titles is 1.0054, with a standard error of 0.0118, a relative error of 1.2 percent, and 95 percent confidence limits of 1.0285 and 0.9823. These data are not shown in this table because there are no sample data for *519.3.

Table B. COMPARABLE CATEGORY NUMBERS FOR THE LIST OF 10 SELECTED CAUSES OF INFANT DEATH FOR THE MONTHLY VITAL STATISTICS REPORT, AND TOTAL NUMBER OF DEATHS IN 1976 AND SIZE OF SAMPLE FOR COMPARABLE CAUSES ACCORDING TO THE EIGHTH REVISION: UNITED STATES

[Eighth Revision category numbers are from the List of 8 Selected Causes of Infant Death used during 1968-78 for the Monthly Vital Statistics Report]

Cause of death according to the Ninth Revision of the International Classification of Diseases, 1975	Category numbers according to the Ninth Revision (1)	Category numbers according to the Eighth Revision (2)	Number of deaths in 1976 (final count), by the Eighth Revision (3)	Number of deaths in 1976 in the sample (4)
All causes.....	...	...	48,265	12,708
Certain gastrointestinal diseases.....	008-009,535,555-558	004,006-009,535,561,563	761	374
Pneumonia and influenza.....	480-487	470-474,480-486	1,961	446
Congenital anomalies.....	740-759	740-759	8,345	2,799
Disorders relating to short gestation and unspecified low birthweight.....	765	777	3,977	466
Birth trauma.....	767	764-768(0-.3),772	1,813	452
Intrauterine hypoxia and birth asphyxia.....	768	776.9	3,599	458
Respiratory distress syndrome.....	769	...	...	...
Other conditions originating in the perinatal period.....	760-764,766,770-779	Remainder of 760-778	15,378	3,464
Sudden infant death syndrome.....	798.0	...	...	...
All other causes.....	Residual	Residual	12,431	4,249

main sections or chapters. The first chapter deals with diseases caused by well-defined infectious and parasitic agents. The next two chapters deal with categories for Neoplasms and for Endocrine, nutritional and metabolic diseases and immunity disorders. Most of the remaining chapters are arranged according to the principal anatomical sites of diseases with special chapters for Mental disorders; Complications of pregnancy, childbirth, and the puerperium; Congenital anomalies; Certain conditions originating in the perinatal period; and a chapter for Symptoms, signs, and ill-defined conditions.

The last chapter (XVII), Injury and poisoning, represents a decided departure from the corresponding chapter in previous revisions. The role of the E code for external causes was changed. In the Sixth, Seventh, and Eighth Revisions, chapter XVII—Accidents, poisonings, and violence—consisted of two alternative classifications, one according to the nature of the injury (the N code), and the other according to the external cause (the E code). In the Ninth Revision, chapter XVII consists only of titles for nature of injury as part of the main classification. The N prefix that was used before the category numbers for these titles in the Eighth Revision has been dropped. In the Ninth Revision the E code is a supplementary classification. For underlying cause of death, where both an E code and another code are applicable, the E code is still used when the other code is from chapter XVII. When the other code is from chapters I-XVI that code and not the E code is used.

In the Ninth Revision there are two codes for certain diagnostic terms that convey information about both a localized manifestation or complication and a more generalized underlying disease process. The traditional etiology code relating to the underlying disease is marked with a dagger (†), and the code relating to the manifestation or complication is marked with an asterisk (*). Tuberculous meningitis, for example, has its dagger code (ICD No. 013.0†) in the chapter for infectious and parasitic diseases and its asterisk code (ICD No. 320.4*) in the chapter for the nervous system and sense organs. Only the dagger codes are used for coding underlying cause of death.

Following are some of the major changes between the Eighth and Ninth Revisions, appli-

able to underlying cause coding in the United States, including those that are most pertinent to the causes shown in the MVSR. They are arranged according to the chapters in the Ninth Revision of the ICD.

I. Infectious and parasitic diseases.—Under the Ninth Revision, colitis, diarrhea, enteritis, and gastroenteritis, without further specification, are assumed to be of noninfectious origin and are classified to chapter IX, Diseases of the digestive system. In the Eighth Revision, unless stated to be noninfectious or due to a noninfectious condition, they were assumed to be of infectious origin and were coded to chapter I, Infective and parasitic diseases. This change transferred deaths that were assigned by the Eighth Revision to Diarrheal diseases (ICDA No. 009) to the Ninth Revision title Other noninfective gastroenteritis and colitis (ICD No. 558), accounting in great part for the low comparability ratio for Certain other intestinal infections (ICD Nos. 007-009).

A section pulling together all late effects of infectious and parasitic diseases was added to chapter I in the Ninth Revision. In the Eighth Revision a few conditions had special late effects codes; for certain other conditions late effects were coded to the resulting chronic condition; for the remaining conditions in chapter I, late effects were coded to the regular code for the infectious or parasitic disease.

The ratios in this report reflect the fact that the code span for tuberculosis included late effects under the Eighth Revision but not under the Ninth; pleural effusion was assumed to be tuberculous under the Eighth Revision but not under the Ninth; and erysipelas was combined with streptococcal sore throat and scarlatina in the List of 72 Causes of Death for the Ninth Revision but was excluded from the most nearly comparable Eighth Revision cause. Thus, the comparability ratio for Tuberculosis (ICD Nos. 010-018) is less than 1.0, and the ratio for Streptococcal sore throat, scarlatina, and erysipelas (ICD Nos. 034-035) is greater than 1.0.

The ratios for Whooping cough, Acute poliomyelitis, and Measles are based on very small numbers of deaths. Also, it appears that in the Eighth Revision a few deaths that should have

been attributed to late effects of poliomyelitis may have been classified to active poliomyelitis.

In the Eighth Revision, deaths from serum hepatitis went to the condition being treated, if known. Otherwise they were assigned to an E code, usually to Complications and misadventures in other and unspecified therapeutic procedures in infusion and transfusion (ICDA No. E931.2). Under the Ninth Revision, because serum hepatitis does not have a code in chapter XVII, deaths attributed to this cause are assigned to Viral hepatitis B without mention of hepatic coma (ICD No. 070.3) increasing the ratio for ICD No. 070.

Deaths from Septicemia (ICDA No. 038) that occurred among the newborn were transferred in the Ninth Revision from chapter I to chapter XV—Certain conditions originating in the perinatal period or, more specifically, to Other infection specific to the perinatal period (ICD No. 771.8).

II. *Neoplasms*.—A new section, Neoplasms of uncertain behavior (ICD Nos. 235-238), has been added to this chapter. Among the conditions transferred to this new section are some of the conditions under the Eighth Revision title Polycythemia vera (ICDA No. 208) and Myelofibrosis (ICDA No. 209), raising the comparability ratio for Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature (ICD No. 210-239).

III. *Endocrine, nutritional and metabolic diseases and immunity disorders*.—A new title—Disorders of fluid, electrolyte and acid-base balance (ICD No. 276)—has been added to this chapter. Most of these conditions were previously assigned to chapter XVI, Symptoms and ill-defined conditions, but were not coded as the underlying cause of death because conditions in this chapter were not coded if another codable condition was entered on the certificate. Consequently, the overall effect of locating this new title in chapter III is to increase the number of deaths assigned to this chapter and to decrease by a smaller number those assigned to chapter XVI.

The low comparability ratio for Nutritional deficiencies (ICD Nos. 260-269) is largely attributable to the transfer of Sprue and steatorrhea and Malabsorption syndrome, unspecified, from

ICDA Nos. 269.0 and 269.1 to ICD No. 579; transfer of cachexia, NOS, from ICDA No. 268 to ICD No. 799.4; and a change in handling a number of trivial conditions that result in acceptance of conditions from other parts of the classification, e.g., mental conditions as the underlying cause.

VII. *Diseases of the circulatory system*.—In the Eighth Revision, mitral and aortic incompetence, insufficiency, regurgitation, and stenosis were assumed to be rheumatic unless stated to be nonrheumatic or due to another condition that would cause a valvular heart disease. According to the Ninth Revision the conditions described by these terms are assumed to be nonrheumatic unless specified as rheumatic or due to a rheumatic heart disease, with one exception—mitral stenosis. The condition described by this term is assumed, as for the Eighth Revision, to be rheumatic.

This change in assumptions resulted in the transfer to Other diseases of endocardium (ICD No. 424) of an estimated 4,015 of the 13,110 deaths in 1976 from Rheumatic fever and rheumatic heart disease (ICDA Nos. 390-398). This transfer accounts in great part for the low comparability ratio for Rheumatic fever and rheumatic heart disease (ICD Nos. 390-398).

In the Ninth Revision there is no separate category for malignant hypertension. The new fourth digits for Hypertensive disease (ICD Nos. 401-404) indicate whether the hypertensive disease was specified as malignant, benign, or not specified as malignant or benign. The Eighth Revision fourth digits denoting the presence of hypertension in ischemic heart and cerebrovascular diseases no longer exist, making it impossible to show hypertension with these conditions for underlying cause tabulations.

Deaths assigned to Hypertension with or without renal disease (ICD Nos. 401, 403) increased under the Ninth Revision as a result of the rule that combines hypertension with cardiovascular diseases only when it is stated that the cardiovascular disease is due to hypertension. The Eighth Revision rule provided for a combination code if there was mention of hypertension anywhere on the record.

According to the Ninth Revision, Cardiovascular disease, unspecified (ICD No. 429.2) has

been separated from Ischemic heart disease (ICD Nos. 410-414). This separation accounts in great part for the increase in deaths assigned to All other forms of heart disease (ICD Nos. 415-423, 425-429), from 49,810 to 124,701 deaths, resulting in a very large comparability ratio. At the same time this separation accounts for a large part of the reduction in chronic ischemic heart disease, for which the title in the Ninth Revision is Old myocardial infarction and other forms of chronic ischemic heart disease (ICD Nos. 412, 414).

The transfer by the Ninth Revision to Hypertensive heart disease (ICD No. 402) of deaths that were assigned to the subtitle Cardiovascular disease without mention of chronic ischemic heart disease with hypertensive disease (*412.2) (introduced by NCHS for use during 1968-78) also accounts for a sizable part of the reduction in Ischemic heart disease (ICD Nos. 410-414).

Diseases of pulmonary circulation have been brought together in a new group—Diseases of pulmonary circulation (ICD Nos. 415-417). These pulmonary diseases have been separated from those in the group title Diseases of veins and lymphatics, and other diseases of circulatory system (ICD Nos. 451-459).

The Ninth Revision transferred Heart failure, unspecified (ICD No. 428.9) to this chapter—Diseases of the circulatory system—from the Eighth Revision chapter XVI, Symptoms and ill-defined conditions (ICDA Nos. 780-796), where it appeared as Acute heart failure, undefined (ICDA No. 782.4). Although this transfer resulted in increasing deaths assigned to circulatory diseases, there was not a compensating decrease in the deaths assigned to chapter XVI, because under the Eighth Revision, conditions assigned to this chapter were not coded as the underlying cause if another codable condition was reported.

VIII. *Diseases of the respiratory system.*—New titles have been added for respiratory conditions including Pneumonitis due to solids and liquids (ICD No. 507); and Chronic airways obstruction, not elsewhere classified (ICD No. 496). Most of the deaths assigned by the new Ninth Revision title Pneumonitis due to solids and liquids (ICD No. 507) were transferred from the Eighth Re-

vision title Pneumonia, unspecified (ICDA No. 486), more particularly from aspiration pneumonia, which was an inclusion term under ICDA No. 486. This transfer had the effect of reducing the number of deaths assigned to the pneumonias.

The deaths assigned by the Eighth Revision to Chronic obstructive lung disease without mention of asthma, bronchitis, or emphysema (*519.3), a subtitle first introduced by NCHS for deaths occurring in 1969, have been transferred to the new Ninth Revision title Chronic airways obstruction, not elsewhere classified (ICD No. 496).

There was a change in the linkage provision that affects the coding of diseases of the respiratory system. In the Eighth Revision, asthma linked with bronchitis and emphysema. The Ninth Revision does not provide this linkage, with the result of an increase in assignments of deaths to asthma, and a corresponding decrease in assignments to bronchitis and emphysema.

The Ninth Revision title Bronchiectasis (ICD No. 494) has been placed in the section Chronic obstructive pulmonary disease and allied conditions (ICD Nos. 490-496). According to the Eighth Revision Bronchiectasis (ICDA No. 518) was a title included in the group Other diseases of respiratory system (ICDA Nos. 510-519). This change resulted in the transfer of an estimated 93.7 percent (685) of the deaths to ICD Nos. 494-495 that were formerly assigned to ICDA No. 518.

IX. *Diseases of the digestive system.*—The instruction in the Eighth Revision was to code ulcer, site unspecified, and peptic ulcer, site unspecified, reported due to, with, or causing gastrointestinal hemorrhage to gastrointestinal ulcer which was an inclusion term under ICDA No. 534. This instruction was changed for the Ninth Revision to provide that these conditions be coded to Peptic ulcer (ICD No. 533). This accounted in great part for a comparability ratio greater than 1.0 for Ulcer of stomach and duodenum (ICD Nos. 531-533).

The comparability ratio of less than 1.0 for Hernia of abdominal cavity and intestinal obstruction without mention of hernia (ICD Nos. 550-553, 560) resulted primarily from the transfer of congenital diaphragmatic hernia from Diaphragmatic (ICDA No. 551.3), a subtitle under

Other hernia of abdominal cavity without mention of obstruction (ICDA No. 551) to Anomalies of diaphragm (ICD No. 756.6).

The increase in the number of deaths assigned by the Ninth Revision to Cholelithiasis and other disorders of gallbladder (ICD Nos. 574-575) resulted from the transfer to this cause of deaths that were assigned by the Eighth Revision to Other diseases of gallbladder and biliary ducts (ICDA No. 576).

X. *Diseases of the genitourinary system.*—The low comparability ratio for Acute glomerulonephritis and nephrotic syndrome (ICD Nos. 580-581) resulted primarily from the transfer of acute renal failure from Acute nephritis (ICDA No. 580) to the new Ninth Revision title Acute renal failure (ICD No. 584).

The low comparability ratio for Chronic glomerulonephritis, nephritis and nephropathy, not specified as acute or chronic, and renal sclerosis, unspecified (ICD Nos. 582-583, 587) is attributable to the transfer of chronic renal failure from Chronic nephritis (ICDA No. 582) to the new Ninth Revision title Chronic renal failure (ICD No. 585).

The large increase in the number of deaths assigned by the Ninth Revision to Renal failure, disorders resulting from impaired renal function, and small kidney of unknown cause (ICD Nos. 584-586, 588-589) results in part from the above described transfers by the Ninth Revision to ICD Nos. 584 and 585; and to the following three additional transfers: (1) Renal failure, NOS, from Other renal disease (ICDA No. 593.2) to the new Ninth Revision title Renal failure, unspecified (ICD No. 586); (2) Uremia (ICDA No. 792) to the new title Chronic renal failure (ICD No. 585), and to Renal failure, unspecified (ICD No. 586); and (3) Acute tubular nephrosis (ICDA No. 593.1) to the new Ninth Revision title Acute renal failure, with lesion of tubular necrosis (ICD No. 584.5).

XI. *Complications of pregnancy, childbirth, and the puerperium.*—The most nearly comparable Eighth Revision title to the Ninth Revision title Pregnancy with abortive outcome (ICD Nos. 630-638) is Abortions (ICDA Nos. 640-645). The large comparability ratio for this set of titles (3.8125) results in large part from the fact that

Ectopic pregnancy (ICDA No. 631) has been transferred from Complications of pregnancy (ICDA Nos. 630-634) to Pregnancy with abortive outcome (ICD Nos. 630-638).

XV. *Certain conditions originating in the perinatal period.*—This chapter was extensively revised, including the change in title. In the Eighth Revision the comparable title was Certain causes of perinatal morbidity and mortality. Conditions that were classifiable to other chapters according to the Eighth Revision are now included in this chapter if they arise during the perinatal period.

Some of the conditions that were previously classified by the Eighth Revision to Anoxic and hypoxic conditions not elsewhere classifiable (ICDA No. 776) were transferred by the Ninth Revision to Other respiratory conditions of newborn (ICD No. 770).

The title Birth trauma (ICD No. 767) of the Ninth Revision does not include all types of intracranial hemorrhage. The exclusion of intraventricular and subarachnoid hemorrhage from this category reduced the number of deaths assigned by the Ninth Revision to Birth trauma.

These changes account for the low comparability ratio (0.7483) between the Ninth Revision title Birth trauma, intrauterine hypoxia, birth asphyxia, and respiratory distress syndrome (ICD Nos. 767-769) and the Eighth Revision title Birth injury, difficult labor, and other anoxic and hypoxic conditions (ICDA Nos. 764-768, 772, 776).

XVI. *Symptoms, signs, and ill-defined conditions.*—The comparability ratio of less than 1.0 for this chapter results from the transfer of inclusion terms to chapters I-XV. Some of the most important of these transfers were the following: Acute heart failure, undefined (ICDA No. 782.4) to Heart failure, unspecified (ICD No. 428.9); Uremia (ICDA No. 792) to Chronic renal failure (ICD No. 585) and to Renal failure, unspecified (ICD No. 586); Electrolyte disorders (ICDA No. *788.0) to Disorders of fluid, electrolyte and acid-base balance (ICD No. 276) and to Late metabolic acidosis of newborn (ICD No. 775.7); Encephalopathy (ICDA No. 781.7) to Encephalopathy, unspecified (ICD No. 348.3); Pylorospasm (ICDA No. 784.2) to Other (ICD No. 537.8) under Other disorders of stomach

and duodenum; Hematemesis (ICDA No. 784.5) to Hematemesis (ICD No. 578.0); Melena (not of newborn) (ICDA No. 785.7) to Melena (ICD No. 578.1); Hematuria (ICDA No. 789.3) to Hematuria (ICD No. 599.7); and Depression (ICDA No. 790.2) to Depressive disorder, not elsewhere classified (ICD No. 311).

Precision of Estimates

In tables 1 and 2 are shown the estimated comparability ratios and their standard errors and relative standard errors. The figures in columns 6 and 7 of tables 1 and 2 are pairs of positive numbers such that the probability that the true value of the comparability ratio is included in the interval defined by them is 95 percent.

Some Specific Examples

Pneumonia and Influenza.—The estimated number of infant deaths assigned to the subcategories in the Ninth Revision under Pneumonia and influenza (ICD Nos. 480-487) together with the number of infant deaths assigned to the subcategories of Influenza and pneumonia in the Eighth Revision (ICDA Nos. 470-474, 480-486) are shown below:

The comparability ratio of 0.7471 (obtained by dividing 1,465 by 1,961) results in great part from a decrease in assignments of deaths to each of the five subcategories under Pneumonia (ICD Nos. 480-486) compared with the corresponding assignments in the Eighth Revision.

Among the deaths transferred out of these subcategories were those attributed to Congenital pneumonia (to ICD No. 770.0) and to aspiration pneumonia (to ICD No. 507.0). Also, there were 208 infant deaths assigned by the Eighth Revision to Acute interstitial pneumonia (ICDA No. 484). An estimated 42 of these deaths went to Pneumocystosis (ICD No. 136.3), or to some other infectious disease when pneumonia complicated the disease (ICD Nos. 001-136). An estimated 158 deaths were classified to the subtitle Other (ICD No. 516.8) under the title Other alveolar and parietoalveolar pneumopathy (ICD No. 516). Interstitial pneumonia unspecified as to whether acute or chronic was classified to Acute interstitial pneumonia (ICDA No. 484) under the Eighth Revision and to the subtitle Other (ICD No. 516.8) under the Ninth Revision.

Hypertensive heart disease.—When the Ninth Revision List of 72 Selected Causes of Death is compared with the Eighth Revision List of 70 Selected Causes of Death for the Annual Sum-

Ninth Revision title	Eighth Revision		Ninth Revision	
	Category number	Number of deaths	Category number	Estimated number of deaths
Total.....	---	1,961	---	¹ 1,465
Pneumonia.....	480-486	1,928	480-486	1,392
Viral pneumonia.....	480	193	480	172
Pneumococcal and other bacterial pneumonia.....	481,482	152	481-482	123
*Pneumonia in infectious diseases classified elsewhere.....	484	208	*484	
Bronchopneumonia, organism unspecified.....	485	475	485	374
Pneumonia due to other and unspecified organism.....	483,486	900	483,486	723
Influenza.....	470-474	33	487	27

¹The subtotals do not add up to 1,465 because in addition to the 1,419 deaths from Influenza and pneumonia (ICDA Nos. 470-474, 480-486) of the Eighth Revision that were assigned by the Ninth Revision to the comparable cause Pneumonia and influenza (ICD Nos. 480-487), there were also 46 deaths from other causes assigned to Pneumonia and influenza (ICD Nos. 480-487).

Codes marked with an asterisk () are not appropriate according to the Ninth Revision for underlying cause-of-death classification.

mary, the comparability ratio for Hypertensive heart disease (ICD No. 402) is 3.3022. This ratio is obtained by dividing 22,026, the number of deaths classified by the Ninth Revision to Hypertensive heart disease (ICD No. 402), by 6,670, the number of deaths classified by the Eighth Revision to Hypertensive heart disease (ICDA No. 402).

This large comparability ratio reflects important changes between the Eighth and Ninth Revisions in rules for selecting the underlying cause of death. It is only when the Ninth Revision List of 282 Selected Causes of Death is compared with the corresponding Eighth Revision List that the Eighth Revision cause most nearly comparable to Hypertensive heart disease (ICD No. 402) is identified. As shown below, the comparability ratio for Hypertensive heart disease (ICD No. 402) is 1.0275. This ratio is obtained by dividing 22,026, the estimated number of 1976 deaths classified by the Ninth Revision to this cause, by 21,437, the number classified to the most nearly comparable Eighth Revision cause, Cardiovascular disease without mention of chronic ischemic heart disease with hypertensive disease (*412.2).

The subcategory *412.2 was introduced by NCHS for data year 1968 together with the following three additional titles:

Chronic ischemic heart disease with or without cardiovascular disease with hypertensive disease. *412.1

Chronic ischemic heart disease with or without cardiovascular disease without mention of hypertensive disease. *412.3

Cardiovascular disease without mention of chronic ischemic heart disease without mention of hypertensive disease. *412.4

These special four-digit subcategories permitted separation of deaths due to "cardiovascular disease without mention of chronic ischemic heart disease" from those involving "chronic ischemic heart disease with or without mention of cardiovascular disease." As indicated in the above table, many of the records that were previously classified to *412.2 are classified by the Ninth Revision to Hypertensive heart disease (ICD No. 402).

Eighth Revision		Ninth Revision	
Cause of death (1)	Number of deaths in 1976 (2)	Estimated number of deaths in column (2) that went to Hypertensive heart disease (ICD No. 402) (3)	Estimated number of deaths in column (2) that went to other causes (4)
All causes.....000-E999	1,909,440	22,026	1,887,414
Hypertensive heart disease.....402	6,670	4,321	2,349
Cardiovascular disease without mention of chronic ischemic heart disease with hypertensive disease.....*412.2	21,437	17,000	4,437
Other causes.....Residual	1,881,333	705	1,880,628

Table 1. COMPARABILITY RATIOS FOR 72 SELECTED CAUSES; BASED ON A STRATIFIED RANDOM SAMPLE OF 1976 DEATHS ASSIGNED ACCORDING TO THE NINTH REVISION AND ON ALL DEATHS ASSIGNED ACCORDING TO THE EIGHTH REVISION OF THE INTERNATIONAL CLASSIFICATION OF DISEASES: UNITED STATES

[Denominators of ratios were selected from the List of 70 Selected Causes of Death used during 1968-78 for the Annual Summary]

Cause of death (Ninth Revision of the International Classification of Diseases, 1975)	Number of deaths assigned according to—		Estimated comparability ratio ²	Error of the estimate of the ratio in (3)		95 percent confidence limits ³	
	Ninth Revision (estimated from sample)	Eighth Revision (total count) ¹		Standard error	Relative standard error	Upper	Lower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All causes.....	1,909,440	1,909,440	...	...	...	...	...
Shigellosis and amebiasis.....004,006	54	55	0.9818	0.0378	3.9	1.0559	0.9077
Certain other intestinal infections.....007-009	353	1,939	0.1821	0.0207	11.4	0.2227	0.1415
Tuberculosis.....010-018	2,400	3,130	0.7668	0.0119	1.6	0.7901	0.7435
Tuberculosis of respiratory system.....010-012	2,039	2,419	0.8429	0.0146	1.7	0.8715	0.8143
Other tuberculosis.....013-018	361	711	0.5077	0.0167	3.3	0.5404	0.4750
Whooping cough.....033	6	7	0.8571	0.0000	0.0	0.8571	0.8571
Streptococcal sore throat, scarlatina, and erysipelas.....034-035	20	14	1.4286	0.0000	0.0	1.4286	1.4286
Meningococcal infection.....036	323	330	0.9788	0.0124	1.3	1.0030	0.9546
Septicemia.....038	5,441	6,401	0.8500	0.0180	2.1	0.8853	0.8147
Acute poliomyelitis.....045	8	16	0.5000	0.0000	0.0	0.5000	0.5000
Measles.....055	11	12	0.9167	0.0000	0.0	0.9167	0.9167
Viral hepatitis.....070	793	567	1.3986	0.0820	5.9	1.5593	1.2379
Syphilis.....090-097	227	225	1.0089	0.0259	2.6	1.0596	0.9582
All other infectious and parasitic diseases.....001-003,005,020-032,037,039-041,046-054,056-066,071-088,098-139	3,981	3,857	1.0321	0.0634	6.1	1.1563	0.9079
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues.....140-208	378,289	377,312	1.0026	0.0017	0.2	1.0059	0.9993
Malignant neoplasms of lip, oral cavity, and pharynx.....140-149	8,209	8,114	1.0117	0.0087	0.9	1.0286	0.9948
Malignant neoplasms of digestive organs and peritoneum.....150-159	105,081	101,729	1.0330	0.0035	0.3	1.0398	1.0262
Malignant neoplasms of respiratory and intrathoracic organs.....160-165	91,191	91,131	1.0007	0.0033	0.3	1.0071	0.9943
Malignant neoplasm of breast.....174-175	33,701	33,403	1.0089	0.0022	0.2	1.0131	1.0047
Malignant neoplasms of genital organs.....179-187	44,953	44,461	1.0111	0.0031	0.3	1.0171	1.0051
Malignant neoplasms of urinary organs.....188-189	16,851	16,980	0.9924	0.0045	0.5	1.0011	0.9837
Malignant neoplasms of all other and unspecified sites.....170-173,190-199	43,938	45,975	0.9557	0.0082	0.9	0.9718	0.9396
Leukemia.....204-208	15,161	15,056	1.0070	0.0056	0.6	1.0180	0.9960
Other malignant neoplasms of lymphatic and hematopoietic tissues.....200-203	19,205	20,463	0.9385	0.0069	0.7	0.9519	0.9251
Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature.....210-239	5,703	4,719	1.2085	0.0261	2.2	1.2595	1.1575
Diabetes mellitus.....250	34,478	34,508	0.9991	0.0087	0.9	1.0162	0.9820
Nutritional deficiencies.....260-269	1,877	2,619	0.7167	0.0262	3.7	0.7680	0.6654
Anemias.....280-285	2,958	3,182	0.9296	0.0124	1.3	0.9538	0.9054
Meningitis.....320-322	1,503	1,589	0.9459	0.0163	1.7	0.9777	0.9141
Major cardiovascular diseases.....390-448	981,184	974,429	1.0069	0.0004	0.0	1.0076	1.0062
Diseases of heart.....390-398,402,404-429	732,989	723,878	1.0126	0.0039	0.4	1.0202	1.0050
Rheumatic fever and rheumatic heart disease.....390-398	8,715	13,110	0.6648	0.0080	1.2	0.6804	0.6492
Hypertensive heart disease.....402	22,026	6,670	3.3022	0.0557	1.7	3.4114	3.1930
Hypertensive heart and renal disease.....404	4,872	4,020	1.2119	0.0438	3.6	1.2978	1.1260
Ischemic heart disease.....410-414	567,520	646,073	0.8784	0.0038	0.4	0.8859	0.8709
Acute myocardial infarction.....410	319,562	319,477	1.0003	0.0054	0.5	1.0108	0.9898
Other acute and subacute forms of ischemic heart disease.....411	4,924	4,028	1.2224	0.0661	5.4	1.3519	1.0929
Angina pectoris.....413	195	186	1.0484	0.0666	6.4	1.1789	0.9179
Old myocardial infarction and other forms of chronic ischemic heart disease.....412,414	242,839	322,382	0.7533	0.0055	0.7	0.7640	0.7426
Other diseases of endocardium.....424	5,154	4,195	1.2286	0.0227	1.8	1.2731	1.1841
All other forms of heart disease.....415-423,425-429	124,701	49,810	2.5035	0.0257	1.0	2.5539	2.4531
Hypertension with or without renal disease.....401,403	7,787	6,130	1.2703	0.0294	2.3	1.3280	1.2126
Cerebrovascular diseases.....430-438	189,553	188,623	1.0049	0.0066	0.7	1.0178	0.9920
Intracerebral and other intracranial hemorrhage.....431-432	24,769	24,845	0.9969	0.0068	0.7	1.0102	0.9836
Cerebral thrombosis and unspecified occlusion of cerebral arteries.....434.0,434.9	46,328	44,803	1.0340	0.0222	2.1	1.0774	0.9906
Cerebral embolism.....434.1	926	826	1.1211	0.0924	8.2	1.3022	0.9400
All other and late effects of cerebrovascular diseases.....430,433,435-438	117,530	118,149	0.9948	0.0061	0.6	1.0067	0.9829
Atherosclerosis.....440	31,273	29,366	1.0649	0.0246	2.3	1.1130	1.0168
Other diseases of arteries, arterioles, and capillaries.....441-448	19,583	26,432	0.7409	0.0098	1.3	0.7600	0.7218
Acute bronchitis and bronchiolitis.....466	759	854	0.8888	0.0274	3.1	0.9425	0.8351
Pneumonia and influenza.....480-487	57,315	61,866	0.9264	0.0067	0.7	0.9394	0.9134
Pneumonia.....480-486	49,663	53,989	0.9199	0.0076	0.8	0.9347	0.9051
Influenza.....487	7,652	7,877	0.9714	0.0078	0.8	0.9866	0.9562
Chronic obstructive pulmonary diseases and allied conditions.....490-496	46,002	24,410	1.8846	0.0150	0.8	1.9141	1.8551
Bronchitis, chronic and unspecified.....490-491	4,353	4,639	0.9383	0.0134	1.4	0.9646	0.9120
Emphysema.....492	17,387	17,796	0.9770	0.0127	1.3	1.0018	0.9522
Asthma.....493	2,675	1,975	1.3544	0.0636	4.7	1.4790	1.2298
Other chronic obstructive pulmonary diseases and allied conditions.....494-496	21,588	4,000	4,000	4,000	4,000	4,000	4,000
Ulcer of stomach and duodenum.....531-533	7,194	6,428	1.1192	0.0247	2.2	1.1675	1.0709
Appendicitis.....540-543	758	752	1.0080	0.0264	2.6	1.0597	0.9563
Hernia of abdominal cavity and intestinal obstruction without mention of hernia.....550-553,560	5,583	5,919	0.9432	0.0169	1.8	0.9762	0.9102

See footnotes at end of table.

MONTHLY VITAL STATISTICS REPORT

Table 1. COMPARABILITY RATIOS FOR 72 SELECTED CAUSES; BASED ON A STRATIFIED RANDOM SAMPLE OF 1976 DEATHS ASSIGNED ACCORDING TO THE NINTH REVISION AND ON ALL DEATHS ASSIGNED ACCORDING TO THE EIGHTH REVISION OF THE INTERNATIONAL CLASSIFICATION OF DISEASES: UNITED STATES—Con.

[Denominators of ratios were selected from the List of 70 Selected Causes of Death used during 1968-78 for the Annual Summary]

Cause of death (Ninth Revision of the International Classification of Diseases, 1975)	Number of deaths assigned according to—		Estimated comparability ratio ²	Error of the estimate of the ratio in (3)		95 percent confidence limits ³	
	Ninth Revision (estimated from sample)	Eighth Revision (total count) ¹		Standard error	Relative standard error	Upper	Lower
Chronic liver disease and cirrhosis.....571	31,799	31,453	1.0110	0.0069	0.7	1.0245	0.9975
Cholelithiasis and other disorders of gallbladder.....574-575	3,102	2,956	1.0494	0.0445	4.2	1.1366	0.9622
Nephritis, nephrotic syndrome, and nephrosis.....580-589	14,859	8,541	1.7397	0.0777	4.5	1.8920	1.5874
Acute glomerulonephritis and nephrotic syndrome.....580-581	426	1,759	0.2422	0.0185	7.6	0.2783	0.2061
Chronic glomerulonephritis, nephritis and nephropathy, not specified as acute or chronic, and renal sclerosis, unspecified.....582-583,587	3,360	6,782	0.4954	0.0195	3.9	0.5335	0.4573
Renal failure, disorders resulting from impaired renal function, and small kidney of unknown cause.....584-586,588-589	11,073	6,782	1.6327	0.0958	5.9	1.8205	1.4449
Infections of kidney.....590	3,968	4,017	0.9878	0.0091	0.9	1.0056	0.9700
Hyperplasia of prostate.....600	1,102	1,077	1.0232	0.0226	2.2	1.0674	0.9790
Complications of pregnancy, childbirth, and the puerperium.....630-676	429	390	1.1000	0.0435	4.0	1.1853	1.0147
Pregnancy with abortive outcome.....630-638	61	16	3.8125	0.0000	0.0	3.8125	3.8125
Other complications of pregnancy, childbirth, and the puerperium.....640-676	368	374	0.9840	0.0454	4.6	1.0729	0.8951
Congenital anomalies.....740-759	12,931	13,002	0.9984	0.0100	1.0	1.0179	0.9789
Certain conditions originating in the perinatal period.....760-779	26,706	24,809	1.0765	0.0238	2.2	1.1230	1.0300
Birth trauma, intrauterine hypoxia, birth asphyxia, and respiratory distress syndrome.....767-769	10,051	13,432	0.7483	0.0306	4.1	0.8083	0.6883
Other conditions originating in the perinatal period.....760-766,770-779	16,655	11,377	1.4639	0.0371	2.5	1.5367	1.3911
Symptoms, signs, and ill-defined conditions.....780-799	28,037	30,802	0.9102	0.0121	1.3	0.9338	0.8866
All other diseases.....Residual	97,585	125,340	0.7786	0.0082	1.1	0.7947	0.7625
Accidents and adverse effects.....E800-E949	100,454	100,761	0.9970	0.0030	0.3	1.0029	0.9911
Motor vehicle accidents.....E810-E825	47,587	47,038	1.0117	0.0027	0.3	1.0169	1.0065
All other accidents and adverse effects.....E800-E807,E826-E949	52,867	53,723	0.9841	0.0051	0.5	0.9941	0.9741
Suicide.....E950-E959	26,919	26,832	1.0032	0.0042	0.4	1.0114	0.9950
Homicide and legal intervention.....E960-E978	19,666	19,554	1.0057	0.0030	0.3	1.0115	0.9999
All other external causes.....E980-E999	4,611	4,766	0.9675	0.0144	1.5	0.9957	0.9393

¹ Figures in this column are number of deaths in 1976 assigned to the categories in the Eighth Revision, selected as the most nearly comparable to the Ninth Revision categories, as shown in Table A.

² Ratio of deaths assigned according to the Ninth Revision to deaths assigned according to the Eighth Revision.

³ The probability is 95 percent that the true comparability ratio will have a value between the upper and lower limits shown. These limits were computed before the standard error was rounded to the fourth decimal.

⁴ Chronic obstructive lung disease without mention of asthma, bronchitis, or emphysema (No.*519.3), introduced by NCHS to be used with the Eighth Revision, is comparable to Other chronic obstructive pulmonary diseases and allied conditions (ICD Nos. 494-496) of the Ninth Revision. The comparability ratio for this set of titles is 1.0054, with a standard error of 0.0118, a relative error of 1.2 percent, and 95 percent confidence limits of 1.0285 and 0.9823. These data are not shown in this table because there are no sample data for *519.3.

Table 2. COMPARABILITY RATIOS FOR 10 SELECTED CAUSES OF INFANT DEATHS FOR THE MONTHLY VITAL STATISTICS REPORT; BASED ON A STRATIFIED RANDOM SAMPLE OF 1976 INFANT DEATHS ASSIGNED ACCORDING TO THE NINTH REVISION AND ON ALL INFANT DEATHS ASSIGNED ACCORDING TO THE EIGHTH REVISION: UNITED STATES

[Denominators of ratios were selected from the List of 8 Selected Causes of Infant Death used during 1968-78 for the Monthly Vital Statistics Report]

Cause of death (Ninth Revision of the International Classification of Diseases, 1975)	Number of deaths assigned according to—		Estimated comparability ratio ²	Error of the estimate of the ratio in (3)		95 percent confidence limits ³	
	Ninth Revision (estimated from sample)	Eighth Revision (total count) ¹		Standard error	Relative standard error	Upper	Lower
All causes.....	48,265	48,265	1.0000	...	...	...	...
Certain gastrointestinal diseases.....008-009,535,555-558	356	761	0.4678	0.0228	4.9	0.5125	0.4231
Pneumonia and influenza.....480-487	1,465	1,961	0.7471	0.0200	2.7	0.7862	0.7078
Congenital anomalies.....740-759	8,404	8,345	1.0071	0.0062	0.6	1.0191	0.9949
Disorders relating to short gestation and unspecified low birthweight.....765	3,830	3,977	0.9630	0.0107	1.1	0.9839	0.9421
Birth trauma.....767	1,297	1,813	0.7154	0.0337	4.7	0.7813	0.6493
Intrauterine hypoxia and birth asphyxia.....768	1,177	3,599	0.3270	0.0212	6.5	0.3684	0.2856
Respiratory distress syndrome.....769	7,560	...	...	...	...	...	...
Other conditions originating in the perinatal period.....760-764,766,770-779	13,059	15,378	0.8492	0.0098	1.1	0.8683	0.8301
Sudden infant death syndrome.....798.0	4,334	...	...	...	...	...	...
All other causes.....Residual	6,781	12,431	0.5455	0.0061	1.1	0.5573	0.5335

¹ Figures in this column are number of infant deaths in 1976 assigned to the categories in the Eighth Revision, selected as the most nearly comparable to the Ninth Revision categories, as shown in Table B.

² Ratio of deaths assigned according to the Ninth Revision to deaths assigned according to the Eighth Revision.

³ The probability is 95 percent that the true comparability ratio will have a value between the upper and lower limits shown. These limits were computed before the standard error was rounded to the fourth decimal.

APPENDIX

BRIEF SUMMARY OF STATISTICAL DESIGN

General Plan for Deaths at All Ages

In this study the total number of deaths in 1976 (1,909,440) is divided into 13,680 cause-age-color-sex-specific strata, with 285 causes or groups of causes of death classified according to the Eighth Revision. A total of 137,292 deaths in 1,140 random samples was drawn, corresponding to the four color-sex groups for each of the 285 causes of death classified according to the Eighth Revision. Then each of these 1,140 random samples was divided into the 12 age groups used in this study (under 1 year, 1-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85 years and over, and not stated). Thus, by the theorem that states that a simple random sample of a population contains a simple random sample of any subset of the population,¹ this division by age gives as the total number of strata in the study 1,140 multiplied by 12, or 13,680.

This total number of strata is designated by L , the total number of deaths in 1976 by N , and the number of deaths in the general or $kmbi$ th stratum by N_{kmbi} . The subscripts $kmbi$ refer to the following general terms: k for the general term for the 285 causes of death, m for the sexes, b for the color groups, and i for the age groups. Therefore,

$$N = \sum_k^{285} \sum_m^2 \sum_b^2 \sum_i^{12} N_{kmbi} \\ = N_1 + N_2 + \dots + N_{kmbi} \dots + N_L. \quad (1)$$

Similarly, the strata according to the Ninth Revision are designated by L' ; and the number of deaths in the general or $k'm'b'i'$ th stratum, by $N'_{k'm'b'i'}$. Thus according to the Ninth Revision,

the total number of deaths in 1976 may be represented as follows:

$$N' = \sum_{k'}^{282} \sum_{m'}^2 \sum_{b'}^2 \sum_{i'}^{12} N'_{k'm'b'i'} \\ = N'_1 + N'_2 + \dots + N'_{k'm'b'i'} \dots + N'_{L'}. \quad (2)$$

Let the number in the stratum according to the Ninth Revision to which the $kmbi$ th stratum according to the Eighth Revision is most nearly comparable be designated by $N'_{k'm'b'i'}$. Then the equation for the comparability ratio (designated by R_{kmbi}) that is to be estimated is:

$$R_{kmbi} = \frac{N'_{k'm'b'i'}}{N_{kmbi}}. \quad (3)$$

Let the estimate of R_{kmbi} be denoted by $r_{k'm'b'i'}$; and the estimate of $N'_{k'm'b'i'}$ be denoted by $x'_{k'm'b'i'}$. Inasmuch as N_{kmbi} is known, the problem of obtaining an estimate of R_{kmbi} reduces to the problem of obtaining an estimate of $N'_{k'm'b'i'}$. This estimate $r_{k'm'b'i'}$, may be defined as follows:

$$r_{k'm'b'i'} = \frac{x'_{k'm'b'i'}}{N_{kmbi}}. \quad (4)$$

As noted above to obtain the estimate $x'_{k'm'b'i'}$, L random subsamples were drawn from the L strata into which the total number of deaths in 1976 were divided according to classification by the Eighth Revision. These L random subsamples were then classified according to the Ninth Revision.

The size of the random subsample drawn from the $kmbi$ th stratum of N is denoted by n_{kmbi} ; and the size of the stratified random sample drawn from all deaths in 1976, classified according to the Eighth Revision is:

$$n = \sum_k^{285} \sum_m^2 \sum_b^2 \sum_i^{12} n_{kmbi}. \quad (5)$$

¹Hansen, Morris H., Hurwitz, William N., and Madow, William G.: *Sample Survey Methods and Theory*, Vol. II, Chap. 4. New York. John Wiley & Sons, Inc., 1957. p. 106.

The total of this n in the study for all ages is 137,292 deaths.

The number of deaths in the stratum according to the Ninth Revision to which the $kmbith$ stratum of the stratified random sample n , according to the Eighth Revision, is most nearly comparable, is designated by $n'_{k'm'b'i'}$; and the total number of deaths at all ages drawn in the stratified random sample, classified according to the Ninth Revision, is designated by n' . Thus, n' may be represented as follows:

$$n' = \sum_{k'}^{282} \sum_{m'}^2 \sum_{b'}^2 \sum_{i'}^{12} n'_{k'm'b'i'}; \quad (6)$$

where L' designates the strata in the sample according to the Ninth Revision.

Estimator of the numerator.—Inasmuch as the denominators of these comparability ratios (defined in equation (3)) are the total counts of deaths in the stratum in 1976 according to the Eighth Revision, the only values estimated from the stratified random sample (n) are, as stated above, the numerators—the numbers of deaths that would be assigned to each of the strata if all deaths in 1976 were classified by the Ninth Revision. The estimator of these numerators is represented as follows:

$$x'_{k'm'b'i'} = \frac{N_{kmbi} x_{kmbi}}{n_{kmbi}} + \sum_{j \neq k}^J \frac{N_{jmbi} x_{jmbi}}{n_{jmbi}}, \quad (7)$$

where x_{kmbi} is the number of deaths in the $kmbith$ stratum of the sample—the stratum according to the Eighth Revision selected as most nearly comparable to the $k'm'b'i'$ th stratum of the Ninth Revision, and where x_{jmbi} represents the number of deaths in any except the $kmbith$ stratum of the stratified random sample that were coded to the $k'm'b'i'$ th stratum by the Ninth Revision. The total number of strata other than the $kmbith$ that contained deaths that were assigned to the $k'm'b'i'$ th stratum by the Ninth Revision is represented by J .

In equation (7),

$$x_{kmbi} = \sum_{h=1}^{n_{kmbi}} x_{kmbih},$$

where x_{kmbih} takes on the value 1 if the death it represents was assigned by the Ninth Revision to stratum $N'_{k'm'b'i'}$; and takes on the value 0 if the death it represents was not assigned to stratum $N'_{k'm'b'i'}$.

Similarly, in equation (7),

$$x_{jmbi} = \sum_{h=1}^{n_{jmbi}} x_{jmbih},$$

where x_{jmbih} takes on the value 1 if the death it represents was assigned to stratum $N'_{k'm'b'i'}$; and takes on the value 0 if the death it represents was not assigned to stratum $N'_{k'm'b'i'}$.

Variance of the numerator.—The variance of $x'_{k'm'b'i'}$, the estimated total of deaths that are coded by the Ninth Revision to the category numbers comprising $N'_{k'm'b'i'}$, is:

$$\sigma^2_{x'_{k'm'b'i'}} = N_{kmbi}^2 (1 - f_{kmbi}) \frac{S_{kmbi}^2}{n_{kmbi}} + \sum_{j \neq k}^J N_{jmbi}^2 (1 - f_{jmbi}) \frac{S_{jmbi}^2}{n_{jmbi}}. \quad (8)$$

where f_{kmbi} is the sampling fraction (n_{kmbi}/N_{kmbi}), and f_{jmbi} is the sampling fraction (n_{jmbi}/N_{jmbi}). For a variate, such as in this study, that takes on only the value 0 or 1,

$$S_{kmbi}^2 = (N_{kmbi} P_{kmbi} Q_{kmbi}) / (N_{kmbi} - 1), \quad (9)$$

where P_{kmbi} is the proportion of deaths in N_{kmbi} that would take on the value 1, that is, that would be assigned to $N'_{k'm'b'i'}$, if coded by the Ninth Revision, and where $Q_{kmbi} = 1 - P_{kmbi}$. The sample variance for stratum $kmbi$ may be expressed as follows:

$$s_{kmbi}^2 = (n_{kmbi} p_{kmbi} q_{kmbi}) / (n_{kmbi} - 1). \quad (10)$$

Similarly, the sample variance for the general term among all the strata in the stratified random sample that include deaths assigned to

stratum $k'm'b'i'$ by the Ninth Revision may be written:

$$s_{jmbi}^2 = (n_{jmbi}p_{jmbi}q_{jmbi})/(n_{jmbi} - 1). \quad (11)$$

Substituting the right-hand members of equations (10) and (11) for S_{kmbi}^2 and S_{jmbi}^2 , respectively, in equation (8) gives the following as the

estimate from the sample of $x'_{k'm'b'i'}$:

$$s_{x'_{k'm'b'i'}}^2 = \frac{N_{kmbi}(N_{kmbi} - n_{kmbi})}{n_{kmbi} - 1} (p_{kmbi}q_{kmbi}) + \sum_{j \neq k}^J \frac{N_{jmbi}(N_{jmbi} - n_{jmbi})}{n_{jmbi} - 1} (p_{jmbi}q_{jmbi}). \quad (12)$$

Inasmuch as $p_{kmbi} = (x_{kmbi}/n_{kmbi})$; $q_{kmbi} = 1 - p_{kmbi}$; $p_{jmbi} = (x_{jmbi}/n_{jmbi})$; and $q_{jmbi} = 1 - p_{jmbi}$, we have

$$s_{x'_{k'm'b'i'}}^2 = \frac{N_{kmbi}(N_{kmbi} - n_{kmbi})}{n_{kmbi}} \left(\frac{x_{kmbi}}{n_{kmbi} - 1} - \frac{x_{kmbi}^2}{n_{kmbi}(n_{kmbi} - 1)} \right) + \sum_{j \neq k}^J \frac{N_{jmbi}(N_{jmbi} - n_{jmbi})}{n_{jmbi}} \left(\frac{x_{jmbi}}{n_{jmbi} - 1} - \frac{x_{jmbi}^2}{n_{jmbi}(n_{jmbi} - 1)} \right). \quad (13)$$

Standard error of the estimate of the ratio.—Inasmuch as the variance of a constant times a random variable is the constant squared times the variance of the random variable, it follows that

$$s_{r_{k'm'b'i'}}^2 = \left(\frac{1}{N_{kmbi}} \right)^2 s_{x'_{k'm'b'i'}}^2. \quad (14)$$

Taking the square root of equation (14) gives the estimated standard error of $r_{k'm'b'i'}$, denoted $s_{r_{k'm'b'i'}}$:

$$s_{r_{k'm'b'i'}} = \left(\frac{1}{N_{kmbi}} \right) \left(s_{x'_{k'm'b'i'}}^2 \right)^{1/2} = s_{x'_{k'm'b'i'}} \left(\frac{1}{N_{kmbi}} \right). \quad (15)$$

Confidence interval for the ratio.—Once the standard error of the estimate of the comparability ratio (denoted $s_{r_{k'm'b'i'}}$) is known, confidence intervals for R_{kmbi} , the true value of the comparability ratio as defined in equation (3) may be computed. The required degree of confidence that a range will cover the true value of R_{kmbi} has been specified for this study to be 95 percent.

Employing the usual notation in the table for the normal distribution² it may be stated that for given percentage p (equal to 5 percent in the present study) the $p\%$ value λ_p of the normal distribution is defined by the condition:

$$\text{Probability } (|r_{k'm'b'i'} - R_{kmbi}| > \lambda_p s_{r_{k'm'b'i'}}) = \frac{p}{100}. \quad (16)$$

With the 5-percent value λ_p of the normal distribution equal to 1.9600 this gives:

$$r_{k'm'b'i'} - 1.9600 s_{r_{k'm'b'i'}} < R_{kmbi} < r_{k'm'b'i'} + 1.9600 s_{r_{k'm'b'i'}}.$$

To illustrate, let

$$r_{k'm'b'i'} = 1.1852;$$

and

$$s_{r_{k'm'b'i'}} = 0.0406.$$

²Cramer, Harald: *Mathematical Methods of Statistics*, table 2. Princeton, N.J. Princeton University Press, 1966. p. 558.

This gives the relation:

$$(r_{k'm'b'i'} - 1.9600 s_{r_{k'm'b'i'}}) \\ < R_{kmbi} < (r_{k'm'b'i'} + 1.9600 s_{r_{k'm'b'i'}}); \\ \text{or } 1.1056 < R_{kmbi} < 1.2648.$$

Thus, we have two positive numbers (1.1056, 1.2648) such that the probability that the true value of R_{kmbi} is included in the interval defined by them is 95 percent.

Comparability ratios for Ninth Revision List of 282 Selected Causes of Death and for List of 72 Selected Causes of Death.—Since we have simple random sampling within each stratum and all strata have been independently selected except the age groups for each of the four color-sex groups and the age groups for the total population, we may assume that the expected value of the sum of any group of strata is equal to the sum of the expected values of the individual terms, where the value of the individual term is represented by $x'_{k'm'b'i'}$.

Moreover, two theorems make it possible to put together the expected value of the variance of these sums by summing up the expected values of the variance of the individual terms. The first of these theorems is that the variance of the sum of independently selected samples is the sum of their variances; and the second theorem is that if a random variable is multiplied by a constant, the variance of the product is the constant squared multiplied by the variance of the variable.

For the total population, for any cause of death or group of causes, the estimate and the variance of the estimate of the numerator of the ratio was obtained by adding the estimates and variances of the estimates of the numerators of the ratios for the cause or group of causes for each of the four color-sex groups. In turn, for each of the four color-sex groups the estimate and the variance of the estimate of the numerator of the ratio was obtained as if "stratification by age after sampling" had not been introduced in the design.

The variances and estimates for the total population, or for each of the four color-sex groups were not obtainable by summing the variances and estimates for the 12 age groups; because the random samples for these 12 age groups into which each of the color-sex groups was divided were not independently selected samples.

For each of the 12 age groups in the total population, however, for each cause or group of causes, the estimate and variance of the estimate of the numerator of the ratio was obtained by summing the estimates and the variances for the four color-sex groups into which the age group was divided. This was possible because the four random samples by color and sex that made up the age group were independently selected samples.

For the total population and for any sub-population the variance of the estimate of the numerator of the ratio for any subgroup of causes of death is equal to the sum of the variances of the component causes. These additive properties of component causes of death classified by the Eighth Revision to a particular Ninth Revision cause have been taken into account in the design and make it possible to estimate comparability ratios and the variances of these estimates, not only for the Ninth Revision *List of 282 Selected Causes of Death* but also for any shorter list of causes into which the 282 list is capable of being compressed. To keep the study within the constraints of time and resources, however, the plan of the study for deaths at all ages provides for computing comparability ratios only for the following: Ninth Revision *List of 282 Causes of Death* (by color and sex) and the *List of 72 Causes of Death* (by age, color, and sex). It should be emphasized, however, that comparability ratios for a number of shorter lists, including a list of 10 leading causes of death, may be obtained directly from the list of comparability ratios for the longer lists, with the only additional computation needed being that for the residuals.

General Plan for Infant Deaths

The plan for infant deaths, with 12,708 deaths in the sample is analogous to that for deaths at all ages. For infant deaths, however, there are only 134 color-cause-specific strata in the stratified random sample compared with 13,680 strata in the stratified random sample for deaths at all ages.

In 1976 there were 48,265 deaths at ages

under 1 year. Of these, 12,708 were drawn in the 134 color-cause-specific strata.

The plan of the study for infant deaths provides for computing estimates of comparability ratios, together with estimates of their standard errors, for the Ninth Revision *List of 61 Selected Causes of Infant Death* (by color) and for the *List of 10 Selected Causes of Infant Death* for the *Monthly Vital Statistics Report*.

SYMBOLS

Data not available-----	---
Category not applicable-----	...
Quantity zero-----	-
Quantity more than 0 but less than 0.05----	0.0
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